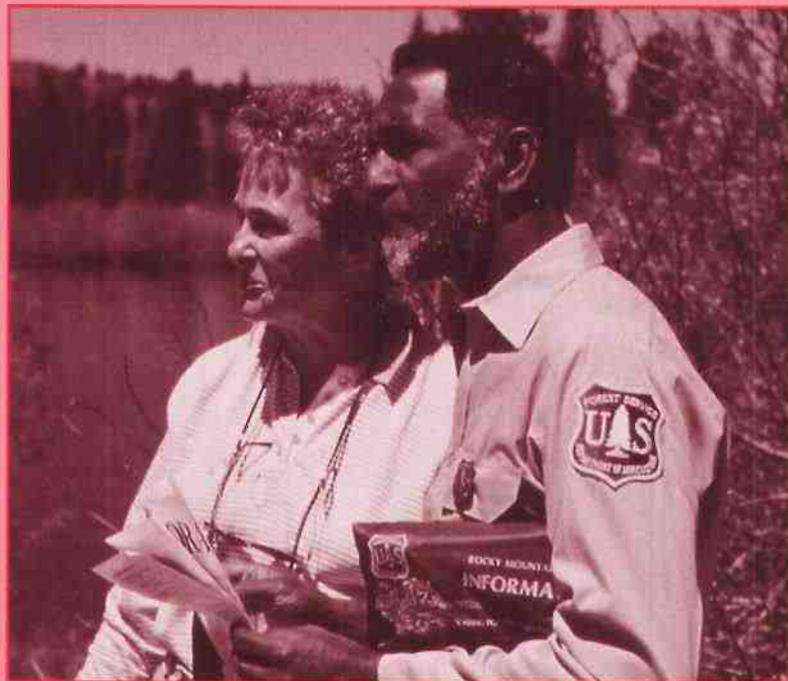


MANAGING MULTIPLE USES ON NATIONAL FORESTS, 1905-1995

A 90-year Learning Experience and
It Isn't Finished Yet



By John Fedkiw



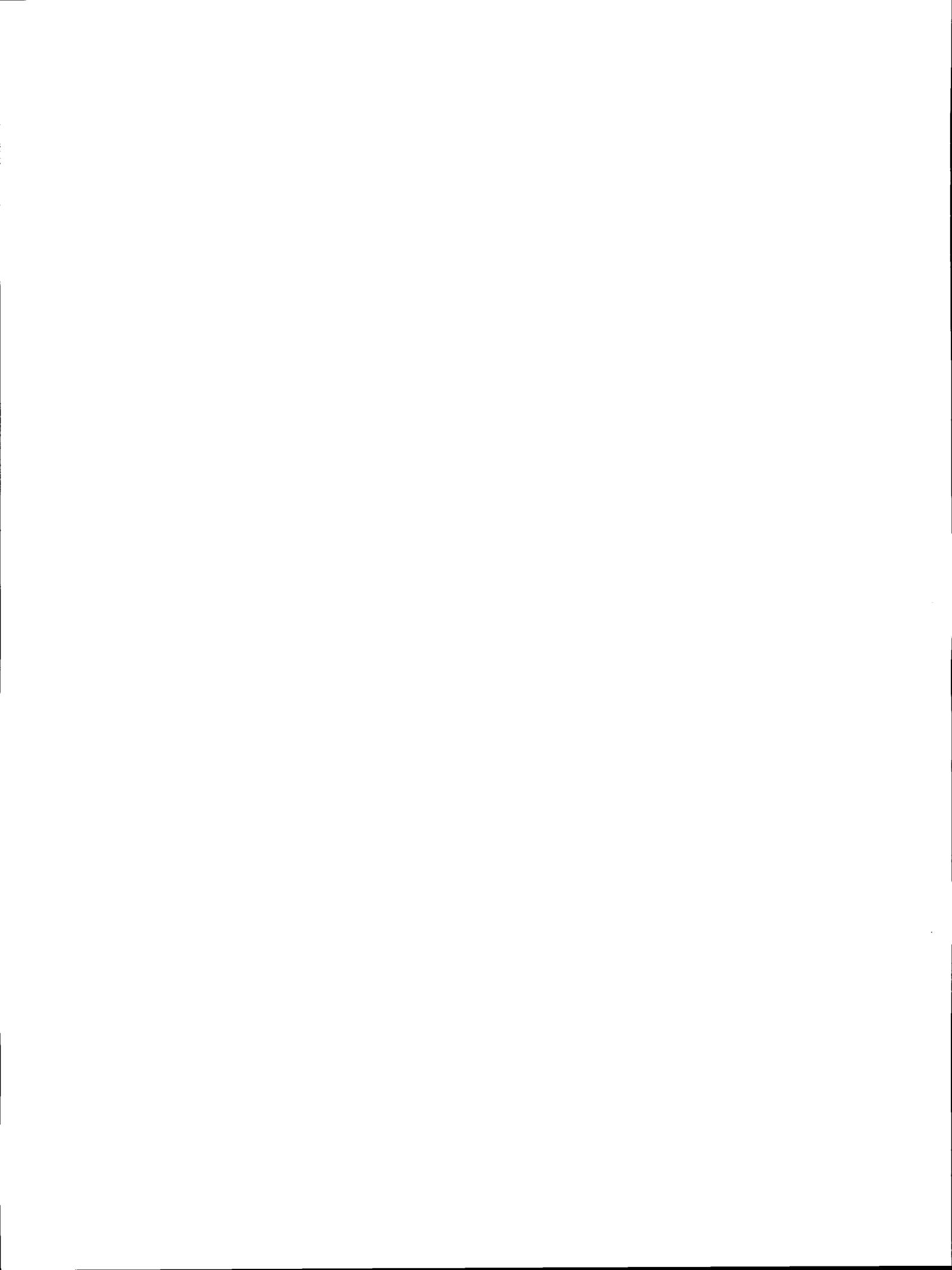
UNITED STATES
DEPARTMENT OF
AGRICULTURE



FOREST SERVICE

**Managing Multiple Uses on National Forests,
1905 to 1995:
A 90-Year Learning Experience and It Isn't Finished Yet**

**by
John Fedkiw**



Dedication

To the national forest resource managers and staff who, over 90 years, have devoted their knowledge and skills to the stewardship of the national forests and grasslands which make up nearly one-twelfth of the U.S. lands and waters.

and

To my wife, Helen, for her loving support of my professional aspirations through all our years together.



Foreword

Once in a while, a truly challenging book comes along. This is one! Dr. John Fedkiw unfolds a story that has not been told this way or this thoroughly before. It is the story of how the dedicated conservationists of the Forest Service have managed the public lands, waters, and resources of the United States and served the public trust for over 90 years.

This story is not an easy one to tell. Each generation has had different expectations for the use and enjoyment of the national forests and grasslands and for the other programs of the Forest Service.

Society has sent — and continues to send — the Forest Service mixed signals over its priorities. Throughout its history, the Forest Service has been buffeted by political, factional, and intergenerational disputes. Reflecting society's strife, each Administration and Congress has set different, sometimes conflicting, priorities. As a result, there has never been quite enough money, people, or time available to the Forest Service to do the impossible — accomplishing everything that society has asked.

Nevertheless, Forest Service management of multiple uses on national forests has been resourceful in adapting to changes in society's expectations and to new knowledge and technology and in implementing productivity improvements to overcome limitations of budgets.

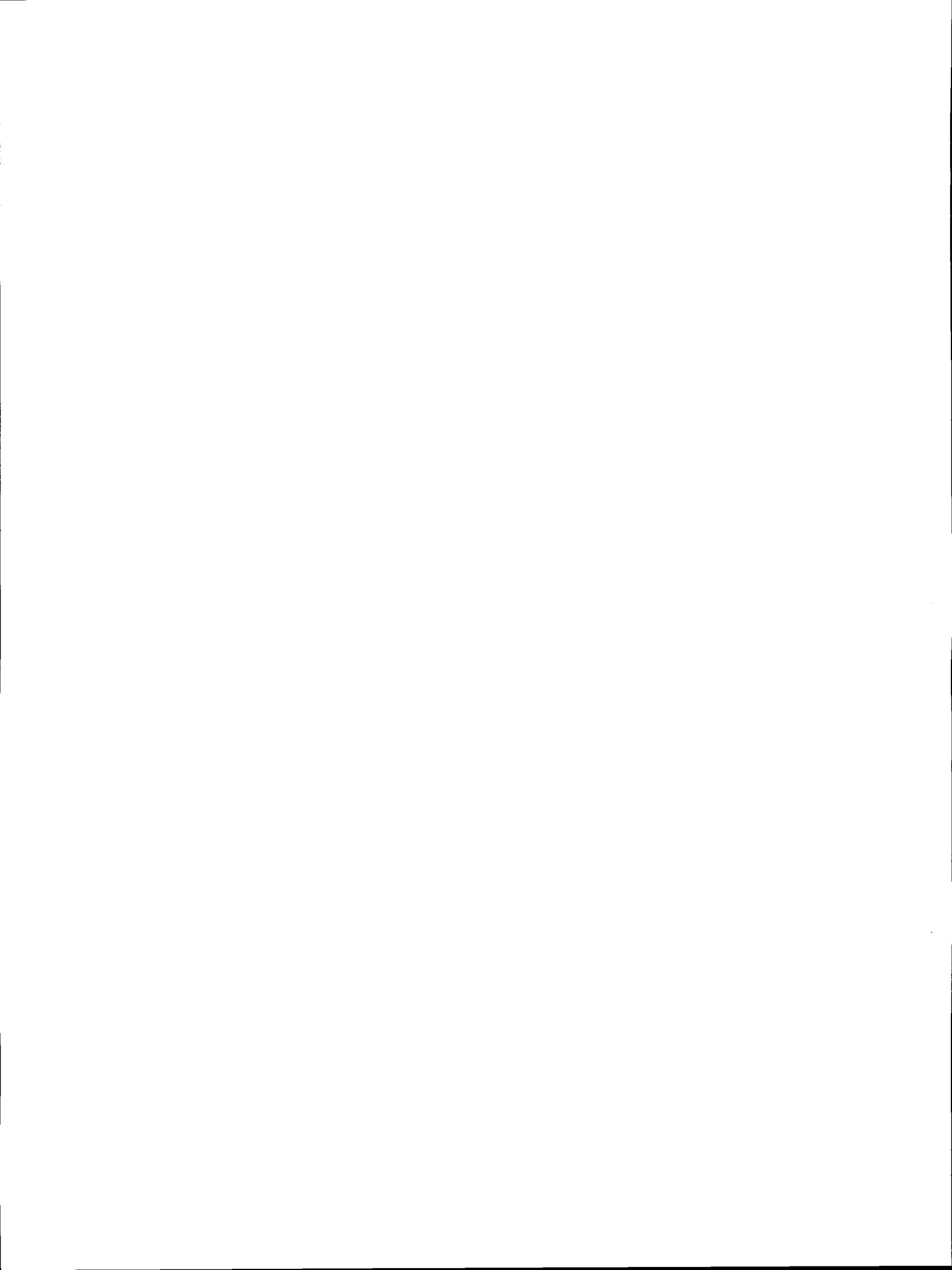
Managing multiple uses on national forests has always included many aspects of the ecological approach to resource management — an approach that the Forest Service explicitly adopted in 1992. We are well on a pathway to the holistic ecological approach to managing multiple uses on national forests. We are again "Breaking New Ground" and, together with the American people, extending the learning experience that has always been a part of the use and management of the National Forest System lands and resources.

What emerges from this book is an understanding that the Forest Service has always found a way to obey the law, care for the land, and serve people, giving society most of what it wanted with extraordinary efficiency. Forest Service employees, agency partners, and everyone who cares about this Nation's natural treasures owe Dr. Fedkiw their thanks.

Redacted for Privacy



Jack Ward Thomas
Chief, USDA Forest Service, 1993–1996



Preface

This project, *Managing Multiple Uses on National Forests, 1905–1995*, was undertaken with the direct support and approval of the Chief of the Forest Service, F. Dale Robertson, and Associate Chief George M. Leonard and the concurrence of the U.S. Department of Agriculture’s Acting Assistant Secretary for Natural Resources and the Environment, John H. Beuter. The original intent was to provide a substantive account of what “multiple-use management” was all about in terms of principles, guidelines, and standards followed. The initial outline and proposal were prepared with the advice and guidance of Hal Salwasser, Director, and James Caplan, Assistant Director, of the New Perspective Project. It was justified as necessary documentation to the 1990 Forest and Rangeland Resources Program emphasis on “multiple-use management” as a leading “role” for the Forest Service, particularly the National Forest System.

The approach through principles, guidelines, and standards for multiple-use management proved infeasible because there was no systematic documentation; there were no specific budgets, programs, staffing, organization, accounting, or reporting for multiple-use management *per se*. A top-down policy approach was infeasible because the policy direction for managing national forests for multiple uses did not give any specific guidelines for applying this policy to specific land areas where management for multiple uses was actually taking place. Upon pondering this dead end, it became evident that multiple-use management was not a system or method as the term and its connotation implied. Rather, it referred to the policy direction to manage National Forest System lands for multiple-use purposes and values.

Because the level and mix of uses of national forest ecosystems changed over time in response to shifts in demands, technology, knowledge, and social values, there seemed to be no other way to cover the subject of managing multiple uses on national forests than to tell it empirically—from beginning to end, 1905 to 1995, use by use, area by area, year by year, decade by decade. Following this approach, it soon became clear that the uses and users were the “drivers” of national forest management; for that matter, of all resource management. Without use and

the anthropocentric objective that use or choice of nonuse implied, there was little need for managing national forests aside from protecting and administering public property. So the method of the story and account of managing multiple uses on national forests responded to the following basic questions:

- Who used the national forests and why?
- How were these uses implemented (managed) on the ground?
- What happened (over time)?

From this perspective, managing multiple uses on national forests emerges as the fitting of multiple uses into ecosystems according to their capability to support the uses compatibly with existing uses on the same or adjoining areas, in ways that would sustain the use’s outputs, services, and benefits, and forest resources and ecosystems for future generations.

Because the multiple uses were explicitly differentiated into categories (user groups) and because their management knowledge and art were developed by function, the uses were also largely implemented by function on national forests. (There were few user advocates for “multiple use” *per se*. Users generally advocated their particular interests, usually recognizing the need to “share” the land with other users with different objectives when the uses were compatible and to compete for the land when they were not). That is the way the story of managing multiple uses on national forests is here told. Over time, implementation of overlapping and adjoining uses becomes progressively a matter of technical planning and coordinating; then integrating multiple disciplines; next, interdisciplinary team planning; and now, an ecosystem approach to managing multiple uses. The fitting of multiple uses within the capabilities of ecosystems and compatibly with existing uses became the development of sustainable systems for recreation, wildlife, fisheries, watershed, timber, landscape, range, wilderness, minerals, and many other more specific uses within national forest and rangeland ecosystem. Thus, managing multiple uses became analogous to forest management and the ecosystem approach to management and evolved within a changing framework of the state of the art

Preface

and knowledge and societal values. The art and the knowledge, for forest management and the ecosystem approach to management, are both dynamic in response to changing uses, technology, knowledge, and societal values.

The modern effort to move from the traditional management for multiple uses to “ecosystem management” or, as it has been expressed and adopted for national forests, to an “ecological approach to management for multiple benefits” can be viewed in an historical context as an evolutionary rather than a revolutionary shift—an extension of the evolving management of national forests that began with the Organic Act of 1897 under the administration of the Department of the Interior and continued

under the administration of the USDA Forest Service from 1905 to 1995. It is so viewed here in this story of managing multiple uses on national forests.

The Epilogue sums up this story as a 90-year learning experience for national forest resource managers, resource professionals generally, and the American people. With the formal adoption of the ecosystem management approach to managing multiple uses and benefits in 1992, national forest managers are once again “Breaking New Ground” in the tradition of the Conservation Movement as expressed by Gifford Pinchot. The learning experience is now being extended into the future within the ecosystem framework of management.

Acknowledgments

I have received help from many people in telling this story about managing multiple uses on national forests and am pleased to acknowledge these contributions.

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I have had much help from the Forest Service in writing this manuscript, but I am glad to say that I have also had the unrestrained freedom to tell this story the way I see it. The responsibility for what is included in this book is solely mine.

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Table of Contents

Chapter 1. Introduction	1
The Concept of Managing for Multiple Uses Emerges	1
The Organic Act of 1897	1
References	4
Chapter 2. Managing Multiple Uses and Protecting Resources: 1905 to 1945	5
The General Character of National Forest Resource Management	5
Early National Forest Staffing	6
Decentralizing Decisionmaking	7
Professional Forester Recruitment Accelerates	7
Research and Cooperation With State and Private Landowners	8
Implementation and Coordination of Resource Uses and Management	8
Managing Grazing by Cattle and Sheep	9
Managing Wildlife Resources and Use	11
Managing Water Resources	12
The Weeks Act of 1911 and Eastern National Forests	13
Managing National Forests for Timber Production	14
Reforestation	15
Improvement of Forest Fire Control	16
Insect and Disease Management and Control	18
White Pine Blister Rust Control	19
Other Pest Management Activities	20
Managing Recreation Uses and Activities	20
Wilderness Preservation	21
Natural Areas for Research	22
Mining	22
Hardrock Minerals	22
Management of Special Uses	24
Homesteading	25
National Forest Use and Management at the End of World War II	25
References	26
Chapter 3. Managing Multiple Uses in the Face of Unprecedented National Demands: 1945 to 1970	29
National Forest Planning and Performance: 1945–1970	29
Diversifying Staff and Skills in Managing Growing Multiple Uses	31
The Management of Multiple Uses: 1945–1970	34
Population, Economic, and Demand Trends	34
Grazing Use and Management	35
Stockowners Sensitive to 1960 Multiple-Use Sustained-Yield Act	37
The National Grasslands	37
Managing Surface Resources on Mineral Leases and Claims	38
Mining Claims	39
Using and Managing Timber Resources	42
Sustained-Yield Units and Long-term Timber Supply Contracts	44
Timber Management Planning	46
1961 National Development Program for National Forests	47
Preparation of Timber Management Plans	48
The Role of Road Development in Timber Resource Management	48
Access To Respond to Natural Disasters	49

Table of Contents

Reforestation and Stand Improvement	50
Planning for Multiple Uses Under the MUSY Act	51
Insect and Disease Management	51
Insect Suppression	52
Disease Control	53
Protection from Forest Fires	54
Fuel Management Activities	55
Initiation of Fuel Management	56
Managing Recreation Uses and Resources	56
National Recreation Areas	61
Designation of Wild and Scenic Rivers and National Trails	61
Wilderness Preservation and Management	62
Reservation of Research Natural Areas	64
Protecting and Managing Watershed Condition	65
Soil Surveys Initiated	67
Water Storage Development	67
Barometer Watershed Projects To Increase Streamflow	68
Wildlife and Fish Management	69
The 1945 to 1960 Period	69
Wildlife Habitat Management and Staffing: 1945–1959	73
Strengthening of Wildlife Management in the 1960’s	73
1960’s Trends in Wildlife and Fisheries Use	76
Emergence of National Policy for the Environment in 1970	76
The 1960’s Open Major Issues for Timber and Multiple-Use Management	77
Timber Management and Fish Habitat	77
Clearcutting: Hardwoods and Wildlife on the Monongahela National Forest	78
Elk/Timber Management Conflicts	79
The Emergence of the Bitterroot Controversy	80
References	81
Chapter 4. Policy Issues and Management Conflicts Challenge Multiple-Use Planning and Management During the 1970’s	85
The National Setting	85
Administration and Congressional Efforts To Expand National Forest Timber Supplies	86
Housing Goals, Timber Demands, and Price Responses	86
The Administration’s Initial Responses to Rising Timber Demands and Prices	88
Congressional Response and the Timber Supply Act of 1969	88
Emergence of the Forest and Rangeland Renewable Resources Planning Act in 1974	90
Administration Efforts To Increase Timber Supplies: 1970–1979	94
Report of the President’s Advisory Panel	95
An Independent Effort for Consensus	96
The Performance of Timber Supplies and Housing Goals in the 1970’s	97
The Clearcutting Issue Leads to New Guidelines for Managing Multiple Uses	99
Early National Forest System Response to Clearcutting Critique: 1970	99
In-Service Evaluation of the Clearcutting Issue on Selected National Forests	100
Chief Cliff Gives Emphasis to the Ecosystem Approach and Training	102
A Nationwide Field Evaluation of National Forest Timber Management	103
Congressional Hearings Elevate Clearcutting to National Issue: 1971	104
Church’s Clearcutting Guidelines: 1973	106

Emergence of the National Forest Management Act of 1976	107
Wilderness Planning and Designation	112
Roadless Area Review and Evaluation (RARE)	113
Eastern Wilderness and Congressional Disavowal of the Pristine Doctrine	114
RARE II	115
Multiple-Use Planning Procedures Improved	119
Regional Planning Area Guides and Unit Plans for Multiple-Use Management	120
Unit plans	120
"Functional" Resource Plans Link to Unit Plans	121
Influence of RPA Legislation	121
Influence of the National Forest Management Act of 1976	122
The Emergence and Development of Public Participation	123
Lessons from the National Issues of the 1970's	125
References	128
Chapter 5. The Performance of Multiple-Use Management: 1970 to 1979	131
The Internal Forest Service Setting: The 1970's	131
National Forest Managers' Training in Ecosystem Management	132
Classifying National Forest Lands and Resources	133
Timber Management	134
Stratification of the Commercial Forest Land Base	134
The Shift to the Unit Planning System	135
Nondeclining-Flow Policy and Its Measure: Potential Yield	136
Silvicultural Practices	137
Timber Harvests, Logging Systems, and Landscape Management	140
Logging Equipment: Methods and Systems	141
Road Design and Construction	142
Landscape Management	143
Wilderness Management and Use	145
Outdoor Recreation and Use Management	148
Growth in Total Visitor Use	148
Staffing for Recreation Management	149
Capacity and Use at Developed Sites	149
National Forest Trails	151
Visitor Information Services and Centers	151
Recreation Special Use Permits	152
Offroad Vehicle Use and Management	152
Cultural Resource Management	153
National Recreation Areas and Wild and Scenic Rivers	154
Minerals Management	154
Surface Mining Activities and Environmental Protection	156
Environmental Analysis Related to Minerals	157
Leasable Minerals	157
Control of Forest Fires and Fuel Management	158
Better Trained and Equipped Firefighters	159
Emergence of Fire as a Management Tool in the West	159
Fire Management Areas	159
Fuel Management	160
A National Model for Planning National Fire Management Budgets	160

Table of Contents

Preservation of Research Natural Areas	160
Biosphere Reserves	161
Forest Pest Management	161
Major Insect and Disease Problems	162
Insect Control	163
Disease Control	164
Herbicide Use	165
Range Management	166
Range Analyses, Planning, and Management	166
Federal Land Policy and Management Act of 1976	168
System-Wide Assessment of Range Condition	169
The Public Rangelands Improvement Act of 1978	169
The Use and Performance of National Forest Rangelands in the 1970's	170
Soil and Water Resource Management	170
National Forest Water Rights	171
Watershed Improvements	172
Managing Wildlife and Fish Habitats and Use	173
Species Richness Approach	175
Featured Species Approach	175
Managing Wildlife Habitats in Managed Forests: An Integrated System	175
Support for and Coordination With Other Resource Activities	177
A Case in Point: Coordinating Timber Management and Elk	178
South Fork Salmon River Strategy	179
Endangered Species Management	179
Habitat Improvement Activities	180
State Cooperation	181
Wildlife Management Institute Study	182
Wildlife and Fish Population Status and Trends	183
National Forest Land and Resource Management Performance in the 1970's	183
Implications for the 1980's and 1990's	184
References	185
Chapter 6. National Forest Management for Multiple Uses: 1980 to 1995	189
The General Setting	189
A New Approach to Forest Planning	189
Economic and Policy Highlights	190
The Role of Public Participation and Growing Confrontation	191
Growing Public Confrontation	192
The National Forest Planning Process and its Performance	193
The Public Issue and Management Concern	193
The Role of Planning Alternatives and Management Direction	194
Management Direction for Implementing Alternatives	194
Principal Guidelines for Planning Multiple Uses	194
The Interdisciplinary Process	196
The Plan Decision Process: Plan Approval, Appeals, and Litigation	196
The Preferred Alternative	196
Forest Plan Appeals	196
NEPA and NFMA Forest Planning Litigation	198
Project-Level Appeals and Litigation	198
National Action Plan To Improve NEPA Compliance	199
Revision of the Rules of National Forest Land and Resource Management Planning	200

Wilderness Designation, Use, and Management	203
Management of Wilderness	203
Wilderness Management: 1980–1986	204
Renewed Efforts To Upgrade Wilderness Management: 1987–1995	206
Research Natural Areas	208
Timber Resource Management	210
Timber Volume Sold	211
Potential for Timber Supply Disruption due to Appeals and Litigation Evaluated	211
The Northern Spotted Owl and Old-Growth Management Controversy	213
The Below-Cost Timber Sale Issue	219
Timber Harvests	222
Clearcutting	223
Road Construction	223
Road Analysis and Display System	224
Silvicultural Examinations and Practices	225
Reforestation	226
Timber Stand Improvement	227
Forest Growth, Mortality, and Potential Yield Trends	227
Pest Management and Forest Health	228
The 1992 Forest Health Strategic Plan	228
Western Forest Health Initiative	229
Exotic Pests and Log Imports	230
Vegetation and Animal Control	230
Fire and Fuel Management	230
Wildfires Worsen After 1984	231
Fuel Management	234
Management of Rangelands	235
Domestic Livestock Use	235
Range Management Activities	236
Noxious Weed Control	237
Role of Public Participation	237
Issuance of New Grazing Permits	238
Emergence of the “County Supremacy” Movement on Federal Lands	238
Mineral Exploration & Development	239
Oil and Gas Leases	239
Coal and Geothermal Leasing	240
Minerals Leased on Acquired National Forest Lands	240
Locatable Minerals	241
Mineral Materials	241
Soil, Water, and Air Resources	241
Coordinating Resource Management With Soil and Water Objectives	241
Soil and Water Inventories	242
Long-Term Soil Productivity Study Initiated	243
Shift Toward an Ecological Approach and Emphasis	243
Water Resource Surveys	243
Soil and Water Monitoring	244
Riparian and Wetlands Management	244
Water Rights	244
Soil and Water Resource Improvements	245

Table of Contents

Air Quality Management	245
Weather Monitoring Program	246
Outdoor Recreation Use and Management	247
Recreation Use of National Forests	247
National Recreation Strategy	249
Universal Access to Recreation Opportunities	249
Scenic Byways and Tourism on National Forests	249
Urban National Forests	250
Interpretive Services	251
“Challenge Cost-Share” Program Expands Recreation Partnerships	252
Volunteer Services Contribute to Recreation Program	252
Heritage Management	253
Trails	253
Tread Lightly	254
Leave No Trace	254
Wild, Scenic, and Recreational Rivers	255
Special Recreation Areas	255
Law Enforcement	256
Marijuana Cultivation on National Forests	257
Wildlife and Fisheries Management	257
Management Practices: 1980–1986	258
Fisheries Management	258
Threatened and Endangered Species	259
Wildlife and Fishery Use: 1980–1986	260
Wildlife and Fishery Habitat Relationships: Modeling Efforts	260
Wildlife and Fishery Management and Use: 1987–1995	261
Fisheries Management	261
Every Species Counts	262
Protecting Endangered Species After Natural Disasters	263
Habitat Management for Endangered Species Reintroduction and Recovery	264
PACFISH Strategy for Endangered Salmon in the Pacific Northwest	264
Get Wild	265
The Growth of Partners in Habitat Management	267
1980 to 1995: A Period of Accelerating Transition and Transformation in Managing Multiple Uses on National Forest System Lands	268
References	268
Chapter 7. Policy Commitment to Ecosystem Approach to Managing Multiple Uses	275
Forest Service Ethics and Course to the Future	276
Breaking New Ground Once More	277
References	278
Epilogue	279
A 90-Year Learning Experience and It Isn’t Finished Yet	279
The Ecosystem Connection	281
References	284

Figures

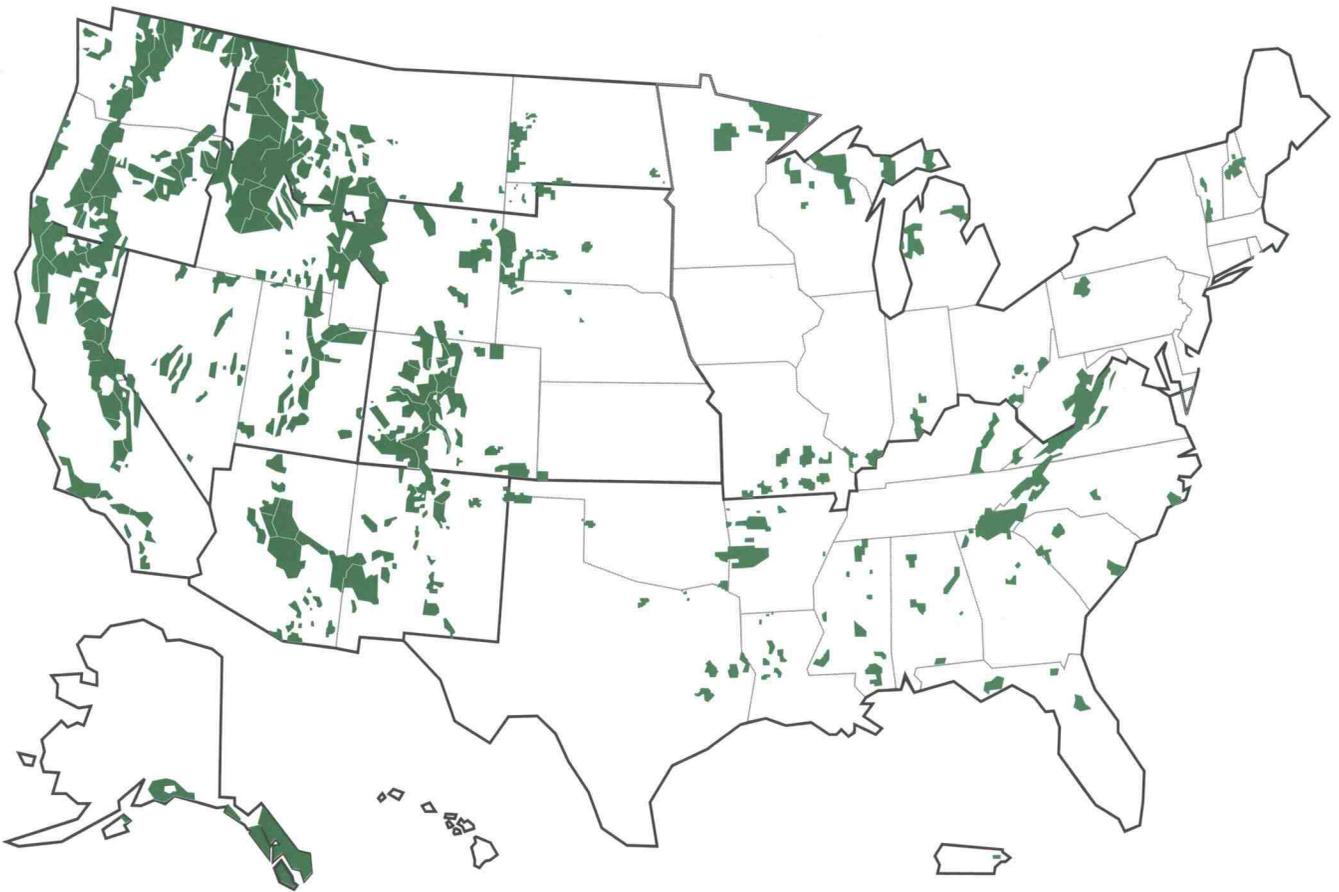
Figure 1. National Forest System lands, including the forest reserves, 1891-1995	5
Figure 2. Number of livestock permitted to graze on national forests, 1906-1992	11
Figure 3. National forest timber harvests, 1905-1945	14
Figure 4. Acres burned by wildfires on national forests, 1910-1994	16
Figure 5. U.S. urban and rural population, 1940-1990	34
Figure 6. National forest timber sold and harvested, 1950-1969	43
Figure 7. Outdoor recreation visitor use of national forests, 1925-1964	57
Figure 8. Outdoor recreation visitor use of national forests, 1965-1994	57
Figure 9. Selected trends in national forests big game populations, 1930-1992	70
Figure 10. Average new housing units constructed annually per 5-year period, 1950-1994	87
Figure 11. Wholesale price trend for softwood lumber, 1960-1988	87
Figure 12. Trend of new home mortgage interest rates, 1963-1994	88
Figure 13. Price increases for softwood lumber, 1970-1979	91
Figure 14. Average annual national forest harvest by decade for major U.S. regions, 1950-1994	98
Figure 15. National forest timber sold and harvested, 1970-1994	140
Figure 16. Total road mileage in the National Forest System, 1967-1995	143
Figure 17. National forest wilderness area and visitor use, 1965-1994	146
Figure 18. Developed outdoor recreation site capacity and use, 1970 and 1979	150
Figure 19. National forest area leased for mineral exploration and development, 1970-1979	157
Figure 20. Decline in pesticide treatments in the Eastern Region of the National Forest System, 1960-1980	162
Figure 21. Beef cattle numbers in the United States and its western regions, 1970-1976	167
Figure 22. Acres of soil, water, and geologic resources inventoried, selected years 1970-1979	171
Figure 23. Wildlife and fisheries user days (WFUD's) on national forests, 1966-1995	173
Figure 24. National forest area treated to provide wildlife food and cover benefits in 1970, 1974, and 1979	180
Figure 25. National forest timber growth, harvest, and mortality, 1952-1991	227
Figure 26. Oil and gas leases on national forests, 1983-1994	239
Figure 27. Coal leases and production on national forests, 1980-1994	240
Figure 28. The Pathway Hypothesis: Over time, the pathway of traditional national forest management leads to a fully holistic approach to resource management	284

Tables

Table 1. Number of Forest Service employees by occupation and skill	31
Table 2. Number of recreation special use permits issued to commercial concessionaries, 1979	152
Table 3. Completed mineral area operating plans by region, 1979	156
Table 4. Number of public input events by type of event	192
Table 5. Appeals of completed forest plans by number, status, and year	197
Table 6. Resolution of forest land and resource management plan appeals	197
Table 7. Summary of project appeal activity, 1986-1992	198
Table 8. Distribution of administrative appeals related to national forest management for 1991 and 1992	199
Table 9. Trend in clearcutting and total area harvested on national forests, 1984-1993	223
Table 10. National Forest System long-term sustained-yield capacity and allowable sale quantity by region, 1994	228
Table 11. Wildlife Challenge Cost-Share assistance	268

The National Forest System-1998

One-Twelfth of the U.S. Lands and Waters



National Forests: On the Pathway Towards Ecosystem Management

Chapter 1 Introduction

The story of managing multiple uses on national forests is a story about the people who used their resources and why; how national forest managers fitted the uses with each other within the ecosystems that embodied and sustained the national forest resources; and what happened as a result of this use and management. It is a story about national forest uses and users and national forest managers and management. It is a grassroots account of the management of multiple uses within the National Forest System from 1905, when these lands came under the administration of the U.S. Department of Agriculture (USDA) Forest Service, to 1995. The multiple uses include a broad range of national forest policy purposes for outdoor recreation, range, timber, watersheds, and wildlife and fish which were made explicit in the Multiple-Use Sustained-Yield Act of 1960. Other land uses such as rights-of-way for pipe and powerlines, public roads, electronic sites, recreation residences, hydropower projects, lodging facilities and resorts, and others were covered by the occupancy and use regulations for national forests under the Organic Act of 1897 (USDA Forest Service 1993).

The forest reserves were initially authorized by Congress and established by Presidential Proclamation in 1891. The reserves were administered by the U.S. Department of the Interior with technical assistance from USDA foresters until they were transferred to USDA under the Transfer Act of February 1, 1905. The forest reserves were renamed national forests under the Act of March 4, 1907, entitled Distribution of Receipts from National Forest Resources (USDA Forest Service 1993).

This story's focus is on the actual uses of national forests and the resource management that national forest managers applied to sustain them and their supporting ecosystems. Its scope is national, but many examples illustrate grassroots use and local, national forest, and regional management. Political issues, policy changes, and national forest funding are addressed where they influence management, but the main thrust of this story is about the users and managers and the uses and resource management as they have been applied on the land. Research and State and Private Forestry, two of the

Forest Service's other major program areas, are similarly addressed where they are relevant.

The Concept of Managing for Multiple Uses Emerges

The idea of multipurpose resource use emerged from the Conservation Movement early in the 20th century. Multipurpose planning for water use and development became a widely supported goal. It became the guiding role of the Inland Waterways Commission appointed by Theodore Roosevelt in 1907 to design multipurpose river basin developments that coordinated irrigation, navigation, flood control, and hydropower production uses (Steen 1976). Conservationists supported the Inland Waterways Commission's 1907 proposal for legislation to establish a multipurpose water resource planning agency, which was eventually passed in 1917 but never implemented due to the intervention of World War I and then congressional termination of the Commission in 1920 (Holmes 1972; Fedkiw 1989). Nevertheless, multipurpose water resource development became the rule for Federal river basin developments and, in time, included recreation, wildlife, and fishery uses.

The concept of managing for multiple uses appeared in the Forest Service's report in the 1920's. Its initial exposition, as "multiple purpose management," appeared in the USDA Forest Service Copeland Report, *A National Plan for American Forestry*, published by the U.S. Senate in 1933 (USDA Forest Service 1933). Twenty-seven years later, Congress formally defined the management of multiple uses on national forests as national policy in the Multiple-Use Sustained-Yield Act of 1960: "National forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes." Congress reaffirmed and expanded this policy in subsequent legislation, most importantly in the Forest and Rangeland Renewable Resources Act of 1974 (RPA) and the National Forest Management Act of 1976 (NFMA).

The Organic Act of 1897

The Organic Act of 1897 established the first national policy direction for national forest use and

management. The Act was explicit about some national forest purposes and uses. It gave the President of the United States the power to establish national forests on public domain lands "to improve and protect the forest within the boundaries, or for the purpose of securing favorable conditions of waterflows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States." This clause later became the basis of the general national forest policy for sustained-yield management of forest products and services. The Organic Act specifically required that public lands judged more valuable for mineral or agricultural use not be included in the national forests. The Organic Act permitted prospecting for minerals on national forest lands under existing public mining laws (General Mining Law of 1872) and national forest management guidelines (Pinchot 1907).

Settlers, miners, residents, and prospectors were allowed to use national forest timber and stone for fencing, buildings, mining, prospecting, and various other domestic uses such as firewood free of charge. The Secretary of Agriculture (the Secretary of the Interior before 1905) was authorized to protect the national forests from destruction by fire and deprecations and "to regulate their occupancy and use and to preserve forests thereon from destruction." This broad, though simple, authorization was all encompassing and permitted all types of uses not specifically cited in the Organic Act, so long as they were not destructive to the forests. Examples of such uses included rangeland grazing, recreational activities, summer homes and resorts, hunting and fishing, flora and bark gathering, rights-of-way for various purposes (such as roads and powerlines), and many others.

James Wilson, Secretary of Agriculture, transmitted a contemporary practical interpretation of the Organic Act management guidance to Gifford Pinchot, the Chief of the Forest Service, on February 1, 1905 — the day administration of the forest reserves was transferred from the Department of the Interior to the USDA. The guidance, initially drafted by Gifford Pinchot, stated:

In the Administration of the forest reserves it must be clearly borne in mind that all land is to be devoted to its most productive use for the permanent good of the whole people and not for the temporary benefit of individuals and companies. All the resources of the forest reserves are for *use*, and this use must be brought about in a thoroughly prompt and businesslike manner, under such restrictions only as will insure the permanence of these resources. The vital importance of forest reserves to the great industries of the Western States will be largely increased in the near future by continued steady advances in settlement and development. The permanence of the resources of the reserves is therefore indispensable to continued prosperity, and the policy of this Department for their protection and use will invariably be guided by this fact ...

You will see to it that the water, wood, and forage of the reserves are conserved and wisely used for the benefit of the house builder first of all; upon whom depends the best permanent use of the lands and resources alike. The continued prosperity of the agricultural, lumbering, mining, and livestock interests is directly dependent upon a permanent and accessible supply of water, wood, and forage, as well as upon the present and future use of these resources ... In the management of each reserve, local questions will be decided upon local grounds. Industry will become considered first, but with as little restriction to minor industries as may be possible; sudden changes in industrial conditions will be avoided by gradual adjustment after due notice; and where conflicting interests must be reconciled, the question will always be decided from the standpoint of the greatest good of the greatest number in the long run (Wilkinson and Anderson 1985).

The Federal policy at the time was to use national forests for national and regional growth and development — the focal point of Secretary Wilson's guidance and the Organic Act. But local use was also important. Access by local users was a realistic extension of the long-held tradition that the resources in the public domain existed for the benefit of local residents who needed them. This use policy was matched by a concern for the permanence of national forest resources and their mosaic of ecosystems; their use was to be balanced with a concern for their protection from fire and destruction and sustaining waterflows, timber supplies, and other permitted uses.



Camping in July 1938 at the Grout Bay campsite, developed under a mature Jeffrey pine stand that also serves as winter habitat for bald eagles. San Bernadino National Forest, California.

Under the Secretary's guidelines, national forest management became the instrument for fitting multiple uses compatibly with each other within the capabilities of forest ecosystems and, over the longer term, adapting the mix and levels of uses to changing market and social values and sustaining national forest resources and their ecosystems for future generations. In 1905, the science underlying U.S. forest and rangeland ecosystems and resource management was still very primitive. The practice of resource management was similarly primitive and, in the absence of strong science, it depended heavily upon learning from past experience, judgment, and such science as was available from European forest conditions and management. As national forest use expanded with rising demands and changing social values, there was enormous room and need for both the science and art to grow and improve. Under these circumstances, adaptive management — adjusting management to fit changing conditions and uses, changing standards, and changing science and art — naturally became the mode for managing the multiple uses. Thus, national forest use and management became as much a learning experience

as a management experience. "Breaking New Ground," as Pinchot characterized the Conservation Movement, became an apt way of characterizing the nature of national forest management. And it remains so to this day.

The Organic Act and Secretary Wilson's guidance set the direction for national forest management. That guidance embodied the utilitarian wise-use concept of the Conservation Movement and the fundamental need to protect the biological productivity of resources for their long-term permanence and benefits. Resource use was related to the welfare of local com-

munities and their workers and residents and *the direction emphasized that local questions about the each forest's management be resolved at a local level.* All uses compatible with resource permanence were to be permitted. Local industry and communities would have first consideration but with as little restriction as possible to minor industries. Sudden changes in local industry conditions were to be avoided in favor of gradual adjustments. Where conflicts occurred, they were to be reconciled in the spirit of "the greatest good of the greatest number in the long run." The *1907 Use Book* elaborated this concept. It recognized that national forest uses would "sometimes conflict a little" and had to be "made to fit with one another so that the machine would run smoothly as a whole." Often one use would need to give way a little here and another a little there so that both could benefit "a great deal in the end" (Pinchot 1907).

This became the Forest Service's philosophy for implementing national forest management strategies and practices for the next 55 years, until the passage of the Multiple-Use Sustained-Yield Act (MUSY) of

Chapter 1

1960. It defined multiple use as the guiding policy for national forests. The MUSY Act provided for the management of all the various national forest renewable resources in ways that would best meet the needs of the American people — and not necessarily the combination that gave the greatest dollar return or the greatest unit output (USDA Forest Service 1993). The MUSY policy was enacted at a time when strong pressures toward single uses were emerging among several interest groups, especially for timber and wilderness. The policy made the multiple-use purposes explicit and directed that national forests be managed in ways that assured equal consideration for all resource users.

The story of the actual use and management of the national forests and administration by the USDA Forest Service begins in Chapter 2. It covers the early years of national forest management, 1905 to 1945, which are generally referred to as the period of custodial management.

Because the western national forests were largely located in the more remote areas and higher elevations where access was poor and population numbers were low, they generally received a lower intensity of use — including timber harvests, which remained relatively limited and geared to meet local needs until after World War II. Livestock grazing was a singular major exception. As with public domain lands (those lands originally acquired and held by the Federal Government but not reserved for special uses such as the national parks, monuments, and

forests or other Federal purposes), national forest rangelands were widely and heavily used for both cattle and sheep grazing almost everywhere in the West.

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Chapter 2

Managing Multiple Uses and Protecting Resources: 1905 to 1945

The national forests became the first Federal Government effort to manage a large natural resource enterprise. In 1905, when the USDA was first authorized to administer these lands, there were 83 forest reserves totaling 75 million acres. Within 5 years, President Theodore Roosevelt had proclaimed 67 more reserves — bringing the total area to 172 million acres. The national forests remained close to that number and area until 1945 and constituted fully 7.6 percent of the U.S. land base (fig. 1).

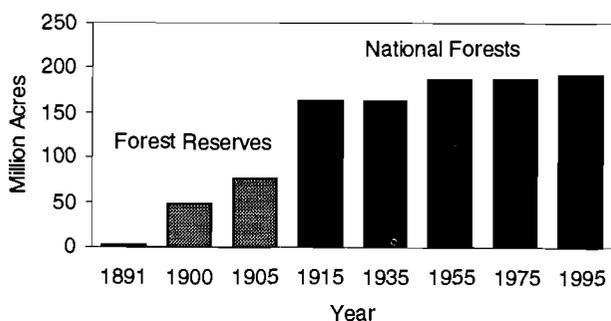


Figure 1. National Forest System lands, including the forest reserves, 1891–1995

Source: USDA Forest Service; Bureau of the Census. 1975. *Historical Statistics of the United States, Colonial Times to 1970*. U.S. Department of Commerce, Washington, DC. p. 533.

The General Character of National Forest Resource Management

The first 40 years of national forest management is best characterized as fitting the multiplicity of natural resource uses into forest and rangeland ecosystems and protecting them from fire and destruction.

Local land users were the driving force behind the management of national forest resources. They included stockowners, hunters, anglers, trappers, loggers and lumbermen, summer home residents, farmers, homesteaders, irrigation and power companies, miners, a wide variety of recreationists, hotel and resort managers and their guests, community water systems, scientific researchers, State game managers, travelers just passing through, and others. The principal constraint on resource uses and

management was that they be applied in ways that would protect the permanence of both the flow of national forest uses, products, and services and the resources themselves.

Because resource demands were modest and there was plenty of space for all within the national forests, the number of uses and users grew throughout this period with little conflict, even though the uses often overlapped or adjoined. Trails and roads for forest fire protection and administration also provided access for hunting, fishing, and other recreational activities. Regrowth of browse, grasses, and trees on harvested timber areas improved wildlife food supplies and cover. Ranchers and shepherders were sensitive about big game and their predators using rangelands, but national forest managers were usually able to find ways to reconcile these concerns without major conflicts. Forest fire damage was greatly reduced to an average annual burn of 234,000 acres during the first half of the 1940's but was still a major concern in 1945, with more than 10,000 ignitions per year. National forest managers improved the quality of recreation experiences and protected forest resources by establishing campgrounds, sanitary facilities, and fireplaces. Game populations were largely maintained and in some cases were improved. The research natural area concept established and implemented a natural ecosystem baseline for monitoring and studying resource performance under the multiple-use management philosophy. Abandoned and eroding farmlands and the heavily cutover woodlots acquired in the 1920's and 1930's under the Weeks Act of 1911, mainly in the Eastern States, were being reforested and improved and were on their way to being rehabilitated and restored as forest ecosystems.

An emerging problem in 1945 was the management of mining claims, particularly their surface resources. The homesteading of lands suitable for agriculture within national forest boundaries was no longer an issue. Though rangelands were generally improving, there were still significant acreages in unsatisfactory condition. Increased timber harvest from the huge national forest reserves effectively contributed to World War II lumber and plywood production and military needs.

Early National Forest Staffing

Young graduates with technical forestry training from eastern colleges and woods-wise men with western ranching and logging experience made up the early national forest administrative and field force. The latter made up the district ranger workforce, and many advanced to higher national forest management roles. There were fewer professional foresters. They provided technical resource management support for forest and rangeland uses, including inventorying and mapping and preparing technical management and work plans.

The Forest Service published the national forests' first "Use Book" (*The Use of the National Forest Reserves, Regulations and Instructions*) in the summer of 1905 (USDA Forest Service 1905). It guided national forest use, protection, and management.

The Forest Service developed its first written and practical district ranger exams in 1906. Each ranger was a land and resource management steward for several hundred thousand acres. Often, he (there were no women rangers until the 1970's) also served as the "policeman, fish and game warden, coroner, disaster rescuer, and doctor" (West 1992). He settled disputes between cattlemen and sheepherders, organized and led firefighting crews, built roads and trails, negotiated and supervised timber sale contracts, issued grazing and other permits, carried out reforestation and disease control projects, and ran surveys. He was the national forest manager who was closest to the uses and the users. One of his major roles was to gain the cooperation of local forest users by earning their respect. Employing

local people with backgrounds similar to those of local residents and national forest users was an important factor in gaining local people's understanding of national forest rules and standards and in encouraging local people to help in fighting forest fires and in accomplishing other forest tasks. Local residents often provided important information on resource uses and conditions.

In the early 20th century, areas in the West were still in transition from a "pioneer" economy of rapid settlement and development — often with exploitive use of timber and range resources — to the conservation and wise use of resources over the longer term. The national forest manager's role was to help users make the transition from the settler's easy access to public lands and resources to a user's managed access with established rules and regulations. Although forest managers sought local support for these rules, many times it was not easy to obtain. Early national forest history is marked by local resistance to national forest managers' restrictions, particularly when it came to domestic livestock



Helen Dowe, a local Forest Service employee, packing equipment into pickup for a survey trip into the Montezuma National Forest (now part of the Grand Mesa Uncompahgre and San Juan National Forests, Colorado).

grazing — the most intensive use of national forests at the time.

Decentralized Decisionmaking

The district ranger became the local line officer and decisionmaker. He implemented national forest uses, protected resources from fire and destruction, and ensured their permanent productivity. He was guided by the technical support and management plans of professional foresters and the general guidelines of the 1905 Use Book and its successor management manuals and handbooks. Forest resource use allocations became, in many ways, a joint or participative activity between the users and the district ranger. The users' needs and their locational constraints were jointly considered with national forest resource capabilities and limitations. In this way, managing multiple uses became first a locational and area decision matter, and second a matter of selecting and applying the practices and methods that would ensure the protection and permanence of resources and compatibility among the overlapping and adjoining uses.

Except for mining, individual national forest uses were largely determined by local user needs and demands. These grew steadily with increasing local populations and improved access. Thus, managing multiple uses developed as a highly decentralized, local decision process within each district under each district ranger's stewardship, with oversight from the forest supervisor, regional forester, and periodically the Forest Service's Washington Office. Management options were bounded by resource capabilities and compatibility among uses, but were also influenced by the users' demands and location constraints. Management of the expanding multiple uses could not be systematically planned on an area-by-area basis for the long term. *Public resource management needed to respond incrementally, year by year, locale by locale, and forest by forest to the changing and growing user demands and the evolving state-of-the-art of resource management in the face of new scientific knowledge, feedback derived from experience, and emerging technology.* Technical management plans and maps, however, were helpful in classifying and locating resource capabilities and identifying their limitations. On-the-

ground implementation of these management plans required determining appropriate uses, management practices, and operational methods on a site-by-site basis. Over the years, this practical management requirement, fitting multiple uses compatibly with each other and the capabilities of the particular situations in ways that would sustain the resources, made it very difficult to define a universal system for managing multiple uses on a site-specific basis.

National forest management was formally decentralized in 1908 when regional offices were established in Denver, Ogden, Missoula, Albuquerque, San Francisco, and Portland (Williams 1994; Clepper and Meyer 1960). Regional foresters (then called district foresters) were authorized to make on-the-ground decisions for their respective regions. Some 377 Forest Service Washington Office employees were reassigned to these new regional offices. The Washington Office also published a new "Manual of Procedure" detailing procedures and policies for the Washington Office and the new regional offices (Williams 1994). Forest supervisors remained accountable for all that happened on their forests; district rangers were responsible for, and took charge of, what happened on their districts. The philosophy was that the person on the ground was the best judge of management situations and options. The public was encouraged to turn to and work with the district ranger, not the forest supervisor. Such a decentralized organization needed some control and, therefore, some uniform performance standards. The "Use Book" initially served this purpose; in later years, it was replaced by expanding manuals and handbooks. Regional and Washington Office people periodically conducted performance reviews and on-the-ground inspections.

Professional Forester Recruitment Accelerates

As forestry schools expanded, the Forest Service aggressively recruited professional forestry graduates. In the mid-1930's, the Forest Service restricted all appointments at the technical forest management level to candidates who had earned a 4-year forestry or related degree. This recruitment policy signaled an end to the era of the self-taught, locally experienced "rugged outdoorsman" in national forest line positions — though some continued to serve as late

as the 1960's. Throughout the 1905 to 1945 period, the Forest Service was the leading employer of professional foresters. Graduates from forestry degree programs or elective options in related fields, such as range or wildlife management, were also eligible and often recruited by the Forest Service.

Conversely, many universities recruited experienced foresters for their teaching faculties from the Forest Service. Aldo Leopold, who developed his concept of wildlife management on southwestern national forests from 1909 to 1928, for example, joined the faculty of the University of Wisconsin and began the first academic program in game management in 1933 — the year he published America's first textbook on game management.

Research and Cooperation with State and Private Owners

The Department of Agriculture began research related to national forest resources in 1903, with investigations of forested rangelands. A USDA Office of Grazing Studies was established in 1910. In 1915, as the need for research on national forest grazing problems became more acute, the Forest Service was given the responsibility for such research.

The Forest Service established its first experiment station at Fort Valley, Arizona — ponderosa pine country — in 1908, with others soon following in Colorado, Idaho, Washington, California, and Utah. Other early research addressed the distribution and growth habits of commercial tree species. Equally important was the need to develop inventory and growth-measurement systems for standing timber and volume-measurement systems for harvested logs. Forestry research studied forest protection, harvest, and regeneration methods. Another important research target was the relationship between forest cover and watershed conditions and performance to runoff and infiltration.

In 1915, the Forest Service created an independent but supporting Branch of Research, which formulated research policies, defined research goals and objectives, and consolidated various research activities. This initiative led to the McSweeney-McNary Act of 1928, which authorized a system of regional

Forest Service forest and range experiment stations, a comprehensive survey of the Nation's forest resources — implemented nationally in 1930 — and an expansion of the broad forestry research program serving not only national forest needs, but also those of States, the forest industry, and other private forest landowners.

Thus, as the use and demands for national forest resources grew, the Forest Service sought to strengthen its underlying science, knowledge, and technology through research on resource protection, management, and improvement and by recruiting professionally trained foresters, range specialists, and wildlife experts. It also began to share its growing knowledge about the use and management of forest and rangeland resources through cooperative programs with State and private landowners.

By 1945, the Forest Service was not only managing the national forests, the most extensive public or private forest management enterprise in the United States, it was also distinguishing itself as the Nation's leading professional forestry agency through its research, its State and private cooperative assistance, and its nationwide forest survey.

Implementation and Coordination of Resource Uses and Management

Coordinating the management of multiple uses where they were complementary, competitive, or overlapping on the same acre, or on adjoining acres with the national forest users, was largely the role of the district ranger and the forest supervisor. This was particularly important where grazing or timber uses and management could significantly influence waterflows, since national forests were specifically created to "protect the flow of waters." In the early decades, coordination also became important where game conflicted with timber or livestock use. This coordination almost always involved cooperation with State fish and game agencies. Under the State's Rights Doctrine, States had the primary role for managing wildlife and fish populations and regulating hunting, fishing, and trapping. The national forest role was limited to habitat management — which indirectly affected such populations.

Because the science of ecology was still developing and largely descriptive, a holistic ecosystem approach to managing multiple uses — encompassing and addressing the forest as a whole including the interdependencies among all its parts — was impractical at the time. The limited knowledge and science that existed about the Nation's natural resources, including their use and management, before 1945 was organized into textbooks and taught in forestry and other natural resource management educational programs by discipline or function rather than holistically.

Shifts in the way the Federal Government organized its planning and budgeting in those early decades of national forest management also had some influence on the national forest funding structure and implementation. In the early 20th century, Federal budgeting was based on an objects-merited approach that funded staff, materials, furniture, buildings, and other things needed to carry out Government operations. Between 1920 and 1945, the Federal Government shifted from the objects-merited system to a functional approach that focused on funding programs for carrying out Government activities such as road construction or reforestation. This functional approach became an effective way to develop and justify programs and budgets and the appropriations for their implementation — a shift that also favored organizing Federal Agency programs by function. The shift also strengthened the decisionmaking influence and power of both the Executive Branch and the Congress over national forest resource management programs and the functional allocation of funding to resource uses and specific management activities. It likewise shifted some of the balance of decisionmaking power from the local, on-the-ground level to the Washington level. However, since national forest management was largely custodial and very limited at the time, the impacts were also limited. In time, however, this approach would lead to funding the management of some resource uses more than others. The Forest Service expressed strong concerns about the appropriate balance of funding among resource uses in the 1960's and 1970's, when the timber and road programs were dominating national forest funding as the Nation focused its priorities on economic growth and housing goals.

In 1974, the Forest and Rangeland Renewable Resources Planning Act would be designed at the behest of its sponsor, Senator Hubert H. Humphrey, to respond to this concern.

From the very beginning, national forest uses and management were implemented by function. In the early decades, national forest budgets were allocated to fund specific activities such as range management, forest fire control, timber sales and management, and road construction. Over time, those functions increased. National forest regulations and management guidelines and much of the management planning were also organized by function; management activities and uses were likewise reported by function. For these reasons, national forest management is described by function in the following sections and chapters. Coordination among the resource uses and management will be described as it has been reported in Forest Service annual reports and elsewhere.

Managing Grazing by Cattle and Sheep

More than half the area of the forest reserves (renamed national forests in 1907) was rangeland where unregulated grazing had gone on since the 1870's and 1880's. Grazing on public domain rangelands was an established use for many ranchers and sheepowners. At the end of the 19th century, however, due to two decades of severe drought and overgrazing, much of the public rangeland was being depleted. The establishment of the forest reserves in 1891 led to a conflict between stockowners and conservation and preservation interests about the continued unregulated grazing on the newly reserved lands and the need to control it, particularly sheep grazing, to protect the soil, range and forest vegetation, and waterflows. Conservation and preservation interests were made up of mostly eastern legislators, conservationists, aesthetic and recreational groups, many western urban people, and irrigationists who were afraid that any use, however small, might damage their water supplies. Timber interests were not overly concerned because in 1891 the best timberlands were owned by private interests and the forest reserves amounted to only 17 million acres. In 1893, this polarization over use brought the creation of new forest reserves to a halt,

when President Grover Cleveland, after proclaiming two additional reserves in Oregon — totaling 4.5 million acres — refused to create any more reserves until Congress provided authority to manage the already existing 17 million acres (Roth, no date; Robinson 1975; Rowley 1985).

In April 1894, the Department of the Interior's General Land Office (GLO) issued its first official policy statement regulating grazing. It prohibited "driving, feeding, grazing, pasturing, or herding cattle, sheep, or other livestock" on all forest reserves (Colville 1898b). However, this order was poorly enforced. For example, a National Academy of Science committee appointed in 1896 reported 2 years later that, with only one exception, it had found no evidence of Government efforts to protect the forest reserves from overgrazing (U.S. Senate 1898; Wilkinson and Anderson 1985).

The grazing issue was resolved after the signing of the Organic Act. The GLO gradually permitted cattle grazing. Then, with assistance from USDA research and the Division of Forestry, it determined that if sheep were properly controlled, their grazing would not harm the range or forest soils and vegetation. They also determined that the welfare of the people would be better served by a USDA-recommended "special tract permit system." Sheep were a concern because they greatly outnumbered cattle and were thought to cause soil and vegetation damage (Coville 1898a, 1898b). To avoid such damage, the GLO adopted the special tract system and required graziers to obtain a written permit to graze a specified number of animals on a specific forest area, which the area could support without damage. When the forest reserves were transferred to the Forest Service in 1905, national forest managers



Sheep grazing on the Kaibab National Forest, Arizona, August 1914.

continued this system. Grazing fees were imposed on permittees in 1906.

Continued range grazing and vegetation research led to the introduction of deferred and rotational grazing systems and other management innovations on national forest rangelands — practices that contributed to improving their vegetative condition and soil stability. By the late 1920's, grazing management was shifting from "rule of thumb" management to "scientific range management" (Alexander 1987). The research-based national forest approach of matching the number of grazing animals and use to the carrying capacity of the permitted rangelands gradually reduced the animal unit months (AUM's), except during World War I when stocking was increased to provide for military needs (West 1992). (An AUM is 1 month's occupancy of the range by one mature cow, weighing 1,000 pounds, and her calf or the equivalent for other grazing animals). Livestock numbers on national forest rangelands, primarily sheep, were reduced from 8.7 million annually before 1935 and a maximum of 10.8 million in 1919 to 5.5 million by 1945 (fig. 2). In 1934, a *Report on the Western Ranges: A Great but*

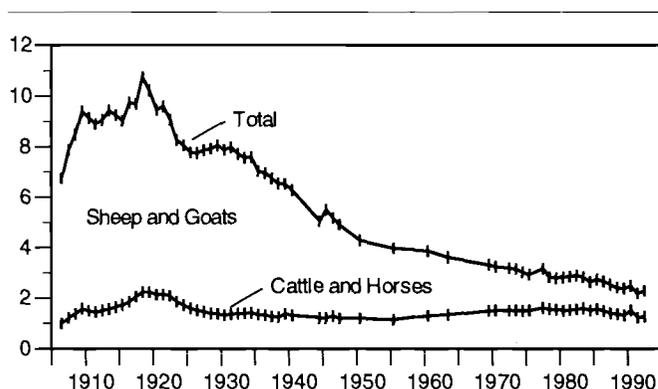


Figure 2. Number of livestock permitted to graze on national forests, 1906–1992

Source: USDA Forest Service.

Neglected Natural Resource (U.S. Senate 1936) revealed that national forest rangelands were in significantly better condition than those in private ownership or in the public domain. National forest ranges had improved from 1905 to 1934, while private and other public ranges had deteriorated significantly (Gardner 1991).

Until the passage of the Taylor Grazing Act of 1934, unregulated grazing on the basis of free and open range continued on the remaining unreserved public domain. The Act introduced regulated grazing on the remaining public domain administered by the Department of the Interior's newly established Grazing Service. In 1946, the administration of public grazing lands was placed under the Bureau of Land Management (BLM), which merged the Grazing Service with the GLO.

Managing Wildlife Resources and Use

Hunting, fishing, and trapping were major national forest uses not specifically cited in the Organic Act, due in part to uncertainty about the role of States and State rights in managing wildlife and fish (West 1992). The Forest Service cooperated with State and Territory game wardens to enforce their laws that protected fish and wildlife on national forests.

The proclamation of national forests itself probably had only a minimal effect on wildlife and fish. It may have reduced poaching levels that might have

occurred otherwise. In the longer term, however, as use and interest in wildlife and fish populations grew and became differentiated, the extensive, contiguous national forest lands provided many options for designating wilderness areas, wildlife refuges, and management areas and for implementing a wide variety of habitat management practices. National forests also became a source of big game animals for reintroduction into areas with extirpated populations.

Early wildlife management efforts focused on controlling livestock and wildlife predators (wolves, coyotes, mountain lions, and eagles) and prairie dog colonies that were considered a hazard to livestock. At the time, the eradication of predators was a widely favored step toward restoring big game populations, which had been reduced to very low levels by the turn of the century, primarily due to unregulated hunting and killing for commercial markets. Game refuges were established on National Forest System lands — often in cooperation with State initiatives to conserve wildlife and increase game populations. Some were also established to concentrate deer and coyotes away from livestock grazing areas to reduce wildlife competition for forage and to reduce livestock predation. In 1939, the 661 refuges and sanctuaries on national forests totaled 36.5 million acres. Their management was limited largely to a few basic principles. Multiple-use coordination of wildlife and domestic livestock grazing, for example, was oriented toward protecting and encouraging the growth of game populations and avoiding conflicts between livestock and game animals and their predators. Predator eradication favored both game and livestock populations. However, where use imbalances between livestock and game occurred, national forest managers, with State cooperation, managed both wildlife habitats and populations more rigorously.

In the late 1920's, national forest managers hunted excess mule deer to reduce the damage being caused by overextended populations on the forage resource on the Grand Canyon Federal Game Preserve (Kaibab National Forest). By 1924, the North Kaibab deer herd had grown from 3,000 to 4,000 animals in earlier years to approximately 100,000 animals. By 1925, the forage resources were severely depleted

and deer die-off had reduced the herd to 32,000. During the latter half of the 1920's, livestock grazing on the preserve remained fairly stable at about 9,000 head, including 5,000 sheep. Although livestock grazing had been somewhat reduced, range conditions did not improve and deer continued to die of starvation. Deer herd reduction was thought to be a key management need and option. In 1927, such reduction was successfully challenged at the U.S. District Court level. The U.S. Supreme Court, upon appeal, however, sanctioned Government hunters to kill Kaibab deer (Russo 1970). In 1928, Government hunters further reduced the herd.

In the Pacific Northwest, issues over timber management on the Mount Olympus National Monument, established on 620,000 acres of national forest lands in 1910 to protect the Roosevelt elk, showed that public concern for protecting the elk outweighed the public demand for timber production. During and after World War I, to develop communities and jobs, national forest managers assigned the Monument and its surrounding national forest area a top priority for road construction and timber production. This action was long and widely opposed by some interests and supported by others. In the mid-1930's, the Forest Service and the USDA Bureau of Biological Survey recommended shooting excess elk in the area around the Monument to prevent overgrazing, disease, and starvation. However, public outrage in the nearby Seattle area and among conservation groups, both of whom felt a great concern for the elk, led to the transfer of the Monument and its adjacent national forest lands into the new Olympic National Park in 1938. Although the herd reduction goal was credible, the public believed that forest management had been insensitive to the elk herd (Wolf 1990).



Group of mule deer holing up in winter cover after a new snowfall on the Bridger-Teton National Forest, Wyoming, 1940.

Notwithstanding the Mount Olympus National Monument experience, national forest managers initiated elk restocking in 8 of the 11 contiguous Western States (excluding California and Nevada). By 1940, the numbers of elk on national forests had increased from less than 100,000 to more than 150,000 (Thomas et al. 1988).

A new, positive concept of habitat management to support wildlife began to emerge from the Kaibab and other experiences. Depression-era public works programs, particularly the Civilian Conservation Corps (CCC), achieved a great deal of habitat improvement. On the administrative side, by 1936 the Forest Service had a Washington Office Director of Wildlife Management, with 61 people assigned to wildlife management activities — mainly in the field (Roth 1989).

Managing Water Resources

The primary and explicit policy goal of the Organic Act was to ensure favorable conditions for water-flows. It responded to farmers and communities who wanted to be assured that grazing and logging would not adversely affect their irrigation and domestic

water supplies. Soil conservation became a prime concern in managing grazing and safeguarding streams from logging. Improved forest fire protection and prompt reseeding of severely burned-over areas reduced the potential for rapid runoff and erosion damage.

National forest managers cooperated with communities to protect the national forest sources of their water supplies. While timber harvesting and management were practiced on some such areas, they were planned to protect municipal water supplies.

States, communities, various Federal agencies, private irrigation companies, miners, and others were permitted to construct and manage dams for farm irrigation, municipal water supplies, mining, hydropower generation, and other purposes. National forest hydroelectric engineers, among the first professional engineers on the national forests, assessed the suitability of water resources for hydroelectric projects and provided technical

evaluation of water development proposals. (USDA Forest Service 1990).

Some dams had been built on national forests while they were still public domain or forest reserves administered by the Department of the Interior. Between 1933 and 1942, the CCC built many more small dams for recreation, water conservation, and fishing. By 1945, there were more than 2,500 such dams. Most had been privately built and were operated under national forest permits, but the Forest Service owned and managed about a third.

The Weeks Act of 1911 and Eastern National Forests

The belief that forests influenced waterflows and contributed importantly to flood control became a driving force behind the purchase and establishment of national forests in the Eastern States, where there was no public domain to reserve as forest land. Congress initially addressed the idea in 1900, when it funded a study to investigate the need for a Southern Appalachian Forest Reserve. Although the

investigation "unmistakably" showed such a need on the grounds of bolstering the southern economy and improving flood control, no reserves were proclaimed. Nevertheless, support for eastern forest reserves grew.

In 1911, to protect the headwaters of navigable streams, Congress authorized the purchase of lands to establish the eastern national forests (Shands and Healy 1977). This legislation became known as the Weeks Act of 1911. By 1920, more than 2 million acres had been purchased. In 1924, the Weeks Act was expanded to include land purchases to protect the flow of streams for irrigation or to promote a future timber supply. By 1945,



Fish dams on stream in Poliza Canyon on the Santa Fe National Forest, New Mexico, 1936. These dams benefit fish, wildlife, riparian area, stream channel condition, and stream condition and flow.

more than 20 million acres had been added to 44 new national forest locations mostly in the Eastern States. Much of the purchased acreage was submarginal and abandoned, often seriously eroding, farmland — a legacy of the agricultural recession of the 1920's and the Great Depression. Before they were abandoned or sold, the forested portions of these lands were often stripped of all saleable timber without regard for the land's future. Protection was not enough. In many places, these seriously damaged woodlands and watersheds needed reforestation and improvement. National forest managers promptly began restoring forest ecosystems on non-stocked lands by rehabilitating damaged woodlands; eliminating feral dogs, cattle, and hogs; and generally improving the related watersheds.

Managing National Forests for Timber Production

In 1898, a year after the passage of the Organic Act, the Department of the Interior's GLO made its first timber sale on a forest reserve. The Homestake Mining Company purchased 15 million board feet of timber on South Dakota's Black Hills Forest Reserve at \$1 per thousand board feet.

By 1901, the GLO's Division "R" and the USDA Division of Forestry were dividing the task of managing the forest reserve lands — Department of the Interior personnel patrolled the reserves and USDA foresters provided technical management support. Forest reserve administration was regulated by Interior's *Forest Reserve Manual* of 1902. When the reserves were transferred to the USDA, the general objective of the forest reserves was defined in the Forest Service's 1905 Use Book as:

... preserving a perpetual supply of timber for home industries, preventing the destruction of forest cover which regulates the flow of streams, and protecting local residents from unfair competition in the use of forest and range. (USDA Forest Service 1905)

The forest reserves provided a legacy of timber sales for national forest lands. However, the timber industry preferred to log off the more accessible private lands and their own lands, so national forest timber sales remained minor in scale. Until World

War II, national forest timber remained largely a reserve to be used, when needed, to meet national demands or to supplement industry's supply from private lands as its supply became more limited or was depleted. Although some national forest managers pressed for large, long-term timber sale contracts to encourage economic and community development, the annual harvest in 1920 was barely a billion board feet (Wolf 1990). In 1926, national forest managers curbed the modest timber sale program and extended long-term sales to avoid compounding the economic and business problems of a depressed timber industry. A soaring timber economy in 1930 increased national forest timber sales to 1.7 billion board feet (bbf), but the Great Depression shrunk harvests for the balance of the decade (fig. 3). In 1940, national forest timber sales reached a new peak of 1.8 bbf. Then, as the demands of World War II grew, sales rose to the 3.0-bbf level (West 1992).

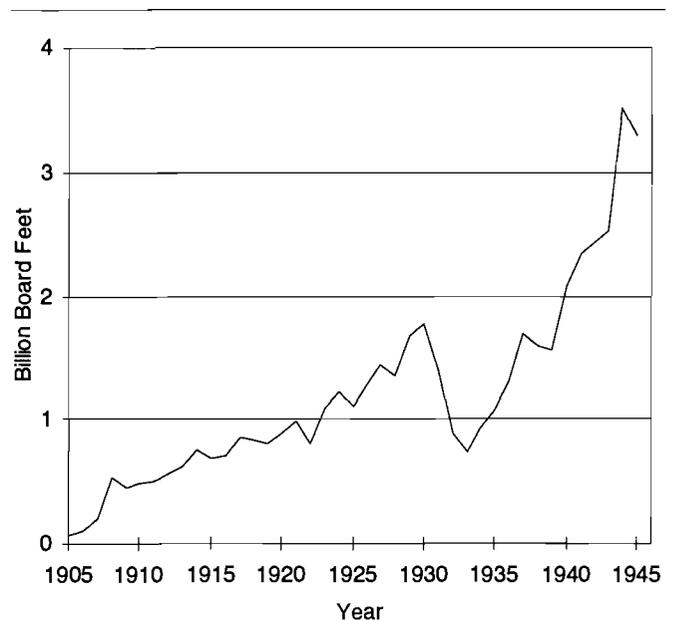


Figure 3. National forest timber harvests, 1905–1945
Source: USDA Forest Service.

To guide the use of standing timber and ensure the forest's future usefulness, all national forests were required to prepare working plans. Each forest's working plan displayed its approximate timber yield to avoid overcutting and to calculate and manage

the rate of timber harvest consistent with its yearly growth and prospective local needs (USDA Forest Service 1908). By the 1920's, detailed management plans were being prepared on each timber-producing forest. Such plans estimated the amount of timber that could be cut from "working circles," which were areas that contained enough timber and timber growth to support local forest industries. They also provided information on the area from which a "continuous" supply of timber could be grown and cut; the amount of timber that could be harvested annually or by decades and still maintain timber growth at a level that would replace the harvested volume; cutting guidelines to ensure the best crops for future harvests; the location of overmature or decadent stands most in need of early harvest; and the contribution of the timber harvests to local industry, employment, and community stability (Wilkinson and Anderson 1985).

Between 1905 and 1945, the annual national forest timber harvest averaged less than a billion board feet. The 40-year harvest total represented only 2 percent of the Nation's total timber supply from domestic sources and involved less than 2 percent of the total national forest area. In this period, timber harvesting and management introduced relatively small changes into forested ecosystems. Such changes were generally seen as benefiting game populations because they created desirable openings in mature and old-growth forest areas, which, in turn, provided edges, openings, and regrowth of young trees and other vegetation that increased the spatial diversity of wildlife food and cover.

Timber harvesting was seen as a tool for increasing national forest timber growth and transforming national forests from "wild" to cultivated forests (USDA Forest Service 1908). Most timbered areas on national forests were available for timber harvesting. However, green timber could be sold and harvested only where regeneration was reasonably assured and where harvesting would not reduce future timber supplies or damage streamflows (USDA Forest Service 1907).

During national forest management's early decades, selective cutting was the most common method of timber harvest (Robinson 1975). However, as the

various silvicultural shortcomings of selective cutting in some forest types became apparent, harvesting gradually shifted toward clearcutting and other even-aged regeneration methods such as shelterwood and seed tree. National forest managers eventually recognized that Pacific Coast Douglas-fir generally did not regenerate and grow successfully in the shade of trees remaining after individual tree selection cuts. Other, less economically desirable shade-tolerant species, such as hemlock, would eventually replace most Douglas-fir in the resulting regenerated stand. Even-aged forest management, including harvesting and regeneration, which removed all trees (clearcutting), was most successful in regenerating Pacific Coast Douglas-fir. Another consideration at the time was the susceptibility of the often shallow-rooted residual old-growth Douglas-fir trees to windthrow and volume losses in partially harvested stands. Other factors favoring even-aged methods included easy and effective slash removal and, in the case of severely diseased and infested areas, the easy removal of infected and infested trees (Robinson 1975). Clearcutting, however, did not become the National Forest System's predominant method of timber harvest and regeneration until well after World War II. But clearcutting patches of Douglas-fir in the Pacific Northwest did begin as early as the 1920's and became more widespread and general by World War II (Robinson 1975).

Reforestation

The reforestation of burned-over lands and non-restocked harvested areas initiated on the forest reserves during their administration by the GLO was greatly accelerated on the national forests after 1905. The Forest Service increased the number of tree nurseries and seedling production. Acres reforested rose from about 1,000 per year before 1905 to 25,000 by 1933. The establishment of CCC camps on national forests, with their ready supply of tree-planting labor, jumped the acres reforested annually to 69,000 in 1934 and to more than 150,000 in the late 1930's and early 1940's. As the acquisition of abandoned farmlands expanded rapidly in the East after 1924, the reforestation of former croplands and fields became a high priority.

With the entry of the United States into World War II in 1942, reforestation on national forests came to a

partial halt. The total cumulative acres reforested to that time, including replantings, was approximately 1.5 million acres, of which 1.1 million were evaluated as established plantations — indicating about a 75-percent success rate. However, 255,000 acres needed improvement to free more desirable species and allow the better quality trees to grow more rapidly, especially where young planted trees were being crowded by natural seeding and sprouting of lower value, less desirable trees and brush (USDA Forest Service 1905–1945). In 1940, an estimated 3 million acres of national forest lands needed reforestation. About a third were on eastern forests and the balance were in the West, where many burned-over areas needed restocking. In the decades following 1905, forest fires were a major destructive force, particularly on western national forests (USDA Forest Service 1905–1945).



Hired crew replanting Douglas-fir in 1936 on the 622-acre area devastated by the Yacolt burn on the Gifford Pinchot National Forest (formerly Columbia National Forest), Washington State. By 1950, more than 19,500 acres had been reforested on this severe burn.

Improvement of Forest Fire Control

Throughout the 1905 to 1945 period, forest fires were a destructive force on national forests. Lightning (the principal cause), the lack of adequate detection and rapid access systems, and persistent drouthiness contributed greatly to the large areas burned each year. Organized protection began soon after 1905. The Expenditures and Receipts Act of 1913 authorized regular funds for developing road and trail access on national forests. It directed that 10 percent of all money received by national forests be available for road and trail construction and maintenance (USDA Forest Service 1983). Although forest fire protection improved steadily, huge conflagrations still occurred. In 1910, forest fires burned 5 million acres on national forests; in 1919, they destroyed 2 million acres. There were seven other

years when forest fires burned between 500,000 and 1 million acres: 1917, 1918, 1924, 1926, 1929, 1931, and 1934 (fig. 4). The annual burn in the 30 years from 1905 to 1935 averaged nearly 600,000 acres (USDA Forest Service 1905–1945, 1993a).

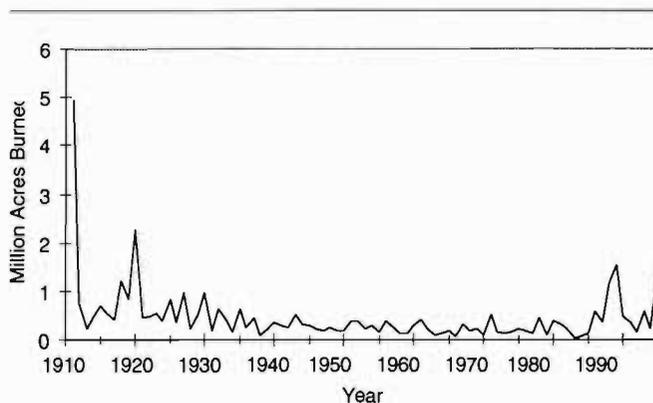


Figure 4. Acres burned by wildfires on national forests, 1910–1994

Source: USDA Forest Service.



Aftermath of August 20, 1910, hurricane and fire, Coeur d'Alene National Forest near Wallace, Idaho.



Forest ranger on forest fire patrol duty, Cibola National Forest, New Mexico, 1923.

Between 1935 and 1944, the standardized fire detection and control system initiated in the early 1920's became fully effective and the persistent drouthiness abated. This helped reduce the average annual burn to 224,000 acres. Many other factors also helped. The forestwide transportation system planning effort, first established between 1928 and 1932, focused on access and transportation coverage for fire control needs (USDA Forest Service 1990). The fire-weather forecasting and fire danger rating systems and information on forest fuel distribution and hazards were greatly improved. More motor-driven fireline-building and trench-digging equipment — including

tractors, plows, bulldozers, and brush-breaking tools — and improved portable chainsaws with light-weight gasoline motors were introduced. High frequency two-way radio sets led to much more effective communication during fire detection and suppression. Experimental work with smokejumpers began in 1934. By 1940, when the operational program began, the number of trained smokejumpers had risen to 24. By 1944, there were 120. Smokejumpers greatly increased the speed of attack on remote lightning-caused fires that were difficult to access by ground transportation and raised the probability that such fires would be suppressed while still small (USDA Forest Service 1905–1945).

The CCC, which operated from 1933 to 1942, with a majority of its 1,300 camps located on national forests, also contributed importantly to the effectiveness of fire prevention and suppression. Corpsmen constructed many fire towers, telephone lines, trails, and roads that substantially improved fire detection and communication systems and provided more



Ranger putting up notice telling campers to extinguish fires, Smuggler Mountain road, White River National Forest, Colorado, June 1915.



Forest ranger recording morning readings of fire-danger weather data on the San Isabel National Forest (formerly Cochetopa National Forest), Colorado, 1939.

rapid fire access. They also contributed their firefighting capabilities to controlling forest fires.

Despite the fact that World War II drained national forests of many of their trained firefighters, national forest managers were able to sustain this improved forest fire suppression performance. They managed to do so by recruiting and training military personnel located at nearby facilities and centers, 16- and 17-year-old boys from local high schools, and elderly men and women (for lookout posts only) from nearby communities.

Insect and Disease Management and Control

In 1902, Congress authorized the USDA Bureau of Entomology and Plant Quarantine as a clearinghouse for advice on the timing and location of insect control measures on national forests (forest reserves before 1907). It also authorized the Bureau to provide technical skills for examining reported outbreaks and to advise the Forest Service on pesticide application and insect control methods. The Bureau

set up a Division of Forest Insect Investigation to provide these services, and national forest managers vigorously used Division entomologists throughout the 1905 to 1945 period to evaluate insect outbreaks, test and develop control methods, and design and oversee practical control operations (Gill and Dowling 1945; USDA Forest Service 1905–1945).

During the early years, reconnaissance and expert inspections to discover insect damage and locate problems before they became epidemic received major emphasis. Insect control funds were very limited. National forests, without dedicated control funds, gave special emphasis to testing and evaluating control methods. Where serious infestations were found, reconnaissance focused on the most valuable timber species. Control activities were concentrated on the forests with valuable timber and where damage from previous outbreaks had been extensive.

The first substantial insect control funding came in 1922 for a major epidemic of ponderosa pine bark beetles scattered over 1.3 million acres in southern Oregon and northern California — causing a loss of 1.5 bbf of valuable ponderosa pine timber. About half the infested area was on private land; a small amount on State forest land; and the balance on national forests, Crater Lake National Park, Indian reservations, the public domain, and revested Oregon and California (O&C) Railroad grants. Many more acres were threatened. This situation of multiple ownerships and public jurisdictions typified the complexity of controlling major insect infestations. Congress provided \$150,000 of emergency funds for control on Federal lands subject to State and private landowner cooperation. The result was a gratifying cooperative control effort between the Department of the Interior, the State of Oregon, private landowners, the USDA Bureau of Entomology, and the national forests, which constituted 285,000 acres in the infested area.

During this period, ponderosa pine bark beetles were generally the most destructive insects on national forests and other ownerships in the western coniferous forest. There were epidemic outbreaks in all of the Western States, killing large numbers of trees, severely impacting the growth of the surviving trees, and setting the stage for devastating fires. Epidemics often started in trees weakened by drought or fire or damaged by windthrow, snow-break, or root rot. Timber losses were often the most obvious result of insect epidemics, but sometimes infestations caused tree stands to revert to shrubs or grasses or to regenerate to less desirable tree species. Wildlife hiding and thermal cover was altered, making wildlife movement more difficult and often disturbing their composition and distribution. Tree loss from insect infestations often resulted in several years of downstream flooding and soil erosion.

Almost every year from 1906 to 1945, bark beetle control was carried out on one or more national forests. During this era, a total of 7.6 million acres were treated throughout the six western national forest regions (Fowler 1993). Because bark beetles did their damage under the bark, spray treatments with bark sprays such as lindane were not as effective against bark beetles as they were against

insect defoliators that damaged tree foliage. Bark beetle control consisted of combinations of felling infested trees, bucking them into short lengths, peeling off their bark, or burning them. Occasionally, standing infested trees were burned.

White Pine Blister Rust Control

In the 1920's and 1930's, white pine blister rust, an introduced fungal disease with no natural controls in the United States, became the object of a major control effort. In 1916, the Office of Blister Rust Control in the USDA Bureau of Plant Industry initiated blister rust control activities in the Northeast, where the disease had first been found in 1910. Control activities centered mainly on non-Federal lands and consisted of eradicating the *Ribes* spp. plant — the rust's alternate host. Field teams systematically searched eastern white pine stands and uprooted *Ribes* plants (gooseberry and currant bushes). Blister rust control began on New Hampshire's White Mountain National Forest in 1924 and then became more heavily concentrated on national forests in Pennsylvania and the Lake States. Blister rust was not a serious problem in the Appalachian national forests of the South because there were too few *Ribes* plants. In 1937, white pine blister rust was reported to be fully arrested in the Northeast by the *Ribes* eradication effort (Benedict 1981).

White pine blister rust was first found in the Western United States in the State of Washington in 1921. It had apparently been introduced from British Columbia, where it had first been discovered in 1910. A White Pine Blister Rust Advisory Board, made up of representatives of public and private landowners, was quickly formed. In 1925, they recommended that all affected ownerships act promptly and vigorously to protect the western white pine timber resource, about 1.5 million acres, and its dependent industry in the Pacific Northwest. The first western *Ribes* eradication efforts began in 1930, when the rust had spread to northern Idaho and western Montana. Blister rust was found in California's western white and sugar pines in the mid-1930's, and control efforts were initiated on its national forests in 1935. Due to limited funding, the western-wide national forest blister rust control effort remained modest until 1933, when the CCC became available and greatly accelerated national forest *Ribes* control.

In 1941, *Ribes* had been eradicated on half of the 2.6 million acres on public and private western white pine and sugar pine timberlands needing blister rust control. The end of the CCC program and war's impact on national forest staffing halted this control program during World War II.

Other Pest Management Activities

National forest managers addressed many other insect and some other disease outbreaks between 1905 and 1945. The general strategy was to detect outbreaks in their early stages when they were easier and less costly to control. National forest managers preferred silvicultural control methods, but used chemicals when they were recommended and effective — after 1930 on the eastern national forests and somewhat earlier on the western national forests — where insect outbreaks could become extensive very quickly.

When spruce budworm heavily infested the foliage of Douglas-fir stands on Wyoming's Shoshone National Forest and astraddle the entrance to Yellowstone National Park in 1928, national forest managers found that such outbreaks could be controlled by chemicals sprayed from high-pressure ground sprayers or dusted from airplanes. If the spruce budworm, a defoliator, was not controlled in one or two seasons, it could kill trees by stripping them of their foliage or affect their growth by defoliating and killing their tops — an unsightly prospect for the entrance to Yellowstone National Park.

Another introduced European disease, the chestnut blight, was killing American chestnut trees in the East. Because there were no known methods to control this blight, national forest managers in the southern Appalachians initiated a systematic effort to market infested and threatened timber before the blight ruined its commercial value. Because no effective controls were available, our Nation lost the chestnut tree as an endemic component of eastern hardwood forests.

In the 1930's and 1940's, pests became troublesome in the Lake States, where large acreages of cutover, burned-over forest lands and abandoned farms had been planted with pine species. In 1934 and almost every year thereafter except the war years, national

forest managers applied chemical treatments to suppress pine sawflies and other defoliators on one or more national forests in these States.

Managing Recreation Uses and Activities

During its first decade, national forest management of recreation uses was largely passive. It supported such established recreation activities as hunting, fishing, trapping, and camping. The 1905 Use Book recognized camping and required district rangers to support State regulations on hunting, fishing, and trapping. Roads and trails were often designed to accommodate recreation access needs as well as other purposes — the Use Book provided for road and trail signs. The *Report of the Forester for Fiscal Year 1912*, for example, observed that national forests were being visited more and more due to the construction of new roads and trails. Some 13,500 miles of trail and 1,500 miles of road were constructed between 1905 and 1912 (USDA Forest Service 1912).

Recreation use was growing very rapidly on national forests near large cities. Camps and cottages on some of the most accessible and desirable national forest lands dotted many canyons and lakeshores that had been set aside and divided into lots to accommodate as many visitors as possible. Commercial uses in recreation areas, such as grazing and timber harvests, were adjusted to meet recreational needs. National forest managers excluded livestock from permitted recreation areas and prohibited livestock driveways in canyons heavily used by campers. They restricted timber harvesting to very light or no cutting at all close to lakes and in other places where it was desirable to preserve natural beauty unmarred for public enjoyment (USDA Forest Service 1911–1913).

National forest managers' sensitivity to the public's interest in recreation grew in the early decades. It was strongly influenced by withdrawals of selected scenic and other attractive national forest lands for national parks and by the establishment of the National Park Service (NPS) in 1916. In 1915, for example, the Forest Service sought and received authority to issue 30-year leases, parallel to the established national park practice, to increase the incentive for individuals to build summer homes



A Sunday drive among the giant redwoods on the Six Rivers National Forest, California, was a popular diversion in 1913.

and for commercial interests to develop hotels, resorts, and other services for the recreating public. In 1917, there were permits for 814 summer homes, 26 hotels, and 28 summer resorts on California's Angeles National Forest — one of the forests most intensively developed for recreation use. In 1919, national forests counted 3 million recreation visits, including sightseers and those just passing through (USDA Forest Service 1910–1920; Wolf 1990). National park recreation visits did not reach 1 million until 1921 (Clawson and Harrington 1991).

Road construction for purposes other than forest fire protection escalated in the 1920's. By 1930, the total national forest road miles exceeded 59,000 and included almost 15,000 miles of forest highway. Between 1933 and 1942, the CCC built many recreation improvements, including small dams that formed many attractive artificial lakes and ponds; sanitary facilities at picnic and campsites, typically pit toilets with simple structures; and picnic tables and fireplaces (Clawson and Harrington 1991). Road access also expanded so that by 1945, national for-

ests were maintaining more than 100,000 road miles per year. Horse and foot trails, which had increased to more than 113,000 miles by 1930, had risen to 150,000 miles by 1945. This rapidly expanding access to national forests combined with increased automobile ownership and use and a growing U.S. population accelerated the recreational use of national forests (USDA Forest Service 1920–1945). The expansion of recreation areas with constructed shelters and improved camping sites and related facilities likewise contributed to this growth.

Annual visits to national forest recreation sites reached a peak of 18 million, but declined to 6 to 8 million during World War II. During the 1905 to 1945 period, national forest visitors engaged in camping, picnicking, swimming, boating, hiking, and riding. Some came to spend time at summer homes or resorts located on national forests. Others came to enjoy the excellent opportunities that national forests offered for skiing, tobogganing, and other winter sports.

Wilderness Preservation

In the early 1920's, the idea of setting lands aside for wilderness preservation emerged on national forests in Colorado and New Mexico. Two foresters, Arthur Carhart and Aldo Leopold, persistently urged that scenic parts of the National Forest System be withheld and retained in as near a natural state as possible (Clawson and Harrington 1991). Forest Supervisor Leopold identified such a wilderness area on New Mexico's Gila National Forest, and it was so designated in 1924 — the first formally designated wilderness in the country. As this concept was evaluated, it was differentiated to distinguish wilderness areas as those of 100,000 acres or larger; smaller areas down to 5,000 acres as wild areas; other areas considered but not yet classed for wilderness as primitive areas; and some tracts without road access as roadless areas. By 1945, almost 15 million acres, 8.5 percent of the national forest area, had been administratively withdrawn from commercial development for wilderness evaluation. Almost 10 percent of the 15 million acres were formally dedicated as wilderness; most of the rest were classed as primitive, with smaller acreages in the wild and roadless categories. Wilderness areas were then viewed as scenic, limited use, and no development areas — a

part of the National Forest System serving those who sought a remote, pre-settlement type of recreation experience. Because so much of the national forests were *de facto* wilderness, largely unaccessed and undeveloped old-growth timber, the criteria for defining wilderness were highly restrictive and oriented toward the most unique undisturbed lands suitable for this use.

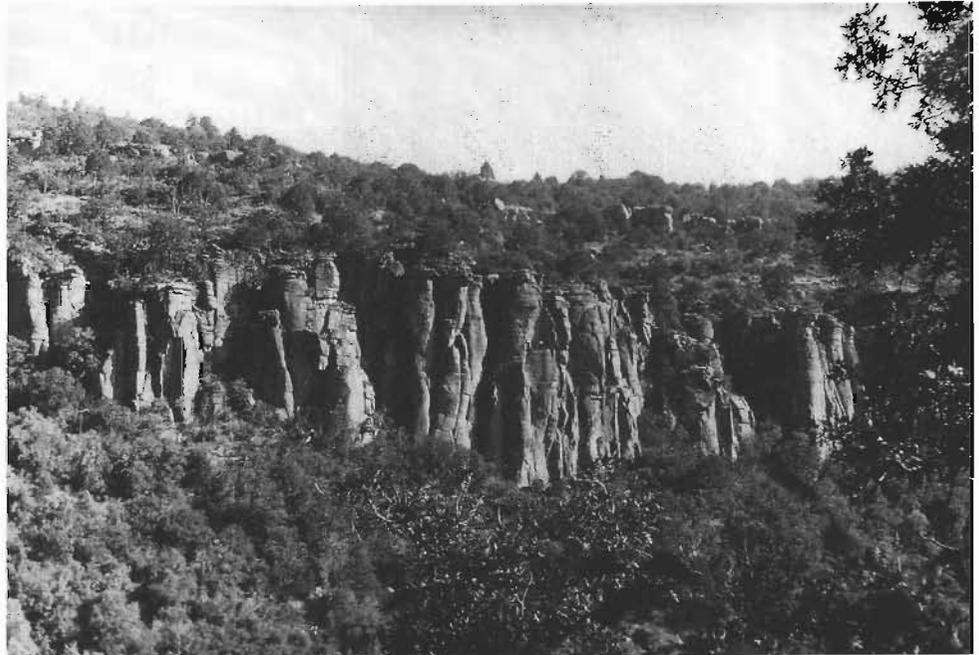
Natural Areas for Research

During the early formation of the national forest wilderness preservation concept, a parallel idea emerged for preserving selected areas as research natural area (RNA) reserves. RNA's were then viewed as baseline areas for documenting the development of individual natural ecosystems and forest types that would be used to evaluate the effects of national forest use and management on ecosystems.

The RNA concept reflected concerns that emerged within the Ecological Society of America in 1917 to protect habitats of rare plant and animal species. To that end, the Society set up a work group that ultimately evolved into The Nature Conservancy. The Forest Service adopted the RNA concept in 1927, when it set aside the first such area on Federal land — the Santa Catalina Natural Area on Arizona's Coronado National Forest. By 1945, a total of 39 RNA's, with an aggregate area of 45,808 acres, had been established on national forests — an average of a little more than 1,000 acres per RNA (USDA Forest Service 1993b).

Mining

Miners' unconstrained access to minerals on national forests and other public lands began to gain national attention in 1909, when President William Howard Taft, concerned about the Navy's



View of the Gila Wilderness, Gila National Forest, New Mexico. In 1924, it was the first national forest land to be designated as wilderness.

fuel supply, withdrew 3 million acres of oil land in Wyoming and California from public entry. In 1910, Congress authorized the President to withdraw public lands temporarily from mining for nonmetallic minerals (oil, gas, shale oil, coal, natural asphalt, bituminous coal) and the fertilizer and chemical minerals (phosphate, potash, and sodium), and the President withdrew essentially all unappropriated public lands from such mineral entry. Between 1910 and 1920, conservationists actively pursued the development of a leasing approach to fuel and fertilizer minerals on public lands and achieved their goal with the passage of the Mineral Leasing Act of 1920. This Act authorized the Secretary of the Interior to lease nonmetalliferous minerals at his discretion and to define use guidelines that would protect public resources and the public interest. National forest managers had little influence over mineral leasing on national forests except to review lease applications and plans (Wilkinson and Anderson 1985).

Hardrock Minerals

National forests are underlain with a significant share of the Nation's hardrock mineral wealth. Where such lands were more valuable for their

mineral use than forestry purposes, the Organic Act of 1897 provided that they be excluded from the forest reserves. Thus, the forest reserves (national forests after 1907) remained open to legal entry for mineral exploration and mining under the General Mining Law of 1872. The 1872 law provided that gold, silver, and other hardrock minerals in the public domain (including national forests created out of the public domain as provided in the Organic Act of 1897), could belong to the "finder" of a valuable mineral deposit by merely staking a claim.

Entry into national forests for mineral exploration and mining was a matter of self initiation; no permit was required. A claim was set at 20 acres, with no limit on the number of claims that could be filed. An unpatented claim gave the finder the exclusive right of possession and use of all surface resources within a claim's boundaries to develop the claim. An unpatented claim could be held by completing \$100 worth of work on it each year or by paying

\$2.50 per acre (\$5.00 for placer claims) to obtain ownership (patent) of the minerals and all surface rights. A patent could be obtained by showing sufficient mineralization to justify a "prudent man" making further expenditures on the claim with a reasonable prospect of success (Wilkinson and Anderson 1985).

In the early decades, the national forest manager's role in mineral prospecting and mining development was not defined by law. The Transfer Act of 1905 gave the Secretary of Agriculture authority to execute all laws affecting national forest lands except those "as affect surveying, prospecting, appropriating, entering ... or patenting of any such lands." The administration of such laws remained with the Department of the Interior (Wilkinson and Anderson 1985), but the Department of the Interior regularly sought national forest managers' advice on the validity of claims that miners sought to patent. Thus, from the beginning, national forest managers recognized



View of the Santa Catalina Research Natural Area in the Santa Catalina Mountains, Coronado National Forest, New Mexico. In 1927, it was the first such area to be established on national forest land.

that "mining claims ... may be sought for, located, developed and protected in accordance with the law and the forest reserve regulation" (USDA Forest Service 1905). The Forest Service made no attempt to regulate valid prospecting and mining activity (Wilkinson and Anderson 1985), but national forest regulations restricted mining claim occupancy and use to the activities necessary to develop such claims. That often included the issuance to miners of free-occupancy permits and free-use timber permits to build cabins on national forest lands beyond their claim boundaries.

The national forest managers' role in reviewing claim patent applications was limited to assessing the

mineral find's validity for practical development, determining whether mineral development was compatible with overlapping or adjacent national forest uses, and ensuring that the claim's surface resources would only be used for mineral development activities. Doubtful claims, those with evidence of fraud or failure to comply with mining law requirements, were always examined on the ground by a practical miner or a mining expert. National forest managers made adverse recommendations to BLM only when a miner or a mining expert certified to the *malefides* of the case (USDA Forest Service 1912).

Fraudulent mining claims were a continuing problem on national forests throughout the 1905 to 1945 period. The *Report of the Forester for Fiscal Year 1913* reported that "frauds committed or sought to be committed in the name of the mining industry (under the 1872 Mining Law) were legion, all but a very few of them are only remotely, if at all, connected either with mines or mining" (USDA Forest Service 1913). Such claims were located to get title to land for a variety of purposes: for townsites; to access scenic surroundings; to control access to timber sales negotiated by the national forests; for summer home sites; to control stock watering places or mineral and medicinal springs; to acquire farmable lands without meeting homestead law requirements; to obtain power and reservoir sites; for transmission line rights-of-way; and for saloons and other enterprises not permitted on national forest land. More than a decade later, the *Report of the Forester for Fiscal Year 1926* (USDA Forest Service 1926) reported on continuing fraudulent mining claims using high-value national forest lands worth from \$1,000 to \$2,500 per acre for business, recreation, and water power development or for controlling access to resources on large adjoining national forest areas. These were essentially attempts to obtain national forest lands through misuse of mining laws — requiring the Government to make heavy cash outlays to identify fraudulent claims and cancel them. The Forest Service sought legislative relief from Congress, but was only successful in obtaining it for particular situations on a few national forests.

The problem of mining law abuse continued to grow to the end of World War II. Of nearly a million acres on 36,000 patented claims, only 14.7 percent had been worked on a commercial basis. For another 2.2 million acres on 84,000 unpatented claims, less than 3 percent was being actively developed beyond the \$100 of work to hold the claim. The timber inventory on these lands exceeded \$50 million. At the end of World War II, mining law abuse was to become a priority national forest issue.

Management of Special Uses

Special uses include all resource uses other than commercial timber sales, forage grazing, occupancy established by the Federal Power Commission, and the U.S. homestead laws. Special use permits could be issued for the following uses: residences, farms, pastures, corrals, apiaries, dairies, schools, churches, roads, trails, telephone and telegraph lines, stores, sawmills, factories, hotels, stage stations, sanatoriums, camps, wharves, miners' and prospectors' cabins, windmills, dipping vats, reservoirs, water conduits, powerhouses and transmission lines, aerial tramways, railroads, and the purchase of sand, stone, clay, gravel, hay, and other products except timber (USDA Forest Service 1907). The list broadened over time.

Special use permits were seen as promoting the welfare of individual users and the larger community living in and near the national forests. The permits provided a means whereby any forest resource, no matter how minor, could be turned to individual account if its use did not conflict with a larger community interest and it was compatible with national forest purposes (USDA Forest Service 1913). A special use permit required a formal application for the use or occupancy of national forest lands and resources and specified use conditions such as area, time, and management requirements and standards. Special use permits numbered about 4,000 in 1905. They increased to 19,000 in 1915. By 1941, they numbered 44,000. Between 1905 and 1945, permitted uses involved only a negligible percentage of the national forest area, but served large numbers of users. Use permits involving the payment of annual fees ranged from 40 to 60 percent of the total permits issued. The balance were free-use permits. Pay permits were issued where uses were commercial,

served industrial purposes, or involved exclusive private use such as summer recreation residences.

Free permits were issued for uses of a public nature, such as cemeteries, Girl and Boy Scout organizational camps, and access roads to private homes or inholdings, and uses such as rights-of-way that were needed to carry out other national forest land uses. Free-use permits were granted to settlers, farmers, prospectors, or similar persons who might not reasonably be required to pay a fee and who did not have a usable supply of timber or stone on lands they owned or controlled.

During the early 1930's, the Forest Service repeatedly sought authority to raise the occupancy permit acreage limit from 5 to 80 acres. National forest managers felt that in many cases the 5-acre minimum was too low to provide for the best development of occupied areas and service to the public. Where additional area was needed, national forest managers could issue only a separate, terminable permit. This option was considered insufficient and lacked secure tenure for longer term occupancy uses such as airplane landing fields, educational institutions' scientific stations, or high-quality resorts. Congress, however, did not choose to extend the 5-acre maximum permit limit.

Homesteading

The Organic Act of 1897 excluded lands more valuable for agriculture from the forest reserves. The Department of the Interior encouraged entry and settlement of such agricultural lands under the liberal terms of the Homestead Act of 1862, which it administered. When the reserves were transferred to the USDA, the exclusion remained in force, and the Department of the Interior continued to administer the entry and settlement of these agricultural lands.

There was strong demand for and pressure to enter and settle these lands, often improperly for speculative timber acquisition and sale or other nonagricultural uses. Often homestead ownership was quickly transferred to timber companies. While not technically violating the law, the intent of the Homestead Act was clearly not being met. This situation, under national forest administration, quickly led to the passage of the Forest Homestead Act of 1906. The

1906 Act encouraged homesteading on national forest lands, but only on lands which national forest managers determined were more suitable for agricultural use. Having settlers on forest homesteads was seen as a benefit to forest protection and a way of thwarting speculative homesteading under the more liberal 1862 law.

Between 1900 and 1910, settlers were awarded a total of 18,000 homesteads on 1.9 million acres. The pressures for entry to these agricultural areas after 1906 (and exclusion of entry under the 1862 law) continued until the demand for new farmland abated during the mid-1920's agricultural depression. By 1926, practically all national forest lands suitable for agriculture had been listed as available for entry for the previous 5 to 15 years. Many areas remained open after a series of earlier entries and abandonments — unpatented and unoccupied — indicating a somewhat optimistic classification for agricultural use. By 1930, entry applications under the Forest Homestead Act had declined to less than 100 per year. In 1934, Congress withdrew homesteading entry under the 1862 Homestead Act on all public lands except those in Alaska. Entry under the Forest Homestead Act remained extant through 1945. In 1937, however, the Forest Service reported that practically no agricultural land remained suitable for homestead entry on national forests. In 1940, there were only 36 applications (USDA Forest Service 1905–1945). Only a few homesteads established on national forest lands actually succeeded as farms; most failed. Failure was attributed to a combination of low soil fertility, low rainfall, climate with a short growing season, and the agricultural depression in the 1920's.

National Forest Use and Management at the End of World War II

At the end of World War II, national forests were still huge, largely undeveloped reserves of natural resources. They were still remote and difficult to reach by the majority of the U.S. population, which was concentrated in the East. Access to national forests was very limited. Western forest industries were getting most of their log supplies — about 80 percent — from their own and other private lands. The eastern national forests, still being rehab-

Chapter 2

ilitated, had little merchantable timber available. National forest timber harvesting — mainly in the West — and mineral exploration and development had been accelerated to meet wartime needs. National forest livestock numbers were at their lowest level since 1906. Rangeland conditions were improving. Due to the influence of wartime demands and conditions, recreation use was still depressed.

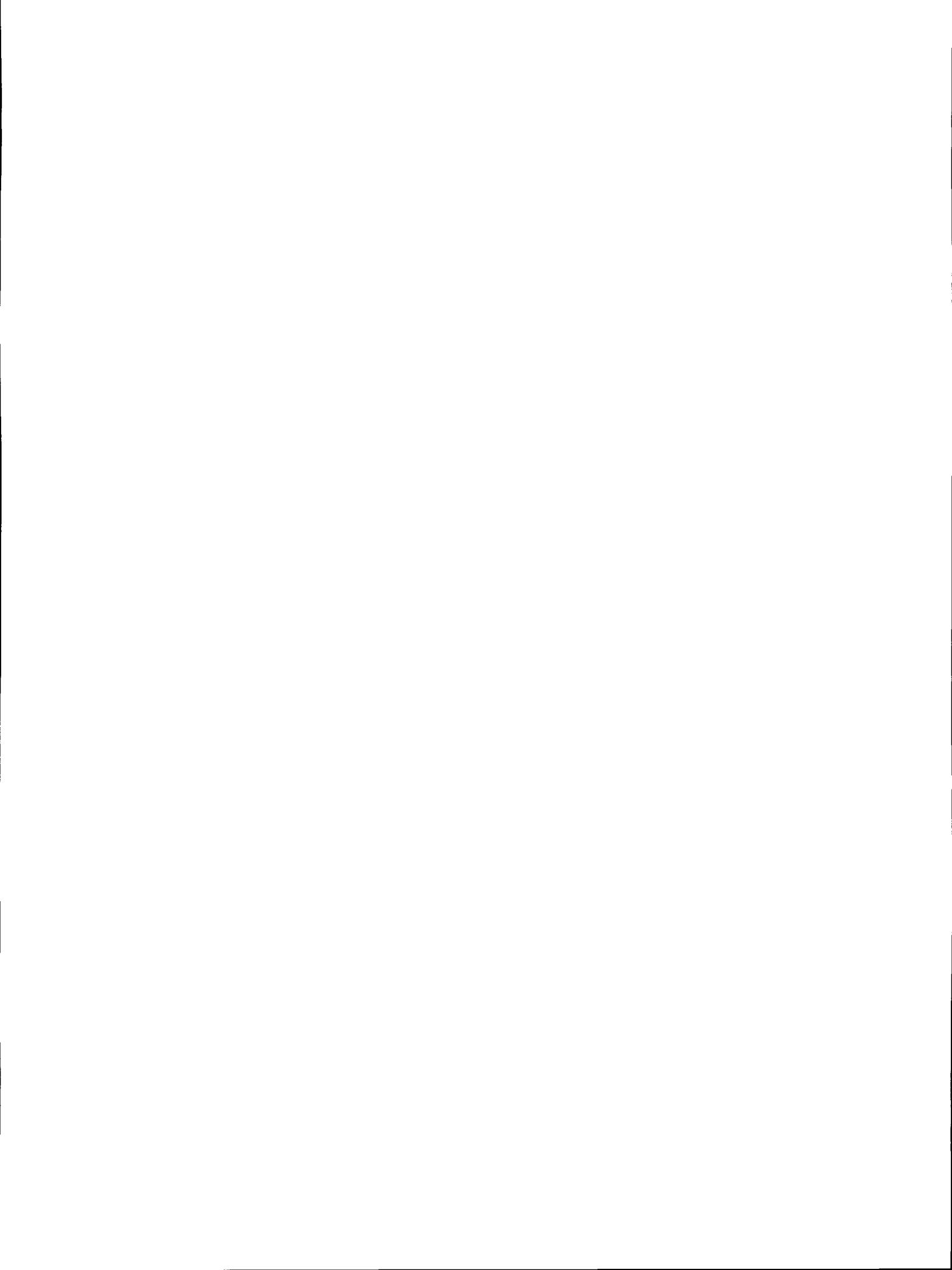
The maintenance and management of national forest resources and improvements were largely foregone or deferred during World War II. Military service and diversion of available staff to wartime priorities reduced the national forest workforce. The depressed management situation, however, would go into rapid reverse as the postwar Baby Boom and rapid economic growth accelerated demand for national forest goods and services.

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Chapter 3

Managing Multiple Uses in the Face of Unprecedented National Demands: 1945 to 1970

National Forest Planning and Performance: 1945 to 1970

Rapid economic and population growth after World War II created extraordinary demands on the goods and services of the Nation's natural resources. National forests quickly became a major source for expanding the supply to meet those demands. National forest managers were immediately challenged to rebuild and expand their workforces, access roads, facilities, and equipment. They also had to make up for the maintenance and management deferred through the war years and deal with the rapid growth in resource demands that outran and continually taxed their managerial capabilities and workforces.

In the 25 years from 1945 to 1970, national forest timber harvesting rose an average of more than 5 percent per year — twice the rate of the national economic growth and almost four times faster than total U.S. production of industrial wood products. During the 1950's and 1960's, national forest timber and the expansion of low-cost Canadian lumber imports offset a near 40 percent decline in the South's average annual softwood lumber production (Ulrich 1989). National forest timber stabilized log supplies for the large and highly productive timber industry of western Oregon and Washington and increased total log supplies for the rest of the West (Fedkiw 1964). The large and rapid increase in national forest timber harvests contributed to the economic stability and growth of many western communities and helped meet national housing goals and lumber demands. They also relieved pressures to harvest the stands of young, small-diameter timber. This gave the South's young and rapidly growing southern pine trees a 20-year opportunity to grow in size and increase the South's timber inventory.

Recreation visits to national forests grew more than 11 percent per year — more than 6 times faster than population growth — as the American family's income and leisure time increased and the Nation's highways and transportation facilities greatly expanded and improved. Hunting and fishing visits rose at an even faster rate. Water-storage facilities for power, irrigation, domestic consumption, mining,

fisheries, and recreation use increased by about a million surface acres. Mineral exploration and development grew sporadically, but steadily.

Beef consumption, nationally and per person, also increased steadily during this period. National forest cattle grazing rose from 1.2 million to 1.5 million AUM's — an increase of 25 percent. Forage productivity improvements and the acquisition of the national grasslands brought a 30-percent increase in grazing allotment carrying capacities. Animal husbandry improvements and improved range forage added significantly to cattle weights. However, there was a significant decline in sheep herding and grazing.

National forest area dedicated to wilderness use increased by 7.1 million acres, from less than 1.5 million acres to 9.1 million in 1964. The National Wilderness Preservation Act of 1964 included these wilderness acres as the initial components of the National Wilderness Preservation System. An additional 5.5 million acres were scheduled for evaluation and eventual wilderness designation over the next 10 years. Nearly a million of those acres were added to the National Wilderness Preservation System by 1970.

There was an evolution in planning and management for multiple uses on national forests during this period. The fitting of multiple uses into ecosystems on individual national forests became increasingly complex as demands for all national forest uses burgeoned. The fitting of adaptive management practices for overlapping and adjacent resource uses into the site-specific conditions within highly variable ecosystems became more challenging. Reconciling competing and overlapping user interests likewise became more demanding, especially as those interests broadened beyond local users to regional and national publics and special-interest groups. Conflicts between the timber industry and wilderness and recreation interests reached national proportions.

During the early years and into the 1950's, planning on national forests focused on individual resources such as timber, rangeland, recreation opportunities, wilderness areas, wildlife and fish, and watersheds. Planning called for inventories of resource

conditions and trends on rangelands, forests, watersheds, recreation sites, and wildlife habitats. Planning determined sustainable timberland and rangeland use levels and assessed the need to modify use or adapt management in areas where there was a need to protect watersheds and other resources. The collection and evaluation of resource data for national forest planning grew throughout the 1945 to 1970 period. The data reflected both the use and the condition of natural resources.



Multiple use: timber growth and harvest and mineral development. Lakeview Logging Company truck hauls harvested logs, Fremont National Forest, Oregon, 1960. The derrick in the background is part of a Humble Oil Company wildcat operation searching for oil or natural gas.

Conflicts were largely avoided or easily mitigated as long as the level of use remained relatively low compared to the national forests' capacity to absorb it. Where conflicts did occur, a multifunctional consultation approach was used to coordinate the uses. Users and State and local wildlife and water resource officials often helped resolve these issues.

National forest efforts to coordinate land uses through management planning became more deliberate as resource uses accelerated during the 1950's. Local managers began to demarcate recreation and special management areas, waterways, roads and trails, and other use characteristics in their plans as resource inventories were completed. The content of these plans differed from forest to forest because the National Forest System had no uniform standards or direction for coordinating multiple uses. Despite this lack of consistency, more informed planning and management decisions were being made. However, the actual implementation of the decisions on the ground in many instances still depended on the district ranger's or forest supervisor's practical experience and intuitive judgment (Wilkinson and Anderson 1985).

The Multiple-Use Sustained-Yield Act (MUSY) in 1960 brought a more balanced consideration of all national forest uses and resources. MUSY mandated that national forests be managed for multiple uses and sustained yield of their products and services; that the various renewable surface resources be used in combinations that best met the needs of the American people; and that the relative values of the various resources be considered and that decisions not be limited to use combinations that gave the greatest dollar return or the greatest unit output.

The Forest Service proposed the MUSY Act when pressures were emerging from the timber industry and wilderness interests, respectively, to increase and to halt the harvesting of remaining old-growth stands. The wilderness interests largely perceived old-growth timber lands as "the" remaining wilderness. They saw the construction of national forest roads to access old-growth timber as rapidly reducing wilderness designation options. The Forest Service felt that legislative direction to manage national forests for multiple uses and sustained yields would provide the policy guidance to ensure



Brahma hybrid cattle grazing under permit on wiregrass forage in a managed stand of longleaf pines, Apalachicola National Forest, Florida.

a nationally balanced mix of uses in the face of the opposing pressures of "single-interest groups" and economic demands for possible "overuse" (USDA Forest Service 1961b).

Diversifying Staff and Skills in Managing Growing Multiple Uses

This period saw an improvement in natural resource science, knowledge, technology, and professional skills. For example, the number of degrees conferred annually in natural resource areas rose from an estimated 10,000 to 15,000 in 1940 to more than 60,000 around 1970, and for the first time around 1970 included a significant number of women. For the same period, the number of doctorates in natural resources subjects rose from 12 in 1940 to 122 in 1970. Membership in natural resource professional societies rose from 6,300 to 47,400 (Fedkiw 1993).

The Forest Service increased both the number of resource professionals in the national forest workforce and the diversity of their knowledge and skills as resource use and management became more complex and the supply of professionally trained

resource specialists expanded. Although foresters continued to dominate the professional workforce, the diversity of skills and knowledge within the national forest workforce in the early 1970's grew (table 1) (Fedkiw 1981).

Although these skills had been previously represented in the Forest Service, they were almost exclusively in Forest Service Research and in Washington and the regional offices. Now they were increasingly needed on national forests and ranger districts.

Depth of experience and seasoned judgment from working with a wide range of forest conditions, uses, and users on the ground were important supplements for managing natural

Table 1. Number of Forest Service employees by occupation and skill, 1972

Occupation or Skill	Number
Forester	5,021
Civil Engineer	1,081
Range Conservationist	262
Contracting and Procurement	239
Landscape Architect	181
Soil Scientist	151
Wildlife Biologist	108
Hydrologist	104
Plant Pathologist	94
Computer Specialist	92
Geologist	52
Fisheries Biologist	24
Archaeologist	4
Geographer	3
Economist	2
Total	7,418

Source: USDA Forest Service 1980.

resources effectively. Multidisciplinary consultation expanded and helped integrate the management of multiple uses. But the driving force of annually expanding use "targets" and management challenges in each individual resource area continued to influence the seeking of resource-specific solutions. Advanced planning and longer lead times became increasingly critical tools for the effective integration of multiple uses and their management.

In this general setting, national forest managers met expanding output and use targets while advancing the art, practice, and effectiveness of managing multiple uses. Although there were shortfalls along the way, national forest outputs and uses rose to peak levels in the 1960's. Wildlife and fisheries habitats, particularly for game species and specifically targeted species, such as the condor, Kirkland's warbler, and osprey, were generally being maintained or improved. Eastern national forests were being rehabilitated. Rangeland conditions were being improved and forage production was increas-

ing. Forest fires were being contained to lower acreages and other natural disasters were being ameliorated. There were more research natural area and wilderness designations. The quality of managing multiple uses improved incrementally, but slowly, responding to growing uses as well as improving science and management skills. National forest managers gave new attention to wetlands and increased their efforts to identify and take measures to protect endangered species and their habitats.

National forest management's incremental responses to the growing and changing mix of multiple uses were progressively building, extending, and modifying use systems throughout the National Forest System, and during this period incremental responses seemed sufficient. The National Forest System was progressively evolving into an integrated association of uses and management systems that were designed to sustain the uses and ensure the permanence of the resources and their productivity. The individual use systems became more integrated

as they increasingly overlapped and adjoined each other in various combinations within the national forests. During the 1950's and 1960's, national forest managers modified and adapted the forest structures and their ecosystems as they provided Americans with increasing quantities of products, services, and benefits from water, timber, mineral, range, wildlife, fishery, watershed, recreation, landscape, and wilderness resources.

However, major events and uncertainties during the 1960's began to reveal serious management inadequacies and dissatisfactions among some national forest users and important groups of the American people.



Managing for multiple uses on the Dale Ranger District, Umatilla National Forest, Oregon, 1960. Range cattle grazing, timber production, water supply, and fish habitat.

Public concerns for wildlife management, for example, began to develop broader and deeper dimensions. Game biologists and some hunters questioned the knowledge and practices used to manage elk throughout the Rocky Mountains. Using timber harvest to improve food and forage supplies, controlling excess livestock and big game numbers, and protecting big game winter range did not always sustain desired deer and elk population levels or quality hunting experiences. This issue came into sharp focus when Montana Department of Fish, Wildlife, and Parks biologists challenged a proposed timber sale on the Lewis and Clark National Forest. National forest managers saw the sale as a necessary part of the Forest's timber management program. The biologists anticipated an adverse impact on elk that would shift game populations from State-owned lands to private lands. To resolve this dilemma, national forest managers joined several Federal and State wildlife agencies in a long-term study of elk habitat requirements (Lyon et al. 1985).

In the East, national forest users on West Virginia's Monongahela National Forest questioned the way even-aged management was being applied to hardwood forests. Such forests provided important turkey and squirrel habitats and long-established, highly valued hunting grounds. National forest users also questioned the visual impacts and quality impairments associated with clearcutting. After several years of challenges from the West Virginia Legislature and national forest users, the Monongahela prepared an environmental impact statement (EIS) on the forest's implementation of even-aged timber management. The Forest recognized the need for management changes and improvements and generally agreed with the findings of a study commission established by the State Legislature. The EIS recommendations, if they could be effectively implemented, indicated that the Monongahela's timber management questions could be resolved, but the issue actually broadened in the early 1970's.

During the 1960's, the public became aware that populations and habitats of some wildlife, fish, and plants were declining, including wetland habitats for waterfowl. National forest managers, responding to these emerging concerns, began to increase their efforts to protect and restore wetlands and to identify

and address endangered species habitat needs jointly with various interest groups and public agencies.

In the West, national forest managers realized that forest fire prevention and control were leading to a new problem — forest fuel buildups. They began to address this concern through fuel inventories and fuel hazard management projects that used prescribed burning to reduce fuel buildups and strategically located firebreaks to slow and control fires that might break out in areas of heavy fuel and high risk.

National forest managers, seeing a need for better soil inventories and soil management capabilities, initiated soil surveys and a related soils training program. The soil surveys were barely underway in 1964 when a massive landslide occurred in the watershed of the South Fork of Idaho's Salmon River. A combination of extraordinary rainstorm conditions and extremely wet soils on steep and unstable slopes, which for decades had been crisscrossed by logging roads, were seen as the cause. These conditions led to severe sedimentation of the river and its tributaries, with devastating damage to salmon fisheries and habitat — particularly spawning beds.

In Montana, local citizens were relentlessly challenging clearcutting and terracing on the Bitterroot National Forest's steeper, more visible mountain slopes. The issue became national in 1970's.

Internally, the Forest Service was using the traditional incremental management response to local demands, issues, and problems — a style that had worked well in addressing natural disasters and catastrophic forest fire conditions. National forest managers felt that shortfalls, failures, or new problems that involved management, as well as natural events, could be ameliorated or reversed using this same approach. Believing this, they took care to define and limit matters to their local dimensions. Implementation of System-wide initiatives such as fuel hazard management and soil surveys was largely left to the regions and forests according to what they perceived were their local priorities and preferred timeframes.

The Forest Service's hierarchical administrative structure and decentralized style of managing multiple

uses continued to prevail during this period — even though national forest managers were becoming more aware of the public’s growing concerns about the direction and quality of national forest management. No comprehensive effort emerged within the Forest Service or USDA to integrate these major events and concerns into an holistic evaluation of the National Forest System’s performance. Although there were a few individual exceptions, the national forest management hierarchy did not generally perceive this traditional hierarchical and decentralized approach to managing multiple uses as a potential weakness or “Achilles heel” in managing national forest lands.

The next part of chapter 3 describes the development and growth of multiple uses on national forests and the efforts to improve resource protection, maintenance, and management in meeting the demands of the American people from 1945 to 1970. Each resource is described separately because that is the way use was managed and reported. The growing need for planning and coordinating the management of multiple uses is given special emphasis.

The Management of Multiple Uses: 1945 to 1970

Population, Economic, and Demand Trends

From 1945 to 1970, the American population grew by 45 percent, from 64 million to 205 million — an increase unmatched before or since. The economy rose almost twice as fast as population and led to substantially improved per capita incomes and family welfare. Leisure time and mobility likewise increased. There were also major shifts in regional demographics as Americans sought to share in the Nation’s economic growth by relocating to areas of growing employment and higher wages. Urban populations rose from 60 percent to 74 percent of the Nation’s population, while rural populations declined to 26 percent (fig. 5). Agricultural productivity per acre and per farmer rose rapidly and induced younger people to out-migrate from rural areas. Even though national growth became concentrated in urban and suburban communities, agriculture and natural resource development prospered.

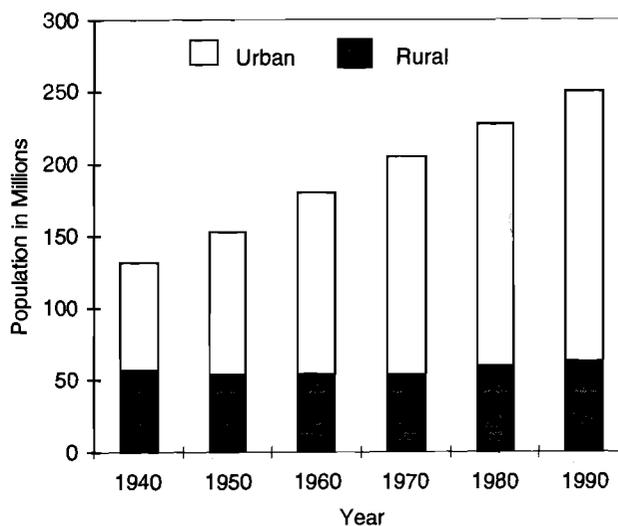


Figure 5. U.S. urban and rural population, 1940–1990
Source: Bureau of the Census, U.S. Department of Commerce.

Between 1940 and 1970, the number of households nearly doubled, from 35 million to more than 63 million. Construction of new housing rose to an average of a million homes per year. The need for replacement housing rose from 100,000 units per year in the 1930’s and early 1940’s to 700,000 units per year in the 1960’s. Lumber and plywood consumption rose from 32 bbf in 1945 to 44 bbf in 1950, an increase of 40 percent, and to 50 bbf by 1970, 57 percent more than in 1945. Beef consumption more than doubled to a peak level in 1976. Cattle numbers rose from 86 million head in 1945 to 132 million by 1976.

Outdoor recreation activities accelerated faster than the population growth. Recreation use on Federal lands soared. Manufacturing, construction, energy use, and urban development also expanded more rapidly and produced great increases in emissions, effluents, and wastes that increasingly impacted the Nation’s air, water, and land for their dispersal and disposal. Rapid growth in every dimension of society brought unprecedented demands on the goods and services provided by the Nation’s natural resources. National forests quickly became an expanding source of supply for meeting those demands.

Grazing Use and Management

In 1945, some 23,000 ranchers and farmers were grazing 1.2 million cattle and 4.3 million sheep and goats on national forests. This stocking level was 45 percent below the severe overstocking of ranges during World War I and closer to range carrying capacity. But seriously degraded vegetation, eroded soil, and other unsatisfactory range conditions remained (USDA Forest Service 1945; Rowley 1985). Although World War II production pressures had also slowed efforts to reduce livestock numbers, livestock producers after the war were prepared to resist renewed efforts to reduce the number of animals they could graze. Cattlemen and sheepowners were resolved to work together to achieve vested rights (established entitlements) to their allotments, clarify grazing objectives, and strengthen their role in managing their livestock on national forest allotments.

As the public became more aware of this issue, national forest managers became more sensitive about letting unsatisfactory range conditions continue. The general press and conservation groups

strongly opposed any increased grazing on Federal lands and supported national forest initiatives for further livestock reductions and range betterment (Rowley 1985).

Despite stockowners' opposition, the Forest Service renewed its emphasis on reducing stock levels. Both stockowners and national forest field employees recognized the challenges in implementing such reductions. They did not agree on methods for estimating grazing carrying capacity or range conditions and trends. Some field employees complained that "We just do not have reliable records of conditions measured periodically from which trends can be determined" (Rowley 1985). Range rehabilitation was recognized as easier to implement and more acceptable to stockowners, but it was a slower process. Between 1933 and 1945, western national forests reseeded 85,000 acres of rangeland, while 45,000 acres of pastured lands were reseeded on eastern forests. This was a start, but 4.2 million acres needed reseeding. To accelerate range rehabilitation, Congress in 1949 authorized \$3 million to develop nurseries to grow grass and shrub seed to reseed

depleted rangelands and restore their forage and browse cover. The Forest Service also began to explore easily demonstrated ways to measure range vegetation conditions and trends (Rowley 1985).

The Granger-Thye Act of 1950 provided for the use of legally authorized 10-year grazing permits and local grazing advisory boards. It also authorized the use of grazing receipts when appropriated by Congress — 2 cents per AUM for sheep and goats and 10 cents per AUM for other stock — for reinvestment on the national forest rangelands for reseeding; constructing fences, stock watering places,



Forest supervisor and district ranger inspecting conditions in Big Whitney Meadows, Inyo National Forest, California, 1958.



District ranger with permittee inspecting range conditions and cattle grazing under permit on an allotment in the Tatoosh Mountain range, Gifford Pinchot National Forest, Washington, 1949.

bridges, corrals, driveways and other improvements; controlling range-destroying rodents; and eradicating poisonous plants and noxious weeds.

The Granger-Thye Act did not grant the vested rights sought by permittees. Permits remained contract privileges rather than absolute rights. The new legal status given local grazing advisory boards encouraged stockowners to participate more actively in negotiating the terms of their grazing contracts. Grazing advisory boards were made up of 3 to 12 stockowners who were also national forest grazing permittees — and could include a representative of wildlife interests appointed by the State game commission. When requested to do so by a permittee, the boards could provide national forest managers with advice and recommendations on grazing permit modifications, animal reductions, or denials for permit renewals. The boards also advised on establishing or modifying individual or community allotments. The Granger-Thye Act brought stockowners some relief from the policy for reducing permitted stock as national forest range management increased its emphasis on improving and expanding forage production to avoid future reductions (Rowley 1985).

Between 1945 and 1955, cattle numbers on national forest rangelands were reduced by 9 percent and sheep numbers by one-third. Range permittees declined by 10 percent to 21,000. The sharp decline in sheep grazing was strongly influenced by market factors such as the advent of synthetic fabrics and a one-third reduction in U.S. wool and mohair production. Wool imports declined even more, by 60 percent, reflecting a sharp drop in market demand. The cattle industry, however, grew as beef consumption steadily rose to a peak in the mid-1970's. Cattleowners, thus,

continued to strongly oppose reductions in permitted livestock.

In this environment, national forest rangeland management shifted away from aggressive reductions and emphasized range improvements to increase forage production. Stockowners strongly supported and cooperated with this shift. They increasingly participated in improvement projects with money, time, labor, and materials. The pace of reseeding, fencing, installing water developments, and building livestock driveways accelerated after 1955. In addition to increasing forage productivity and output, these range improvements also helped correct some of the longer term problems of deteriorating and depleted ranges. Cattle numbers in 1970, compared to 1955, were up about 31 percent to 1.5 million, and range carrying capacity was up by 30 percent. Half of the increase in capacity was due to the addition of the national grasslands in 1954. With this shift in management emphasis, the aggressive drive for livestock reductions faded. But national forest managers made it clear to stockowners and their political representatives that such reductions were still needed on the more critical lands. Sheep numbers declined to 1.7 million by 1970 and allotment

permittees dropped below 18,000 by 1970. When allotments were no longer needed for sheep, some were converted to cattle allotments.

National forest grazing managers installed an allotment analysis system using improved methods and measures for assessing range conditions and trends developed by research in the mid-1950's. Permittees were encouraged to participate in allotment analyses and planning. They also began to hire range scientists to do independent range studies for their own interests. By 1960, allotment analyses had been completed on a third of the 11,000 national forest allotments. Some 1,900 — more than 17 percent — had plans based on these analyses. In 1965, grazing permittees became cosigners of their 10-year permits. By 1970, the first cycle of systematic range analysis and planning had been completed on all allotments. Range rodent and noxious weed control also advanced during this period (USDA Forest Service 1945–1970; Rowley 1985).

Stockowners introduced improved breeds and animal breeding during this period. These improvements, together with greater forage production and higher forage consumption per animal, increased the number of cows calving and overall stock weight, a performance difficult to quantify, but nevertheless an observed benefit of better animal husbandry and range betterment.

Grazing on southern national forests was free until 1965. Because the southern forests had been acquired through piecemeal purchases of farmland, their progress in range management had been slow and difficult. Long-established customs and free use of open range reinforced the reluctance of local stockowners to accept regulated grazing. Poor economic conditions in the more remote rural South also slowed progress. In 1965, however, when cattle grazing was expanding with growing beef demands, grazing fees were introduced on southern forests.

Stockowners Sensitive to 1960 Multiple-Use Sustained-Yield Act

The MUSY Act in 1960 specifically identified range as a resource use, along with outdoor recreation, timber, wildlife, watershed, and fish, among the national forest multiple-use purposes. Although the

Act explicitly authorized range use in law for the first time, the livestock industry perceived a threat from this affirmation. The industry became particularly sensitive to recreation use, including wilderness, as a competitor to traditional grazing privileges. The emergence of the environmental movement during the 1960's and early 1970's similarly raised stockowner and range manager concerns, as environmental groups began to perceive national forest range managers as being too closely allied with range users and livestock organizations. These unfolding sensitivities were indicative of changes to come in the 1970's and later.

The National Grasslands

In 1954, the administration of 3.8 million acres of rangeland land utilization projects (LUP's) was transferred from the Soil Conservation Service (SCS) to the Forest Service. The SCS had originally acquired these lands, primarily in the Great Plains Region, and managed them for domestic livestock grazing during the depth of the Depression under a New Deal program designed to purchase unprofitable, low-productivity farmlands for Federal administration. In 1960, the Secretary of Agriculture designated almost all of these lands as 19 national grasslands and formalized their management by national forest managers (Rowley 1985). NFMA formally incorporated the national grasslands into the National Forest System in 1976.

The national grasslands brought new challenges to national forest managers. The Bankhead-Jones Farm Tenant Act, as amended in 1963, required that their management promote grassland agriculture and sustained-yield management and demonstrate sound land use practices to adjacent public and private landholdings. During its 20 years of management, the SCS had established cooperative agreements with Great Plains grazing associations and districts to help integrate the management and use of LUP grasslands with the needs of the private operators who leased them. The SCS issued permits to the associations, which, in turn, redistributed grazing privileges among their members according to the overall grazing limits. The associations often participated in planning and design of LUP improvements. This participative and coordinated approach to rangeland husbandry was in stark contrast to the

national forests' direct control of rangeland management. National forest managers, nevertheless, accepted the challenge and eventually acceded to much of the SCS approach and practice in grassland management. As grassland managers and technical assistants assigned to the national grasslands transferred to range positions elsewhere on the National Forest System, they helped spread the use of cooperative, integrative, and demonstration approaches to other national forest rangelands (West 1992; Rowley 1985).

Managing Surface Resources on Mineral Leases and Claims

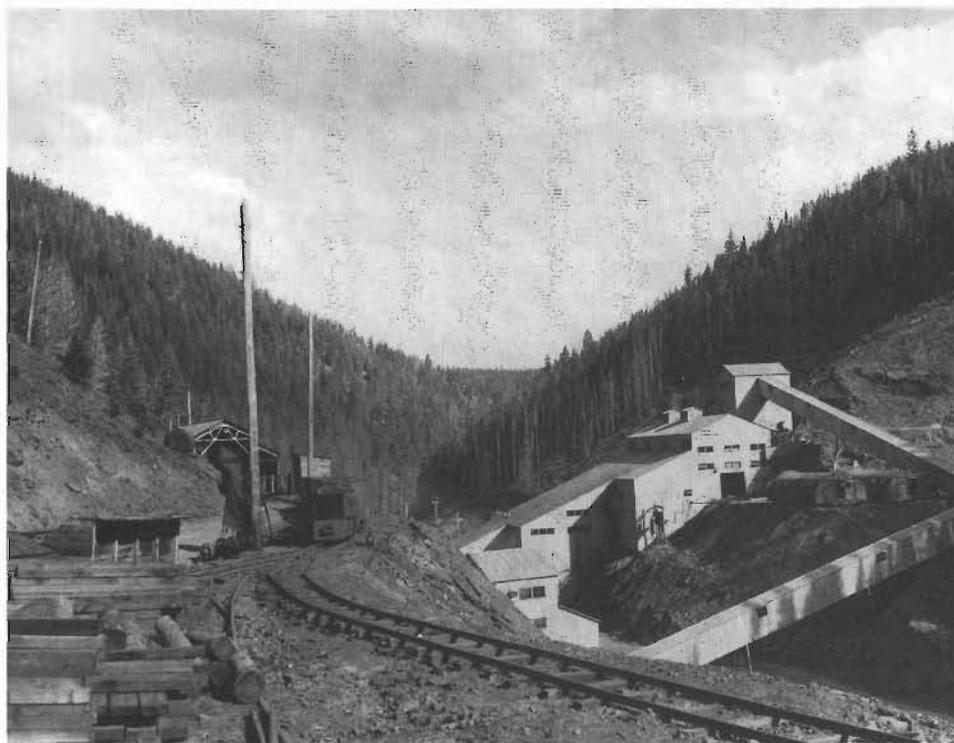
The exploration and extraction of leasable minerals (oil, gas, coal, oil shale, phosphate, potassium, and sulfur) on national forests grew steadily in the postwar years as national development and related demands for energy resources expanded rapidly. In the late 1940's, leases — mainly for gas and oil — numbered about 4,000 and covered less than 5 million acres. By 1970, their number had increased to 19,000 and covered 16 million acres — almost 10 percent of all national forest lands. Most of the growth occurred on the former public domain lands in the western national forests and on the acquired lands of the southern national forests. But leasing occurred in all regions.

The BLM had responsibility for administering both mining leases and hardrock mineral claims on national forests created from the public domain. In 1947, the BLM was also delegated the administration of mineral leases and claims on acquired national forest lands. The Department of the Interior's Geological Survey was responsible for technical administration of the leases. The role of

national forest managers was to ensure that mineral exploration and development were compatible with national forest surface rights and resources. By interdepartmental agreement between Interior and USDA, this included reviewing applications, recommending approval actions, and stipulating conditions for the protection and use of surface resources.

In reviewing lease applications, national forest managers sought to further mineral development, under conditions that protected the surface resources for timber production, watershed protection, forest recreation, and wildlife and fisheries. In 1951, for example, California's Los Padres National Forest worked cooperatively with BLM, the Izaak Walton League, the Audubon Society, and the oil industry to agree upon a set of special stipulations for all oil and gas leases in the Sespe Condor Sanctuary (USDA Forest Service, 1951–1952).

National forest managers reviewed each application to determine whether mineral development and use



Blackbird mine operations on Blackbird Creek, Salmon National Forest, Idaho, location of the world's largest cobalt deposit, 1952.

could be carried out in harmony with surface uses. Where harmonious use was impractical, they assessed the relative values. In the case of strip mining, for example, a determination could be made that the best public interest precluded strip mining altogether in valuable watershed or recreation areas, but could be permitted in other areas. Where such mining would seriously impair the surface resources, a stipulation would be made that, after mining, the operator would restore surface resources for productive use and otherwise prevent soil erosion.

In 1960, wildlife groups challenged oil and gas interests when the latter applied for leases to explore and develop oil and gas resources on the North Kaibab section of Arizona's Kaibab National Forest. National forest managers worked cooperatively with BLM, the oil industry, the Geological Survey, the State of Arizona, sportsmen, and other conservationists to review lease applications and issue final permits. They jointly developed 35 stipulations to protect wildlife and wildlife user interests. The stipulations controlled the number of wells that could be drilled at any one time; the location,

construction, and use of roads; pipeline locations; limits on tanks and other surface uses; disposition of equipment; revegetation measures; and measures to protect scenic, water, wildlife, and other resources. As it turned out, the exploration ended as a "dry hole" (USDA Forest Service 1963–1964). By the end of the 1960's, national forest managers were initiating coordination and protection actions on about 4,000 leases per year.

Mining Claims

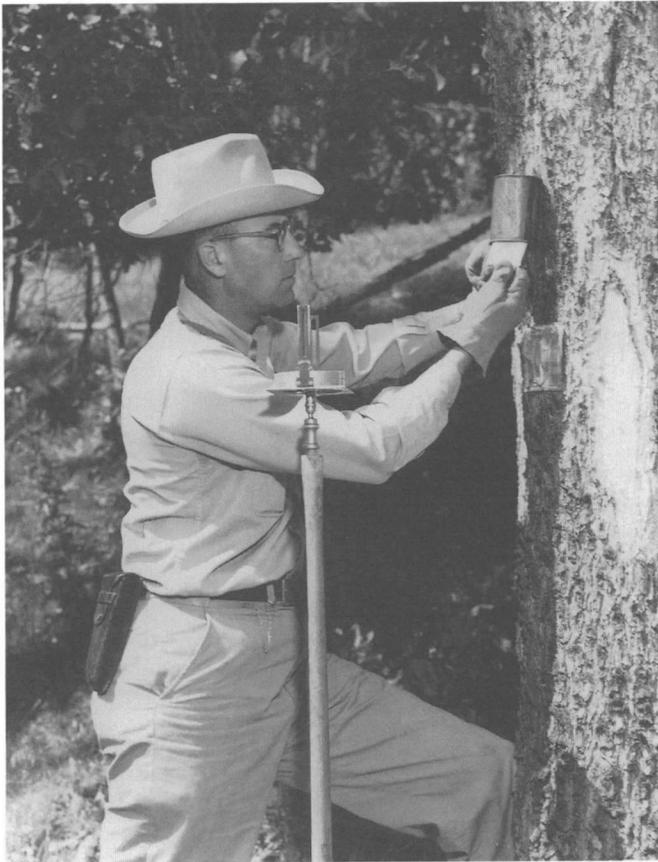
Shortly after World War II, the number of people staking spurious claims on national forests under the 1872 Mining Act accelerated. Many claimants intended to use the staked claims for purposes other than mining. The 1872 Act did not provide that mining be done on a claim after it was patented, nor did it provide any checks against damage to soil, timber, water, or other resources. In many places, a finder could still stake a claim by filing a document with the county and marking the site with a note in an old Prince Albert tobacco can. In many counties, there were literally thousands of such questionable claims. The late 1940's and early 1950's became an

era of the "weekend miner." Legitimate claims by miners who had actually discovered minerals and were working to develop them were mixed in with spurious claims — making the handling of mining claims a nuisance for national forest managers. Many national forest managers became skeptical and even hostile to mineral development (Peterson 1983).

In the big-timber country of California and the Pacific Northwest, where timber values often far exceeded estimated values of minerals on claims (some timber was valued up to \$25,000 per acre), some claimants clearly used the mineral



Hydrologist checks pH content of strip mine, Shawnee National Forest, Illinois, 1967.



District ranger examining mining claim found in a can nailed to a tree during a forest boundary survey in the Clear Creek area, Boise National Forest, Idaho, 1955.

laws to obtain title to that timber. Other claims were used to control access to large bodies of merchantable national forest timber or to develop summer home sites. In many areas, the claimholder's preemptory right to surface resources often made effective natural resources management difficult or impossible.

In the early postwar years, the national forest resource manager's role in mining claims and patents was largely reactive and limited to initiating protests against claims believed to be invalid and those where surface resources were being improperly used. Mining claimants, to hold their claims, had to do a small amount of work on them each year and had the right to use surface resources, but only as needed for such work.

Legitimate mining operations continued to be encouraged, and they increased on national forests. Claimants could obtain patents to *bona fide* claims under the mineral laws and title to 20 acres of timber as well as the minerals. But national forest managers increasingly saw a need for stronger guidelines and more deliberate efforts to protect the public's interest in proper land and resource management on frivolous claims.

In the early 1950's, the Forest Service proposed the separation of surface and subsurface (mineral) rights as one solution to the growing problem of managing surface resources on claims and adjacent lands. This did not jeopardize the interests of legitimate miners, but it could prevent abuse of mining laws from spurious claims and interference with managing other national forest uses and resources. The American Mining Congress, representing the mining industry, agreed that it was time to face the problem, and a new law, the Mining Claim Rights Restoration Act, was passed in 1955. It separated surface rights from subsurface rights while permitting legitimate mineral exploration and mine operations. The law also withdrew the staking of mining claims to extract common-variety materials: sand, stone, gravel, common pumice, and cinders. These became "salable" minerals subject to permits and sale under direct national forest supervision.

Uses unrelated to mining were no longer permitted on mining claims, nor could claimants remove timber except as needed to operate their claims. In addition, the 1955 Mining Act provided a procedure requiring the claimant, upon proper notice, to prove his or her claim was valid. The national forests promptly instituted a review process, guidelines, and a schedule to identify valid claims — a review that took 12 years to complete. Some 1.2 million claims were identified, covering 24 million acres. Tens of thousands of dormant and abandoned claims were eliminated. By 1967, national forest managers had validated 13,371 claims, less than 2 percent, on the basis of verified claimant statements.

National forest managers reviewed hundreds of occupancy applications on unpatented claims where claimants had become occupant-owner residents of valuable improvements. Qualified claim occupants

— those entitled to surface rights — received relief through leases, special use permits, or purchase of the occupied site or an alternate site, but this type of relief required that all rights to the unpatented mining claim be reverted to the Government. Thus, the age of frivolous national forest mineral claims eventually came to an end (USDA Forest Service 1956–1968).

During the 1950's and 1960's, except for periodic spurts of uranium prospecting and a few high-value minerals, most national forests were not very active in hardrock mineral or energy development. The principal, and largely sufficient, sources of domestic ores and energy were being located on private and BLM lands. The more remote, topographically rough, and difficult to access national forests were largely ignored — with the notable exceptions of nickel, cobalt, and uranium (Peterson 1983).

During the cold war and missile-driven uranium boom, claimants filed about 5,000 claims per month. In the late 1960's, renewed interest in prospecting for uranium, silver, copper, molybdenum, and gold again prompted the staking of many hundreds of claims on national forests. The number of claims examined for compliance with mining laws rose to 4,000 per year, and surface rights were coordinated on 10,000 to 40,000 claims each year.

During the 1960's, as public interest in protecting natural resource conditions grew and the environmental cause emerged, some mining companies began to introduce resource protection measures into their national forest operations. For example, national forest managers and six major mining companies cooperated to ensure environmental protection in developing their leases on Missouri's Clark National Forest. By the terms of their leases, permits, and agreements, these companies took action to control erosion, prevent stream pollution, revegetate disturbed lands, and reduce harmful air emissions. In Colorado, the American Metal Claim Company (AMAX) cooperated with national forest managers; the Colorado Game, Fish, and Parks Department; and the Colorado Open Space Foundation to plan and operate mining projects near a well-known ski resort on the Arapaho National Forest. Environmental protection practices focused

on maintaining water quality for established uses; providing both winter and summer recreational opportunities, including swimming, hiking, hunting, and camping; and creating a pleasing appearance (USDA Forest Service 1970). These actions were at the forefront of the mining industry's response to intensifying concerns about national forest environments.

But there also were more challenging situations. In 1969, the American Smelting and Refining Company (ASARCO) located a major molybdenum deposit in the highly scenic and game-rich White Cloud Peaks area on Idaho's Challis and Sawtooth National Forests. ASARCO applied for a special use permit to build an 8-mile access road to its claim. It worked closely with national forest managers to evaluate road access options for minimizing impacts on the area's sensitive scenery, ecology, and game resources. Nonetheless, ASARCO's proposed development became very controversial. Conservation interests opposed the road proposal and argued that the permit be denied due to threats to wildlife, water quality, and scenic values. They felt that protection of these resources outweighed the benefits from mining a relatively abundant mineral (Wilkinson and Anderson 1985).

In the public press, writers protested the rationale that gave mining top priority on a pristine 80-square-mile national forest area that included 54 scenic mountain lakes and one of Idaho's few glaciers. They urged that the White Cloud area be closed to mining. Under the mining laws, national forests had no regulations to control prospecting or to protect surface areas, water quality, fish, wildlife, timber, or soil resources; they also lacked authority to deny access. Their authority was limited to regulating the manner and route by which a road could be constructed. National forest managers held three public meetings on the White Cloud issue, which then became moot in 1970 when ASARCO, due to political sensitivity and a weak molybdenum market, withdrew its permit request and ceased further development (Wilkinson and Anderson 1985). In 1972, Congress added the White Cloud area to the Sawtooth National Recreation Area, where mining was permitted only under strict resource protection standards: the use of tracked vehicles and other

moving equipment on this highly scenic area with fragile soils and frail ecology susceptible to aesthetic damage was prohibited or restricted. The White Cloud issue illustrated how national forest authority was limited to managing only surface resources on claims filed under U.S. mining laws. It also illustrated the influence of environmental interests.

Using and Managing Timber Resources

The military's demand for timber products abated abruptly after 1945, but rising domestic housing demands quickly absorbed wartime timber supplies and more. Annual housing starts rose to 1.5 million per year by 1950 and remained at that average level until 1970. National forest timber supplies increased from 3.1 bbf in 1945 to 3.5 bbf in 1950. Between 1945 and 1950, even though demand for wood was strong and rising, expansion of the national forest timber harvest was dampened by the lack of adequate roads. Road construction budgets were scarcely enough to maintain wartime harvest levels. In 1946, the Federal Housing Expediter eased this situation by allocating funds "to build 1,443 miles of access roads, and reconstruct 656 additional miles to develop a maximum contribution from national forests toward providing more lumber for veteran's housing" (USDA Forest Service 1945–1950).

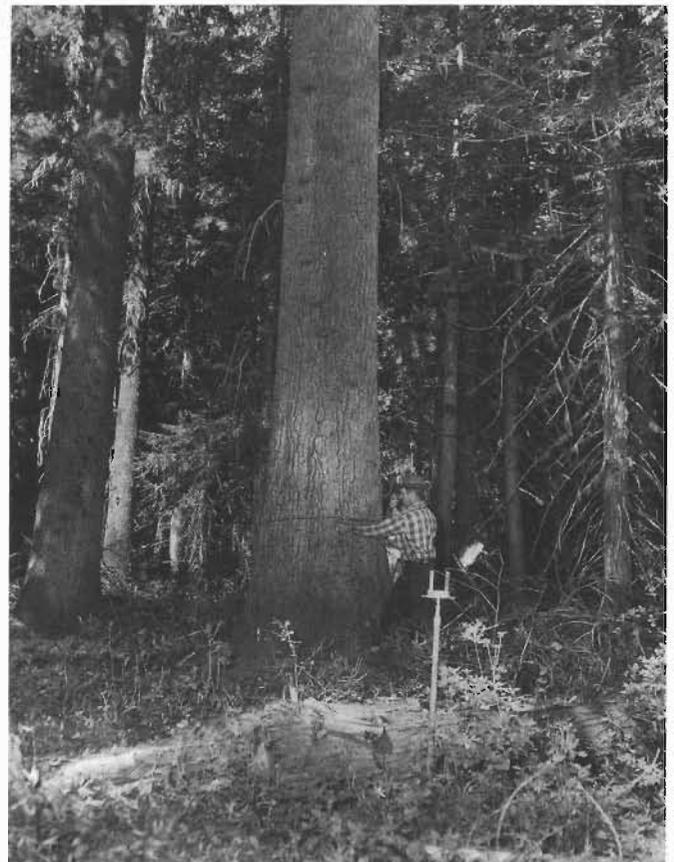
Congressional leaders, administration officials, and national forest managers saw expanding national forest softwood sawtimber harvests and producing high-quality wood products as performing a social service to the Nation. The softwood timber inventories of the Northeast and Lake States had been heavily depleted by the early 20th century. In the South, supplies of large trees and high-quality timber were declining rapidly and the smaller second-growth trees were producing low-quality wood products. Southern softwood inventories were also declining as timber harvests continued to exceed the growth of younger stands (USDA Forest Service 1945–1950). National forests, at this time, held half of the Nation's softwood timber inventory, primarily in mature and overmature stands in the West (Powell et al. 1992).

In the West, the national forest allowable cut was the calculated timber volume that could be sold and harvested in each year of the current decade and

each decade thereafter on a long-term, sustainable basis. This calculation was based on the planned life (rotation age of the managed forest) of the existing old-growth timber inventory and the accretion from the estimated growth of any young timber in these stands and expressed on an annual basis.

During the postwar years, allowable cuts were separate determinations in the national forest timber management plans prepared each decade for some 400 working circles. Working circles basically represented the efficient national forest timber supply areas for the established local timber industry. Working circle allowable cuts were summed up to estimate the allowable cut for the whole forest.

Actual annual timber sale volumes generally lagged behind calculated allowable cuts because some timber markets were limited by industry's milling



Forester measuring a 46-inch d.b.h. western white pine on a timber-survey sample-tree measurement plot, Powell Ranger District, Clearwater National Forest, Idaho, 1951.

capacity or the available timber harvest included species for which markets were limited or nonexistent — a common situation in the Rocky Mountains. Lack of staff and funding to prepare timber sales and build access roads contributed to this lag. National forest managers viewed the allowable cut estimates as an upper limit to the average annual and decadal sales level while the western timber industry interpreted them as lower limits for timber sales and expected the full amount of the allowable cut estimate to be offered for sale throughout the 1945 to 1970 period. During the 1940's and 1950's, and into the 1960's, the industry widely held the view that national forest estimates of the full allowable cut were conservative compared to the sustainable harvest potential. They continually pressured national forest managers to raise allowable cut estimates. The allowable cut, or the allowable sale quantity (ASQ) as it came to be called in the 1980's, became a persistent and divisive issue between the timber industry and the Forest Service (Cliff, no date).

In 1950, the allowable cut level for all national forests was 6.0 bbf, but actual timber harvest volume, due to lack of access, was limited to 3.5 bbf. As staffing and funding improved, road construction and reconstruction accelerated from 2,000 miles per year in 1950 to 4,700 miles in 1960. Timber sales and harvests during the 1950's rose almost every

year. Timber harvests reached 9.4 bbf in 1960 — 85 percent of the allowable cut of 11.0 bbf (fig. 6). The decadal updating of inventories and management plans with more accurate and detailed data permitted a steady rise in the calculated estimate of the sustainable allowable annual cut for the 400 national forest working circles. Such data included new information on growth, reproduction stocking, protection, reforestation and stand improvement practices, access, wood utilization standards, and inventory levels. Changing technologies and improved timber inventory methods were especially important. They made intensive timber utilization more economical and timber inventories more accurate. These improvements continued to influence yields and harvests through the 1960's as the total national forest allowable cut rose to 12.9 bbf in 1969. In that year, the harvest rose to 11.9 bbf — almost 8.4 bbf more than in 1950 — and to 92 percent of the allowable cut (USDA Forest Service 1945–1970, 1984, 1993).

Ninety percent of the increase in national forest timber harvests came from the western old-growth. The largest share came from Washington and Oregon with 41 percent, northern California with 20 percent, and Idaho and Montana with 15 percent. Small increases in the rest of the Rocky Mountain and Great Plains States forests added

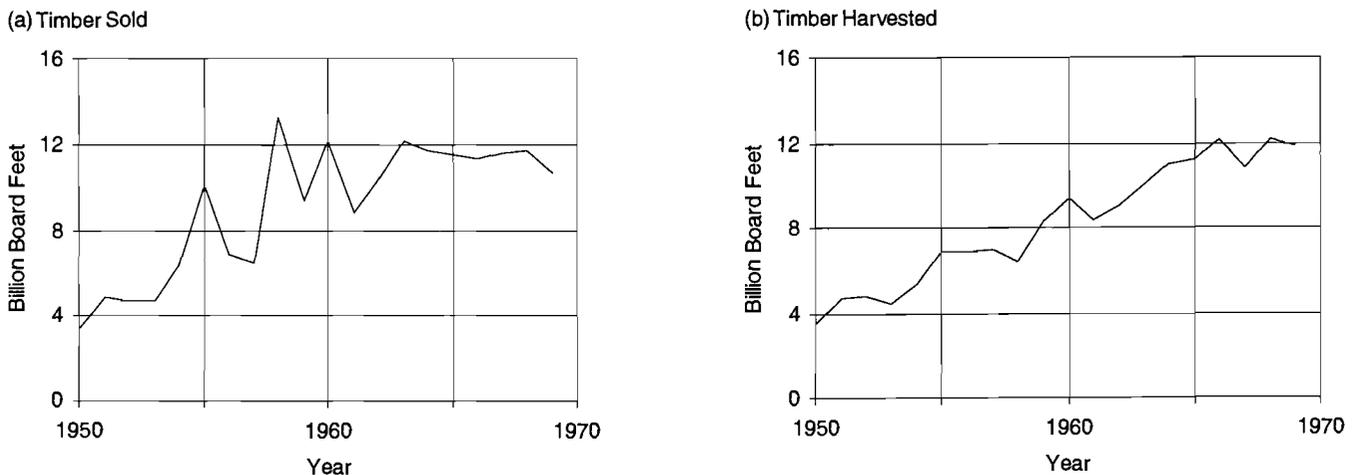


Figure 6. National forest timber sold and harvested, 1950–1969

Source: USDA Forest Service.

9 percent, Alaska had 5 percent, and the remaining 10 percent came from the eastern and southern national forests (USDA Forest Service 1993).

In the East, national forests focused on rehabilitating the heavily cutover, often burned-over acquired forests and reforesting abandoned farm croplands and fields. Planted forests were still too young to be harvested for sawtimber. To rebuild growing stocks and sawtimber inventories in the rehabilitating forests, only half of the growth was being harvested. Thus, average annual timber sales and harvests of the southern and eastern forests were limited to about half of their sustainable allowable cut levels.

During the late 1940's and 1950's, national forest timber supplies in the Douglas-fir areas of western Oregon and Washington offset the timber harvest decline on private lands. As a result, the total harvest in western Oregon and Washington during the 1950's remained relatively stable at an average annual level of 10.9 bbf, while the harvest share from Federal lands rose from 25 to 37 percent. Some lumber mills, however, went out of business for lack of logs, as the larger and higher quality logs were increasingly used for plywood by an expanding softwood plywood industry. Many lumber mills short of timber supplies shifted their operations to northern California, Idaho or Montana, and Canada, where available public timber supplies helped expand jobs and community growth (Fedkiw 1964; USDA Forest Service 1993).

Nationally, the rising western national forest harvest offset large declines in softwood sawtimber harvests and lumber production in the younger, much cutover, and declining private inventories in the East



Clearcutting by staggered settings in old-growth on the Willamette National Forest, Oregon, 1953.

and South. Softwood lumber production in the South had dropped from 10 bbf in 1940 to less than 6 bbf in the early 1960's and 7 bbf in 1970. In the New England, Mid-Atlantic, and Lake States, softwood lumber production declined by 1 bbf in the same period. The huge old-growth reserves of the western national forests provided 20 years of reduced market pressure on the declining softwood sawtimber stocks on industrial and other private forest lands in the East and South. This respite in sawtimber harvests in the eastern United States helped to increase the rate of regrowth and buildup of softwood timber stocks, particularly in the Southeast and Northeast, which became important sources of increased sawtimber supplies during the 1970's (Ulrich 1989; Wheeler 1969; Row 1962).

Sustained-Yield Units and Long-term Timber Supply Contracts

Up through the 1940's, national forest managers used sustained-yield units and long-term timber supply contracts to advance community development and stability and to develop young, managed

forests. The Sustained Yield Forest Management Act of 1944, passed largely through the efforts of the Western Forestry and Conservation Association and with the support of timber companies in need of new log supply sources, authorized the Secretary of Agriculture to establish cooperative and Federal sustained-yield units on national forests. The Act was designed to promote forest industry, employment, and community stability where sustained-yield units could ensure a stable and continuous timber supply. By 1945, national forests in seven regions had identified 64 potential opportunities for cooperative sustained-yield units and more than 61 opportunities for Federal sustained-yield units, and had applications for 60 cooperative units and 16 Federal units (Clary 1986).

Sustained-yield units could be established on national forests where community stability depended on Federal forest timber supplies and where such supplies could not be assured through the usual timber sale bidding procedure. The sustained-yield unit was designed to supply the timber needs of such communities on a sustainable basis without competitive bidding, but at prices not less than the appraised value of the timber. A *cooperative unit* was an agreement between an industrial or other private timber landowner and the national forest to establish and manage a unit made up of both private and national forest timberlands. A *Federal unit* contained only national forest timberlands.

Only one cooperative unit was ever established — the Shelton Cooperative Sustained-Yield Unit on the State of Washington's Olympic National Forest, established in 1947 through a 100-year agreement with the Simpson Logging Company. The unit included 110,000 acres of virgin national forest old-growth and 159,000 acres of Simpson's second-growth and regenerating forests. This cooperative arrangement provided the Simpson Company a sustainable timber supply of 90 million board feet per year. Without this cooperative arrangement, the Simpson harvest would have been 50 percent lower, mills would have closed, and 1,400 people in the local communities of Shelton and McCleary would have lost jobs (Clary 1986; Steen 1976). The Simpson unit was effectively phased out in the

1980's, as its dependence on national forest timber declined to zero. Simpson's timber needs are now being supplied by the regrowth on company lands, but the formal contractual dependency on national forest timber remains a valid agreement.

Just five Federal sustained-yield units were ever established. They reserved a total 1.7 million acres of national forest timber lands in Arizona, California, New Mexico, Oregon, and Washington. These units essentially guaranteed a sustained timber supply to local mills located in small communities dependent on the timber industry. Each, however, became a continual source of complaints and frustration to national forest managers (Clary 1986). All units are still in existence, except the one in Flagstaff, Arizona, which was developed in 1948 to support two saw-mills. In 1980, the Coconino National Forest shut this unit down when the surviving mill had grown strong enough economically to operate without the preferential supply of a sustained-yield unit (Clary 1986).

In the face of strong opposition from many segments of the timber industry, conservation groups, organized labor, civic organizations, and communities, national forest efforts to advance community stability through sustained-yield units faded in the 1950's. One of the outgrowths of the retrenchment was the development of oral timber sale bidding in the Pacific Northwest. Oral bids gave local timber firms an opportunity to meet "outside" competition and thus support community stability (Leonard 1995).

National forests offered long-term timber sale contracts to encourage the development of the pulp and paper industry. In 1950, a public auction of 4.5 million cords of pulpwood on four Colorado forests culminated years of effort to develop a market for the Engelmann spruce timber that dominated the mountain slopes of the upper Colorado. The sale required erection of a pulp mill with a capacity of 200 to 250 tons daily and would keep that mill supplied for 30 years. Since two-thirds of the sale area timber was dead — killed by tiny spruce beetles — the sale also became a gigantic salvage project. In the high mountains, short summers and low humidity kept the beetle-killed timber in usable condition for pulpwood for many years.

In 1958, Alaska's Tongass National Forest awarded a long-term pulpwood sale of 1.5 billion cubic feet to the Ketchikan Pulp and Paper Company. This culminated three decades of effort to bring a pulp and paper industry to southeast Alaska. The sale required construction of a 300-ton capacity mill that would employ 800 people, and would supply that mill with 50 years of pulpwood. There were three additional long-term sale contracts; two have been canceled (the latest, Alaska Pulp Corporation in 1993), and a third, the Pacific Northern Sale, was modified to a 25-year contract when pulp mill construction became infeasible. The 25-year contract was completed in the 1980's by the Alaska Lumber and Pulp Company (now Alaska Pulp Corporation) (Leonard 1995). Only one long-term contract, Ketchikan Pulp's, remains operational — but under revised terms and reduced volume. These were among the last long-term timber sale contracts that national forests granted.

Timber Management Planning

Until the late 1970's, there were very few and only rudimentary national guidelines for overall national forest management planning. Official regulations, focused primarily on timber management, had only six specific requirements. They were to aid in providing a continuous supply of national forest timber; be based on the principle of sustained yield; provide an even flow of timber to help stabilize communities and local employment; help coordinate timber production and harvesting with other national forest lands and uses in accordance with principles for managing multiple uses; establish the allowable harvest rate at "the maximum amount of timber

that may be cut from the national forest lands within the unit by years or other periods"; and be reviewed and approved by the Chief of the Forest Service (Wilkinson and Anderson 1985).

Central control and consistency for all timber management plans among the national forests was ensured by the Washington Office review and approval process (Leonard 1995). From Pinchot times, three basic procedural steps have been used in timber management planning: determining the land that was suitable for harvest (the commercial forest land); calculating the amount of timber that could be sold from the suitable land base on a sustained basis; and deciding the appropriate methods for harvesting and regenerating that timber (Wilkinson and Anderson 1985).

Commercial forest land (CFL) included all areas capable of growing at least 20 cubic feet of commercial wood per acre per year in soil conditions,



Winberry sale unit, Willamette National Forest, Oregon, clearcut in 1951, showing advanced regeneration and brush in 1957 after 1953 replanting. Brush provides wildlife habitat and forage until shaded out by new tree crop.

terrain, and locations where logging would not be too costly. CFL excluded lands withdrawn for wilderness, administrative sites, or other purposes. In 1952, CFL made up 94.7 million acres — more than half of the National Forest System. By 1962, there were 96.8 million acres. CFL acres declined thereafter as new wilderness areas were designated by Congress.

National timber management guidelines gave national forest managers a great deal of flexibility and discretion and placed responsibility for planning and carrying out plans at the national forest and ranger district levels. Some latitude in national direction was desirable and necessary to enable district rangers to deal more effectively with local forest timber type variations and conditions and other national forest resources and uses (Wilkinson and Anderson 1985). The pressure to harvest timber in areas reserved for recreation, landscape aesthetics, and watersheds led to more specific guidelines. For example, in rejecting a 1962 plan for “near

natural” management in certain zones of California’s Sequoia National Forest, the Chief of the Forest Service called for a certain amount of harvesting in some scenic areas. He felt that maintaining all parts of every scenic area in a near-natural condition — in this case, the establishment of virtually unmanaged areas of up to 100,000 acres — was impracticable (Clary 1986). The Forest Service issued new national direction that required allowable cut levels for landscape management areas to be determined separately and used only where there was assurance that the forest and industry could protect the desired features and attractions of landscape areas.

In the mid-1950’s, during the planning for the Quilcene watershed on Washington’s Olympic National Forest, the city of Port Townsend was concerned about timber harvesting and management in its municipal water supply source. National forest managers assured the city that the Forest would “propose nothing in the way of management that would adversely affect the amount and purity of the water supply.” The watershed was part of the Quilcene working circle, and more than half of the watershed supported mature and merchantable timber. The Forest wanted to begin harvesting as soon as possible so that average annual harvest would be smaller (it would be spread out over a greater number of years). The harvest plan stipulated that the timber harvest would be limited to the watershed’s sustainable yield of 9.5 million board feet per year; clearcuts would be limited to 30 acres or less (compared to a maximum of 80 acres); each clearcut patch would be reforested soon after slash disposal; and national forest managers would carefully select logging practices to protect watershed conditions (Clary 1986).

1961 National Development Program for National Forests

In 1961, President Kennedy, on behalf of the Forest Service, transmitted a long-term “Development Program for National Forests” to Congress, in which it was determined that the long-term sustainable harvest of national forests under intensive management would be 21.1 bbf by the year 2000. This included an intermediate goal of 13 bbf by 1972 (USDA Forest Service 1961a; Clary 1986). The goals, however, were never realized. Timber sales and harvests



Winberry sale unit, Willamette National Forest, Oregon, in 1972, showing 20-year regrowth of Douglas-fir planting following clearcut in 1951. Planted trees are more than 20 feet tall and brush is suppressed.

averaged less than 12 bbf through the 1960's, 1970's, and 1980's.

Nevertheless, national forests were seen to play an important role in the Nation's timber supply and economy, particularly in the housing sector. The harvesting of old-growth timber, which was often decadent or deteriorating, was also viewed as a positive factor. Such harvests replaced mature and overmature western coniferous forests that had little or no net growth with fast-growing young timber stands (Clary 1986; USDA Forest Service 1945–1970).

Preparation of Timber Management Plans

Forest supervisors and their timber staffs, working with district rangers, prepared timber management plans, although in the major timber-producing regions a significant amount of technical work was centralized in the regional offices — from the taking of timber inventories to the calculation of allowable annual cuts. The Washington Office Timber Staff reviewed timber management plans throughout the 1945 to 1970 period. Often, allowable cuts were increased above pre-war levels to reflect updated inventory and regeneration data, improved harvest methods and equipment, shorter rotations, and higher utilization standards. National forest timber management plans "that did not calculate timber so as to permit the greatest annual allowable cut were returned to the regions for revision" (Clary 1986). The final approval for national forest timber management plans rested with the Chief of the Forest Service.

The Role of Road Development in Timber Resource Management

Developing and maintaining the national forest road system was a primary priority throughout the



Reforestation and clearcutting. A 15-year-old Douglas-fir plantation well-established following a 1950 clearcut, Gifford Pinchot National Forest, Washington, 1955. In the background, a more recent clearcut area with mature timber on either side.

post-World War II period. Although road access to all parts of the National Forest System was needed to administer, protect, use, and manage the national forests efficiently, timber management to develop vigorous young forests and achieve the full allowable cut became a strong focus for the rapid development of the road system. Timber harvests became the principal basis for financing, justifying, and accelerating the construction of almost all local logging and collector roads, and many mainline access roads. Road system development also allowed the use and management of national forests for other purposes, especially outdoor recreation, wildlife, and fisheries.

An average of 22,000 timber sales per year took place during the 1950's; in the 1960's, the average was 24,000. More than 90 percent were very small sales to small local timber operators and other users, generally less than 100,000 board feet and under \$1,000 or \$2,000 per sale. About 1,000 sales per year involved 100,000 to 1 million board feet to somewhat larger operators. The bulk of the annual timber sale volume, however, was sold through



Residual ponderosa and sugar pines left as seed source after logging, Umpqua National Forest, Oregon, 1953. Residual trees will be harvested later, after the unit has been restocked.

another 1,000 or so sales of 1 million to 20 million board feet or more to medium- and large-size timber operators. These large sales were an important tool in developing the access road system; they required three types of roads: arterial (mainline) roads, the primary road system to major drainages or large land areas; collector (lateral) roads, to feed into the primary roads and reach smaller drainages and blocks of land; and local roads (logging spurs), temporary, lower standard roads to reach specific timber sales.

To extend the road system into previously undeveloped areas, timber sales scheduled many widely spaced timber harvest units. This approach encouraged smaller units that could be harvested and naturally seeded by surrounding timber, artificially seeded, or planted. Such units, with "no cut" areas between, limited the logging disturbance to a relatively small portion of the total timber sale area. The selection harvest system, often used for ponderosa pine, removed only a few trees per acre. Such sales

covered larger harvest areas and likewise extended the road system to previously unroaded areas.

Although the national forest road system was initially developed to reach and extract national forest timber, it was seen as the key to opening up the national forests for hunters, anglers, hikers, other recreation interests, and other users. The total permanent road system in 1945 was about 100,000 miles. By 1970, it was nearly 200,000 miles.

Arterial and collector roads were engineered to Government standards and constructed by the Forest Service or the timber operator as a timber sale requirement. Temporary

spurs were built by timber operators and treated as logging costs. However, many of these spurs were built on lines staked by national forest engineers where future permanent roads would be needed. Maintenance or reconstruction in later years would add these roads to the permanent road system. Between 1950 and 1970, timber operators built 70 to 90 percent of the annual road miles constructed or reconstructed. The annual mileage built by timber operators rose from 1,500 miles in the early 1950's to 3,800 miles in 1960 and over 6,000 miles by 1970. Roads built by the Forest Service increased from 500 miles in 1950 to 850 in 1960 and 1,100 miles by 1970.

Access To Respond to Natural Disasters

Between 1949 and 1951, repeated hurricane-force storms blew down timber over wide areas of western Oregon, northern Idaho, and western Montana — as much as 8 bbf in Oregon and a half-billion more in Idaho and Montana. National forest managers reori-

ented timber sales and road plans as soon as possible to salvage the heaviest concentrations of dead and damaged trees.

With major outbreaks of Engelmann spruce and Douglas-fir beetles in Idaho, Montana, and Oregon in 1952, the emergency efforts shifted to harvest the newly infested timber as soon as possible. A decade later, in 1962, the Columbus Day storm again caused similar widespread timber damage in Washington and Oregon. Redirected timber sales and road construction enabled salvage of 1.4 bbf of national forest blowdown timber by 1964 (USDA Forest Service 1949, 1953, 1964–1965).

Reforestation and Stand Improvement

Before World War II, 1.2 million acres of deforested land had been planted or seeded, and an unknown amount had received timber-stand improvement cuts, weeding, thinning, or pruning. During World War II, these activities were largely suspended. By 1946, some 3.2 million acres of CFL needed reforestation and 3.8 million acres needed some type of timber-stand improvement.

Such work was reactivated in 1946, but it was limited to sale areas where timber operators paid for reforestation and post-harvest stand treatments. In that year, 27,600 acres were planted or seeded. Reforestation had doubled to 56,000 acres by 1955, accelerated to 200,000 acres in 1962, and stabilized at about 260,000 acres per year in the late 1960's. This trend reflected the rising national forest timber harvest level, primarily clearcutting, and a shift away from natural regeneration to planned reforestation. About 50,000 acres per year were being naturally regenerated in the 1960's. Success was improved by brush removal and scarifying the soil surface to expose mineral soil.

National forest tree nurseries were reactivated after the war. In 1950, 13 nurseries produced 45 million seedlings. This rose to 88 million in 1955 and 137 million in 1960, then stabilized at 100 million to 120 million seedlings per year. Superior seed production areas, seed orchards, and hybrid production were developed in the late 1950's. By 1963, national forests had 13 superior forest tree seed production areas on 10,069 acres, and 28 forest tree



Ponderosa pine seed orchards, Hackamore area, Modoc National Forest, California. Forest worker installing metal bands to prevent chipmunks from climbing trees to harvest pine cones and eat the seeds.

seed orchards were under development on 1,763 acres. The number of seed orchards and their area continued to expand seed production during the balance of the postwar period.

The quality of regeneration management improved throughout this period. In 1962, the Forest Service established the position of certified silviculturist on national forests and upgraded it to the level of senior timber sale positions. Forest Service research completed studies that improved regeneration methods, seed orchards, seed production, seed and tree quality, and nursery management and production.

Weeding, precommercial thinning, and sanitation cuts to remove both excess and poor-quality trees increased from about 250,000 acres per year in the early 1950's to more than 500,000 acres per year

between 1955 and 1963. As thinning costs rose significantly, these activities declined to 300,000 acres in 1970. Other activities were animal damage control, mainly fencing to exclude deer, on about 200,000 acres per year, and rodent control on several hundred thousand acres. Prescribed burns were increasingly used, especially in the South, to protect longleaf pine from brown-spot disease, to reduce understory brush competition, and to prepare the ground for natural seeding (USDA Forest Service 1946–1970).

Planning for Multiple Uses Under the MUSY Act

The initial planning for managing multiple uses under the MUSY Act established a two-stage process for classifying national forests into land-use zones. Such zones were defined in the first-stage regional multiple-use planning guides. They gave broad direction for establishing, planning, and managing zones for recreation, travel influence, water influence, landscape, grassland, general forest, and formally dedicated areas such as research natural areas and wilderness. The zones varied somewhat

among the regions. The general forest zone was usually CFL. Wildlife areas were not zoned because wildlife occupied all zones. All regions required the water influence, travel influence, and dedicated-area zones. Regional guides, however, did not give any direction on the use combination or pattern of uses that would best meet the public's needs within the regions nor how the use combinations or patterns should be determined. Multiple uses actually were coordinated incrementally on the ground through management decisions and practices within each land-use zone as the demand for uses emerged, site by site and year by year (Wilson 1967, 1978).

In the second stage, district rangers prepared district multiple-use plans that classified their entire district into land-use zones. These plans were used to decide where management activities should take place. District plans did not withdraw CFL from timber production; rather, they directed the protection of landscapes, water quality, recreation, and other resources within the land-use zones. Timber planners were required to ensure that timber harvest plans would protect other designated zone values. Sometimes this direction required reducing the allowable cut or modifying management practices. Resource planning for nontimber uses created other difficulties. For example, wildlife resource planners would often categorize CFL within a general forest zone as elk winter range, which called for adaptation of timber harvests and management. Thus, wildlife management under the multiple-use plans was essentially a matter of coordination with other uses rather than a matter of separate zoning. In time, it became apparent that neither the functional resource plans of the earlier years nor the multiple-use plans of the 1960's provided any clear or uniform guidelines for coordinating multiple uses (Wilkinson and Anderson 1985; Wilson 1967).

Insect and Disease Management

The Forest Pest Control Act of 1947 elevated the national priority of and strengthened the Federal Government's leadership and funding in pest control. Forest industry groups and the American Forestry Association, who often saw insects and diseases as generally more destructive to commercial timber stands than forest fires, strongly influenced this legislation. The new policy recognized



Foresters on Pisgah National Forest, North Carolina, discussing multiple-use plan for the Pisgah Ranger District, 1963.

that the key to cost-effective pest management was coordinated control of pest infestations on all land ownerships and authorized Federal technical and financial assistance to States and private landowners. The Act, which was initially administered by the Department of Agriculture's Bureau of Entomology, placed heavy emphasis on surveys and early detection of forest pest outbreaks. In 1953, the Secretary of Agriculture transferred the administration of the USDA forest insect and disease research and control programs to the Forest Service. Throughout the post-World War II period, following the 1947 policy direction, national forest managers coordinated insect and disease control with State and private landowners through technical and financial assistance for detection, evaluation, and control of insects and diseases on all ownerships. This multi-jurisdictional and multi-ownership approach approximated an ecosystem-wide approach and contributed significantly to the effectiveness of pest management (Worrall 1994).

The National Forest System's emphasis on insect and disease management and control accelerated rapidly after World War II — partly in response to more frequent spruce budworm and bark beetle attacks in the mature and overmature western national forests. It was also influenced by the low cost and high effectiveness of DDT and aerial spraying on spruce budworm in aging true fir, Douglas-fir, and spruce forests.

Insect Suppression

By 1960, national forest managers and pest control experts were conducting insect suppression projects on 80 national forests per year. Such projects involved 10 to 16 species of bark beetle, 6 to 8 defoliators, and a half a dozen or more other insects. Bark beetles continued to be the most destructive insects in the pine, Douglas-fir, and spruce forests of the West. Periodically, they were also very damaging to southern pines. Annually, four species of bark beetles — the mountain pine, western pine, Engelmann spruce, and southern pine beetles — caused the most damage. Bark beetle suppression projects were the largest and most costly insect control efforts.



Ranger chopping bark of mature ponderosa pine to check for bark beetle infestation on Panguitch Lake District, Dixie National Forest, Utah, 1953.

From 1958 to 1969, some 700,000 to 1.2 million felled trees, stumps, and cull logs were debarked, burned, or treated with chemical emulsion bark sprays annually to control bark beetles. The strategy was to suppress initial outbreaks while they were small and less costly to control. However, epidemic outbreaks were frequent in the 25-year post-1945 period. Epidemics often followed major windstorms that damaged mature and aging timber. Commercial salvage operations quickly removed damaged and weakened trees that were highly susceptible to beetle attack, so they became an important tool in containing outbreaks and limiting the spread of beetles to healthy timber.

Spruce budworm was the most destructive defoliator. It attacked Douglas-fir, true firs, and spruce stands on western national forests and spruce and fir stands in the Lake States. Immediately after World

War II, spruce budworm and other defoliators were sprayed with DDT. National forest managers learned that DDT was less toxic than compounds previously used to suppress defoliators and had a very low cost (less than \$1.00 per acre after 1958). In 1963, the total area sprayed for defoliators reached a peak of 1.2 million acres and averaged 600,000 acres per year from 1957 to 1965.

National forests used DDT liberally in this period (USDA Forest Service 1945–1970). Although early studies indicated some environmental sensitivity to DDT, the Forest Service cooperated with the Federal Council on Insect Control and Federal and State wildlife agencies to reduce possible adverse effects (USDA Forest Service 1959).

In 1962, because of perceived damaging impacts of pesticides on some wildlife, Rachel Carson, in her book *Silent Spring*, raised serious challenges to the use of chemical pesticides, particularly DDT. *Silent Spring*, a subsequent report by President Kennedy's Science Advisory Committee, and reports from other information sources on pesticide hazards quickly contributed to grave public concerns about pesticide use. In 1963, more people observed aerial spray projects on national forests and other lands and participated in monitoring than ever before in the history of forest insect control. Despite this intense scrutiny, there were no reports of discernible pesticide damage to fish, wildlife, or other national forest resources.

Nevertheless, the use of DDT on national forests was greatly reduced in the latter 1960's, partly because of fewer defoliator outbreaks and partly because of restrictions on pesticide use. The national forest area treated with pesticides to suppress defoliators dropped from 1.7 million acres in 1963 to 800,000 acres in 1965, then fell sharply to 72,000 acres in 1966 and 14,000 acres in 1969 as use restrictions were tightened. At the same time, national forest managers mounted aggressive screening and testing activities to find nonpersistent pesticides that were acceptable alternatives to DDT. Biological control methods and silvicultural practices were also expanded and used to minimize insect outbreaks and damage.

Treatments for insects other than bark beetles and defoliators were limited to very small acreages. The total area annually treated for such insects varied from 200 acres in 1954 to 25,000 in 1964, and averaged 6,000 acres a year for the entire National Forest System.

Disease Control

After World War II, white pine blister rust control efforts were renewed. Although there were questions about the cost-effectiveness of the *Ribes* eradication, studies on previously completed eradications were reporting favorable results. White pine blister rust control continued to be the largest national forest disease control effort by far. Some 3.5 million acres of national forest white pine and sugar pine lands were designated for *Ribes* eradication. They involved 30 national forests in the West and the Lake States (now the Eastern Region) (Benedict 1981).

In 1949, Forest Service research experimented with applying the chemical *Actidion* on tree boles of infected trees to kill the blister rust fungus. By 1957, this experimental procedure was being applied to infected trees on national forests. An antibiotic foliar spray, *Phytoactin*, was tested in 1958 and sprayed from ground equipment and helicopters between 1959 and 1965. More than 500,000 acres were treated from the air and an additional 1.5 million acres from the ground. However, the use of these treatments was terminated in 1965 and 1966, as evaluations determined these antibiotics were not effective (Benedict 1981).

Genetic testing, begun in the 1940's produced a first generation of rust-resistant western white pine seedlings in 1957. By 1966, scientists were able to show that second-generation progenies had a 66-percent survival rate. Western white pine seed orchards to develop rust-resistant tree seeds and seedlings were eventually planted in Idaho in the early 1970's. A similar project to develop rust-resistant sugar pines was initiated in California in 1957 (Benedict 1981).

During the mid-1960's, continuing evaluations of *Ribes* eradication in western white pine areas of Idaho, Montana, and Washington found that the rust was reinfesting young stands in protected areas at an average rate of 3 percent per year. It would not be

economically feasible to bring such young stands to merchantable size. When compared to its benefits, the cost of eradicating *Ribes* was excessive. In the meantime, Douglas-fir, white-fir, western larch, and cedar had increased in relative value to western white pine in the northern Rocky Mountains and were finding good markets. Therefore, national forest managers decided to curtail *Ribes* eradication in Idaho, Washington, and Montana. Elsewhere, where *Ribes* eradication was still considered effective, it was continued on a cautious basis. By the late 1960's, only 15 forests were eradicating *Ribes*.

In 1959, four western national forest regions pilot tested silvicultural control of dwarf mistletoe, a parasitic disease of conifers, to evaluate control methods, costs, and operational problems in infected ponderosa pine, Douglas-fir, and lodgepole pine stands. During the 1960's, they implemented a control program that treated about 25,000 acres annually in those regions. Infected mature trees were harvested or otherwise removed, and the infected branches were pruned from younger trees.

Oak wilt, another introduced fungal disease, emerged as a new disease problem in the East in the 1950's. It was limited to five national forests in the Appalachian and Ozark Mountains. Because the disease posed an unknown threat, analogous to Dutch elm disease and chestnut blight, to the widespread, valuable oak species and forests, it was aggressively searched out in wide-reaching surveys. In the early 1960's, the infected trees removed from national forests numbered less than 200 per year; in 1968 and 1969 less than 100 were removed, and those were limited to the Monongahela National Forest in West Virginia (USDA Forest Service 1945-1970).

Protection From Forest Fires

After World War II, national forest managers responsible for forest fire control turned to more effective use of the growing technology and the expanding road network to reduce forest fire losses and damage. This included expanding smokejumper crews for rapid access to fires in remote mountain areas, using helicopters to move people and equipment to larger fires without using parachutes, and using aircraft to drop water and fire retardants on fires. The effectiveness and striking power of firefighting organizations was raised through increased use of new and improved mechanical firefighting equipment and expansion of the road system to reduce the need for large firefighting forces. Radio communications were improved and expanded. The effectiveness of logistics, communications, and coordination among firefighting forces of Federal and military agencies, States, and industry on large and highly destructive fires was increased. Technical knowledge of fire behavior for more effective firefighter training and generalship and strategies for coordinating new air-attack techniques with ground-attack methods were improved. A uniform national fire danger rating sys-



Air tanker dropping borate slurry at the head of the Monrovia fire, Angeles National Forest, California, October 1958.



Fighting wildfire with hand tools on the Hanover fire line, Nez Perce National Forest, Idaho, August 1967. The lightning-caused fire eventually burned 2,450 acres.

tem was developed for more accurate prediction and comparison of fire situations. Clothing and protective equipment for firefighter safety were also improved.

The average annual burn on national forests was reduced to 200,000 acres per year — barely one-tenth of one percent of the total national forest area. By 1951, the total strength of the short-term firefighting force was reduced to 6,000, compared to more than 13,000 in 1940, at the time of the CCC, and 9,300 in 1945, after the CCC.

The number of fires controlled annually on national forests varied from 7,000 to 13,000, and averaged 11,000 per year. Lightning caused a consistent 55 percent of the total fires — mostly in the West. Given the quadrupling of the timber harvest and even greater increases in the use of the national forests by recreationists, this performance was an extraordinary achievement. However, there were a few bad years. In 1951, more than 510,000 acres burned. Severe drought in the Southwest and California and the driest fire season since 1922 in western Washington and Oregon contributed to one of the worst national forest fire seasons, measured in

terms of timber killed and other resources damaged, in many years. A billion board feet of sawtimber and 100,000 acres of young stands were damaged or destroyed. These fires also damaged watersheds in the Southwest and California. Heavy rainfall on some of the burned areas caused severe flash flooding.

The year 1967 was similar to 1951. Washington, Oregon, Montana, and Idaho had the warmest and driest summer since 1910, when 2.8 million acres burned in Montana and Idaho alone. Despite sustained critical forest fire conditions, fire damage was limited to 208,000 acres.

Resource losses were similarly limited. This success was attributed to modernized fire control capability and strong interagency cooperation. Some 15,000 firefighters, including organized crews of American Indians, Hispanic-Americans, farmworkers, loggers, and BLM Alaska Native crews were mobilized. Foresters were drawn from every part of the Nation to supervise firefighting. Smokejumpers attacked a record number of fires with more than 4,000 jumps. The National Guard, the Army Reserve, and the U.S. Army and Air Force provided additional firefighters and equipment. The Forest Service employed hundreds of aircraft and bulldozers and massive amounts of support equipment and marshaled supplies, feeding facilities, and other support for firefighters. More effective fire attack and control plans were made possible by recently adopted airborne infrared fire mapping technology that could “see” the fires through smoke and darkness.

Fuel Management Activities

Fire control managers were also responsible for disposing of fuels from timber harvests, road rights-of-way, and thinning. They burned fuels when moisture conditions minimized the risk of spread to green timber

and atmospheric conditions dissipated smoke quickly. Firefighting equipment such as bulldozers, water tankers, and pumps were often kept on stand-by to minimize losses in case a burn escaped to green timber. Any such escapes were suppressed as forest fires. In the late 1960's, 300,000 acres or more were being burned annually, although by 1961 chipping, chopping, and other alternatives to burning were being used. The latter alternatives did not create smoke or impair visibility, which began to be seen as environmental concerns in some areas in the late 1960's.

Flammable vegetation was being removed from about 1,000 miles of roadside each year to minimize the threat of forest fires caused by passing motorists. Fire-hazardous snags were being felled on 500,000 acres per year to reduce the incidence and spread of lightning fires. Eventually, in the late 1970's, a number of selected snags per acre were being left to provide habitat for cavity-nesting birds and wildlife. Prescribed fires were being used in carefully selected situations to improve forage production, timber crops, and wildlife habitat on about 300,000 acres per year.

Initiation of Fuel Management

In the 1960's, national forest managers began to recognize that controlling forest fires to protect resources, regeneration investments, and other improvements, and to reduce risks to users, was leading to another problem — the buildup of woody forest debris, which created a potential for major fires in certain forests, particularly during drought years. In the past, periodic wildfires under natural conditions and fires started by Native Americans in presettlement times had been nature's way of avoiding woody debris accumulations. Prescribed fires — controlled burns set at times and under conditions that ensured slow, low-intensity burns that would consume the accumulated fuels with minimum damage to the forest itself — became one remedy. The earliest reference to prescribed burning as a forest fuel management tool on national forests appeared in the Quincy, California, *Feather River Bulletin*. It related to conditions on the Plumas National Forest in 1918:

... If the Forest Service were to adopt the policy of burning off the ridges in the early spring, this would eliminate in great measure the possibility of fire spreading over any great area, and would give the fire fighter unmeasurable advantage (McLean 1993).

In the late 1960's, western national forests began to apply prescribed burns to limited areas, up to 50,000 acres per year. About 1,000 miles of fuel and firebreaks were also being put in place. Progress was slow, but by 1969 it was evident that where fires had originated or burned into fuel-treated areas, both suppression costs and damage were significantly lower (USDA Forest Service 1968–1970).

Managing Recreation Uses and Resources

Postwar recreation visits to national forests — each single entry by a person equated to a visit — literally exploded when wartime gas rationing and other restrictions ended. Visits rose from 18 million in 1946 to 46 million in 1955 and 132 million in 1964 (fig. 7). In 1965, Federal agencies adopted a uniform unit for measuring recreation activity on Federal lands — the recreation visitor day (RVD), 12 hours of onsite use by one or more persons. Recreation use continued to rise, to 173 million RVD's in 1970 — an average increase of 2.7 percent per year compared with a population growth rate of 1.1 percent (fig. 8).

Human populations shifting to the West and Southwest accelerated use pressures on western national forest lands and resources, particularly on forests near highly urbanizing areas and growing cities. Increasing affluence, leisure time, and high-tech equipment, and the use of offroad vehicles and boats, dramatically influenced the way Americans recreated. Although the CCC had effectively equipped many national forests with good-quality recreation facilities, the burgeoning use soon outgrew the 20-year-old public facilities and pressed into the less-developed lands and resources that were made accessible to recreation visitors by the expanding road system. The road system grew from 100,000 miles in 1945 to nearly 200,000 miles in 1970 and opened up access to new opportunities for recreation experiences.

The rapid rebound of recreation visits after World War II made recreation management a race to catch up and keep abreast of the growing use. Although recreation visits had declined by 50 percent during the war, many areas near population centers had been used continuously. In the absence

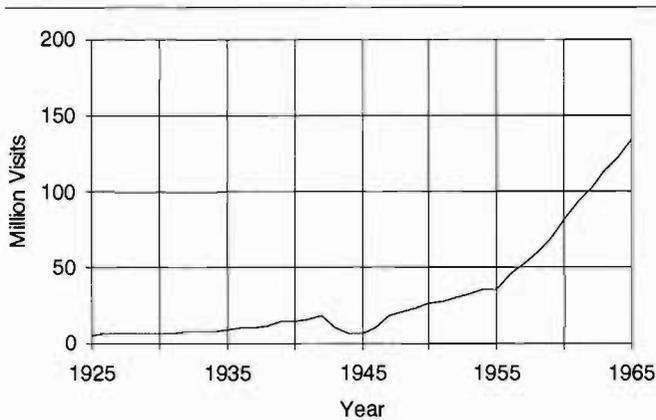


Figure 7. Outdoor recreation visitor use of national forests, 1925–1964
Source: USDA Forest Service.

of maintenance during the war years, many facilities and areas had deteriorated and needed rehabilitation. Thus, restoring impacted recreation environments and upgrading, repairing, and rebuilding latrines, water systems, fireplaces, shelters, bathhouses, parking areas, and other facilities became an immediate priority after the war.

All national forests were planning new recreation areas or expanding existing facilities to relieve over-use at many sites and to serve the rapid growth of recreation use. New recreation areas and sites were often planned and located where the buildup of recreation activities in accessible but unimproved and undeveloped areas threatened to impact resource conditions, recreationists' safety, or the quality of the site itself. A great increase in the popularity of winter sports created demand for more winter sports areas, skilifts, winter resorts, and more challenging skiing terrain. Ninety percent of the terrain available for public skiing was located on the western national forests, and it became a major

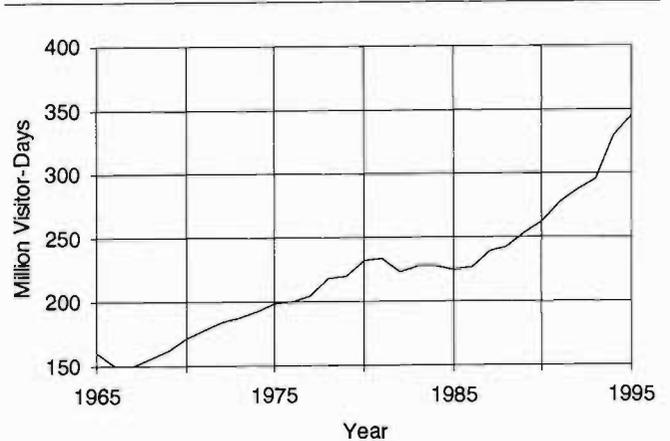


Figure 8. Outdoor recreation visitor use of national forests, 1965–1994
Source: USDA Forest Service.

source of winter sports expansion. From 1952 to 1959, the number of recreation visits to national forest winter sports facilities more than doubled, growing from 1.9 million to 4.2 million. The exploding participation in winter sports also required national forests to find ways to ensure the safety of large numbers of people in high-country winter conditions. Avalanche control to protect winter sports enthusiasts became an important need and difficult challenge on many forests.

A 5-year issue over developing a part of the San Geronio Primitive Area on Southern California's San Bernardino National Forest as a ski area illustrates the pressure for winter sports development on national forests. In 1947, following public hearings, national forest managers decided that the San Geronio watershed's values were best protected by keeping the proposed ski area in permanent wilderness, but it would be open for backcountry skiing (USDA Forest Service 1947–1948).

Recreation use in the 1950's continued to grow strongly on national forests and everywhere else in the United States. Congress established the Outdoor Recreation Resource Review Commission (ORRRC) in 1958 to focus national policy attention on long-term outdoor recreation needs. The Commission's task was to inventory and evaluate outdoor recrea-



Winter sports on the Arapaho National Forest, Colorado. Jumping hill at Winter Park during NCAA tournament, March 1956.



Skiing on the Coconino National Forest, Arizona, 1957. This is the advanced slope at Snow Bowl.

tion resources and estimate the amount and type of recreation facilities that would be needed by 1976 and 2000. It completed its report in 1961.

The Forest Service, anticipating participation in the ORRRC studies, initiated its own survey on national forests in 1957. In that, the forests launched a 5-year initiative called Operation Outdoors to improve the quality of existing facilities and add new recreation

areas and facilities to relieve the continuing crowding and accommodate the 66 million visits projected for 1962. They employed professional landscape architects and recreation planners to review, update, and revise plans to modernize 4,700 campgrounds and picnic areas and prepare designs for new ones. By 1962, 22,000 family camps and picnic units were renovated and 17,000 new units were constructed. In addition, national forests developed or expanded



Cross-country skiers and snowmobiles on Trillium Lake Basin snow trail, Mt. Hood National Forest, Oregon, 1961.



Bridger Bowl Ski Area, Gallatin National Forest, Montana, 1961. Skiers waiting for ski tow to slopes in the background.

30 winter sports areas, 59 swimming sites, several boating sites, scenic outlooks, and other areas. Although this progress was significant, it achieved only about half of the targeted objectives, while recreation visits rose to 113 million in 1962 — twice the level projected by Operation Outdoors (USDA Forest Service 1945–1970).

The national forests learned from the Operation Outdoors experience and the ORRRC studies that their 1957 growth projections greatly underestimated growth trends. Undismayed, the Forest Service incorporated higher targets for expanding recreation areas, facilities, and services to meet higher projections of recreation visits in its 10-Year Development Program, which President Kennedy transmitted to Congress in 1961 (USDA Forest Service 1961a). This program also included construction of more multiple-purpose roads and trails to serve the expected higher levels of recreation use in addition to increased timber harvests. Landscape, travel, and recreation zones were also being identified in management plans and on the ground to further integrate recreation use, management, and development with other national forest uses.

As visits to national forests rose from 27 million in 1950 to 113 million in 1962, the greatest increase came in the number of people just seeking general enjoyment of the forest environment. Automobile visits increased greatly (U.S. automobile registrations rose from 30 million in 1945 to 75 million in 1962). Driving for pleasure and picnicking were among the most popular onsite activities, growing from 14 million in 1950 to 61 million in 1962. Hunting and fishing visits increased from 7 million to 26 million. Visits for hiking and horseback riding rose from 600,000 to 2.5 million. All of these uses were helped by the expanding road system and existing trails (USDA Forest Service 1945–1970). Because the new roads often took the place of former trails built primarily for forest fire protection, the total miles of trails maintained by the national forests declined steadily, from 144,000 miles in 1945 to 105,000 in 1962 (Wells Associates, Inc., 1985).

Other, more site-specific activities also grew rapidly. Camping increased from 1.5 million visits in 1950 to 8.0 million in 1962, and winter sports from 1.5 mil-



Forest visitors enjoy lunch at the C.L. Graham Wangan picnic ground, White Mountain National Forest, New Hampshire, 1966.

lion to 5.3 million. Swimming visits rose from 1 million to more than 3 million. Other visits, for boating, waterskiing, resort use, gathering forest products, summer home use, and nature study, rose from 1.3 million to 6.7 million (USDA Forest Service 1945–1970).

During the balance of the 1960's, recreation management focused increasingly on raising the quality



Girl Scouts having lunch and visiting with forester during the 1960 Girl Scout All-State Encampment at Todd Lake, Deschutes National Forest, Oregon.

of the recreational experience, improving services, and continuing expansion of the total capacity of developed sites and facilities. Landscape management was expanded as a new multiple-use discipline. Landscape areas and scenic vistas began to receive equal expert management consideration with other uses and values sought by national forest users. For example, the number of observation sites for enjoying scenic vistas increased from 242 in 1962 to 444 in 1970, and their capacity for people at one time (PAOT) grew from 12,000 to 26,000 — an increase of 117 percent.



Visitors at the "Cradle of Forestry in America" Visitor Information Center, Pisgah National Forest North Carolina, listening to recorded message about the "Things to Come" exhibit, 1967.

The Visitor Information Service (VIS) was introduced in 1963 to help the public understand and interpret the national forests' historical and natural resources. The VIS provided road and trailside exhibits and signs, nature trails, personal contacts, and visitor centers at the most heavily visited attractions. In 1963, three centers were open to visitors: the Mendenhall Glacier Center on Alaska's Tongass National Forest near Juneau, the Missoula Smokejumper Center in Montana, and the Redfish Lake Center on Idaho's Sawtooth National Forest. By 1970, 36 such centers had a PAOT capacity of 7,305 visitors. The number of interpretive sites and trails, including those designed to serve persons with disabilities, reached 240 — and they could serve more than 20,000 visitors at one time. In 1970, the RVD's spent at information sites exceeded 2 million.

Between 1962 and 1970, the PAOT capacity at developed sites areas grew more than 52 percent, to 1.3 million. The greatest percentage increases in capacity occurred at boating, swimming, observation, and information sites. There also were huge increases in campsites, picnic sites, and winter

sports areas. Total capacity at organization camps, hotels, lodges and resorts, and recreation residences remained about the same.

Concessionaire operation of developed sites was introduced in 1951 at well-improved areas where user charges could be readily justified. Sites operated by concessionaires rose to 148 by 1970, more than 10 percent of the publicly developed PAOT capacity at developed recreation sites. Concessionaire operation of recreation and visitor sites freed national forest managers to give more attention to the strategic and development aspects of national forest recreation management.

Almost 40 percent of all visitor use occurred at developed sites. The dispersed use of the national forest environment constituted 105 million RVD's — more than 60 percent of the total 173 million RVD's in 1970. Driving for pleasure over forest roads made up 38 million of the dispersed RVD use, and hunting, fishing, hiking, and horseback riding contributed another 38 million RVD's.



Multiple use: wood is hauled out as recreationists drive into the Cherokee National Forest, Tennessee, over an attractive forest road to South Holston Reservoir, 1962.

National Recreation Areas

National Recreation Areas (NRA's) were an early Federal effort to improve and ensure the quality and supply of outdoor recreation opportunities close to areas of population concentration and growth centers. The establishment of NRA's was generally limited to areas with high recreation-carrying capacity (greater than 20,000 acres) and located where there were 30 million or more people within a 250-mile radius — a ubiquitous situation now. Each NRA is authorized by a separate individual act of Congress. The first national forest NRA was established in 1965 at Spruce Knob – Seneca Rocks on West Virginia's Monongahela National Forest. Spruce Knob was the State's highest mountain and the central attraction in 100,000 acres of a unique scenic and recreation area. Its development plan included facilities to accommodate a million recreation visitors per year by the 1970's and conservation of scenic, scientific, and historic sites. The plan permitted timber cutting, grazing, and mineral development with adaptations as needed to sustain the priority uses.

Two more NRA's were established in 1966: the Whiskeytown – Shasta-Trinity NRA on California's Shasta-Trinity National Forest and the Mount Rogers NRA on Virginia's Jefferson National Forest. Their total PAOT capacity at developed sites such as campsites, picnic areas, boating sites, motels, and lodges was 16,000. They could also accommodate tens of thousands of RVD's in dispersed-use activities such as hunting, fishing, driving, hiking, and scenic enjoyment. In 1967, visitor use at each of the initial three NRA's reached a million RVD's. The Flaming Gorge NRA, the fourth such area, was designated in October 1968 as a part of

the Ashley National Forest in northeastern Utah and southwestern Wyoming. It included 200,000 acres of outstanding scenic country and the numerous recreation facilities surrounding the Flaming Gorge Reservoir constructed by the Department of the Interior's Bureau of Reclamation in 1964.

Designation of Wild and Scenic Rivers and National Trails

In October 1968, Congress extended its authority for designating Federal lands and resources to the preservation of wild, scenic, and recreational rivers — with the Wild and Scenic Rivers Act — and of national scenic, historic, and recreational trails — with the National Trails System Act — for the use and enjoyment of present and future generations. These Acts responded to ORRRC report recommendations. They reflected a growing concern that continuing national growth and development would encroach upon and preempt the recreation and aesthetic opportunities remaining in underdeveloped and newly developing areas on Federal lands and an

urgency to ensure an adequate supply of such opportunities for future generations.

Congress initially designated eight wild and scenic rivers. Four of these rivers and a major part of a fifth, totaling almost 500 miles, were mainly on national forest lands and were to be managed by the Forest Service. The Act designated 27 other rivers for detailed study; the Forest Service was responsible for nine of these. The rivers and their immediate environments were to be evaluated for their outstanding scenic, recreation, geologic, fish and wildlife, historic, and cultural resources. Designated wild and scenic rivers were to be preserved in their free-flowing condition and their immediate environments protected for the benefit and enjoyment of present and future generations. Public listening sessions were scheduled as studies developed management plans and options that could be presented to the public.

Congress also designated two national scenic trails — the Appalachian Scenic Trail and the Pacific Crest Scenic Trail — and named 11 other scenic trails and 29 historic trails for study. In the West, the Pacific Crest Trail extended 1,599 miles through national forests in Washington, Oregon, and California and was to be administered by the Forest Service. The Appalachian Trail extended 2,000 miles from Maine to Georgia. The Forest Service would cooperate with the Department of the Interior to administer the 840 miles that passed through eight eastern national forests and participate in other studies where trails traversed national forest lands. Congress recognized the contributions that volunteers and private, non-profit trail groups had made to the development and maintenance of the Nation's trails and encouraged their continued participation in the planning, development, and management of national recreation trails.

Wilderness Preservation and Management

Wilderness use in the immediate postwar years represented less than 1 percent of the total visits to national forests. In 1947, wilderness areas — those areas classified as wilderness, wild, and primitive — were visited by 144,000 people who spent 406,000 days in them (USDA Forest Service 1947–1948). As the number of visits grew steadily, though slowly, the

progress of national forest evaluation and classification of primitive areas as wilderness or wild also progressed. The 1947 decision to retain the San Geronio Primitive Area as permanent wilderness exemplifies an early post-World War II step in such evaluation.

In 1947, there were 77 wilderness, wild, and primitive area setasides on national forests, with a total area of more than 14 million acres. The National Forest System goal was to preserve, for all time, representative examples of the variety of American wilderness conditions. Areas selected for evaluation were kept in a substantially primitive, unmodified condition. Neither road construction nor commercial timbering was allowed. However, since most of the areas were in high country with little commercial timber, their withdrawal from timber cutting had little effect on the available timber inventory or allowable cuts. Access inside wilderness areas was limited to trails or waterways. Regulated livestock grazing was allowed in places where it had been long established. Many areas provided big game habitat. The national forest criteria for classification were very strict — pristine, primitive conditions and absence of any significant evidence of previous human activity such as logging, roads, residences, or other development. Wilderness areas were seen as the last remnants of pristine conditions in America. They were being selected to provide genuine wilderness recreation opportunities for those who wished to “rough it,” as well as for those who yearned for solitude and a reflective, awe-inspiring experience (USDA Forest Service 1947–1948).

The pristine goals for wilderness gave national forest managers the policy direction to provide the finest wilderness conditions and experience to be found within the National Forest System, while balancing the lands and resources available to respond to the demands for more intensive uses. This approach worked well through the 1940's and into the 1950's and had the support of industry, conservation groups, wilderness interests, and communities. Conservation group interest in the preservation and management of wilderness areas grew during these years. All areas were located in the western national forests except the 7,610-acre Linville Gorge Wild Area established in 1953 on North Carolina's Pisgah

National Forest. Another significant national forest reservation in the early 1950's was the closing of the airspace over the Superior National Forest roadless areas, which banned flying over the reserved area that eventually became the Boundary Waters Canoe Area.

The number of areas being considered for wilderness on national forests rose to 83 in 1961. As some lands, often those with commercial timber, were withdrawn from wilderness consideration as evaluation progressed, others were added, so the total area remained fairly close to 14 million acres. In 1961, 15 areas greater than 100,000 acres, including the Boundary Waters Canoe Area, were classified as wilderness and 30 areas of 5,000 to 100,000 acres were classified as wild areas. These represented 40 percent of the total national forest wilderness set-aside of 14.7 million acres and included a second eastern wild area — the Great Gulf Area, with 5,400 rugged acres on the slopes of Mt. Washington on New Hampshire's White Mountain National Forest (USDA Forest Service 1945–1962).

By 1960, the number of wilderness visits rose to 765,000 — still less than 1 percent of all national forest recreation visits. Thus, it was apparent that wilderness was being valued more as a symbol and setting for human experiences than as a resource whose physical use would increase rapidly. The idea or mental image of wilderness and its symbolism captured America's imagination as the national movement for wilderness designation advanced (Roth 1984a; USDA Forest Service 1945–62).

As the 1950's unfolded, the steady extension of national forest roads and timbering into unroaded



Field foresters checking watershed conditions on Hamilton mesa, Pecos Wilderness area, Santa Fe National Forest, New Mexico, 1954.

areas increasingly raised questions about the compatibility of logging with recreation and wilderness designation (Roth 1984a). Logging versus recreation came to be a source of friction. Some users began questioning the balance between commodity production and the aesthetic values of national forest. Uncertainty emerged among wilderness interest groups over the compatibility of the multiple-use management philosophy with wilderness preservation. Here and there, the withdrawal of commercial timberland from areas earlier classified as potentially suitable for wilderness designation aggravated these concerns. Wilderness leaders and advocates lost confidence in the Forest Service's administrative discretion to designate commercial timber lands as wilderness, where such areas were also valuable for wilderness. In 1956, they initiated a prolonged effort to develop and obtain passage of Federal legislation. They sought to provide statutory authority for wilderness designation; to withdraw Forest Service authority to declassify or reduce the size of wilderness-type areas; to protect wilderness against mining and water project developments; and to extend wilderness preservation to other Federal lands (Roth 1984b).

The Multiple-Use Sustained-Yield Act of 1960 was passed in this changing environment. Even though the Act implicitly recognized the compatibility of wilderness preservation with the multiple-use management philosophy, it mobilized wilderness advocates to seek passage of legislation that ultimately became the National Wilderness Preservation Act of 1964. Under this Act, Congress delegated to itself the power to designate areas of the National Forest System and other Federal lands as parts of a new National Wilderness Preservation System (NWPS), reducing the national forest managers' role from designating wilderness areas to identifying and evaluating candidate areas, recommending their classification, and managing the congressionally designated wilderness areas .

The Wilderness Act designated all of the Forest Service's previously classified wilderness or wild areas and the Boundary Waters Canoe Area as the initial components of the NWPS. These initial designations included 54 areas totaling 9.1 million acres that had been designated since 1924. The Act also directed that the remaining 5.5 million acres of national forest primitive areas be reviewed within 10 years to determine their suitability for wilderness. The findings were to be reported to the President, who would then recommend wilderness designation or other reclassification (Roth 1984a, 1984b; Steen 1976).

The Forest Service moved consciously to even more rigorous wilderness standards as it developed its procedures for classifying the remaining national forest primitive areas. The review was designed to ensure consistent national application of pristine standards for wilderness, even though the Wilderness Act provided only general definitions of wilderness and no guidelines on how to reconcile wilderness preservation with other national forest uses and resources. Under these circumstances, the classification process was quickly burdened by the ambiguities between the preferences of wilderness advocates and the Forest Service's rigorous criteria. Advocates participating in evaluation of primitive areas consistently pressed for inclusion of substantial acreages that did not meet the Forest Service's pristine standards. The Wilderness Act's broad guidelines left wide room for discretion. Thus, the participative

process often led to compromise rather than consistent selection. The Wilderness Act similarly set no goals or guidelines for the ultimate size of the National Wilderness Preservation System. Stewart Brandborg, Executive Director of the Wilderness Society, argued on behalf of the advocates that the political process should be allowed to decide the ultimate size of the wilderness system (Roth 1984a).

During the 1960's, the Forest Service realized that Congress would likely include more than the classified primitive areas in the NWPS. In 1967, the Chief went beyond the Wilderness Act study requirements and directed regional foresters to complete an inventory and review of all remaining unclassified roadless areas larger than 5000 acres. In 1971, this initiative became the Roadless Area Review and Evaluation (RARE) — the second comprehensive national forest assessment of roadless lands for wilderness designation. The initial inventory had been undertaken in 1926 to identify primitive areas.

Between 1964, when the Wilderness Act was passed, and 1969, Congress designated seven new wilderness areas totaling 793,000 acres. Wilderness RVD's in 1969 exceeded 5 million and made up about 3 percent of the total recreation visitor use. These RVD numbers substantially exceeded the number of previously counted "visits" or single entries because wilderness recreation typically involved 4 to 5 days per visit.

Reservation of Research Natural Areas

National forests continued to reserve research natural areas (RNA's) after World War II and by 1970 had added 33 RNA's covering 41,288 acres, bringing their total to 72 and their area to 86,608 acres. The RNA's ranged from 18 acres to 9,102 acres, with a mean area of 1,202 acres — almost 2 square miles. RNA efforts continued to focus on establishing representative natural areas of major forest types and their scientific study and educational use to obtain and share information about natural system components and processes to distinguish differences between RNA development and that of representative managed ecosystems (USDA Forest Service 1992b).

In 1947, for example, on the Thornton M. Munger RNA at the Wind River Experimental Forest in Wash-



Thornton T. Munger Research Natural Area, representing old-growth Douglas-fir and western hemlock, 1952. Growth and mortality have been periodically measured in the stand since 1947.

ington's Gifford Pinchot National Forest, a long-term study of old-growth Douglas-fir and western hemlock was initiated to evaluate growth and mortality, crown class development, and species succession. This study, 36 years later, provided dramatic data on the dynamics of stand structure and species composition in Douglas-fir and western hemlock old-growth and the static nature of old-growth total stand volumes as annual mortality offset annual growth.

In 1950, the G.A. Pearson RNA was established on Arizona's Coconino National Forest to maintain in its natural state a representative stand of pure ponderosa pine typical of the commercial old-growth stands on the Coconino Plateau. In the 1990's, the Pearson RNA would provide data on goshawk habitat preferences for less-dense stands and

management guidelines to keep the goshawk off the endangered species list.

The Elk Knoll RNA was established in 1957 on Utah's Manti-LaSal National Forest to maintain an area of subalpine vegetation, trees, and shrubs in a protected condition free from domestic livestock grazing. It served as a baseline for evaluating ecological trends of subalpine vegetation under various grazing regimes, and in time helped to calibrate an evaluation scale to assess the Manti-LaSal's range conditions.

Protecting and Managing Watershed Condition

Maintaining favorable watershed conditions continued to be a prime national forest management concern as timber harvesting — including road building — and recreation increasingly became the most widespread national forest uses after 1945. Reliable flows of good-quality water were needed not only to sustain wildlife and fisheries habitats, provide quality recreation opportunities, and serve other national forest needs, but also to ensure water supplies for downstream communities, farms, and industries. National forest watersheds were the major water source for 1,800 cities and towns. Hundreds of smaller communities and thousands of rural residents received all or part of their water supply from the national forests.

National forest water yield was particularly important in the 11 contiguous Western States — Washington, Oregon, California, Nevada, Arizona, New Mexico, Utah, Colorado, Wyoming, Idaho, and Montana, where national forests made up 21 percent of the land area and yielded 53 percent of the total runoff. More than 600 hydroelectric power developments and thousands of industrial plants depended on water supplies from these forests. National forest watersheds were also the major water supply sources for agricultural irrigation in the West and the locale and sites for many reservoirs that provided water storage and regulated waterflows.

East of the Great Plains, national forests were fewer and more widely dispersed and did not loom large in the total water supply picture. But in the Ozarks and the Appalachians and some other critical eastern watershed areas, they often played an important



Young rangers at Rocky Mountain Region training camp receiving field instruction on analyzing watershed conditions, Pike National Forest, Colorado, 1952.

role in local and regional water supplies and flood control.

Following World War II, the national forests renewed their efforts to prepare management plans for important watersheds. These plans provided basic soil and water information for land use and management. In time, such watershed plans included quantified data on actual and potential water yields, conditions, and current and potential water requirements. This effort advanced slowly. Most watershed management concentrated on projects to rehabilitate watersheds already damaged by forest fires, overgrazing, and other causes of damage.

By the end of the 1950's, there were up to 90 active watershed rehabilitation and stabilization projects per year on damaged lands and waterways on about 80 national forests. Although the multiple uses were managed in ways that protected the soil and provided adequate vegetative cover, there were still some areas where cover was inadequate due to extreme past abuse and forest fires. In 1958, these areas constituted 3.5 million acres of eroding slopes, some 43,000 acres of slides and unstable dunes,

6,200 miles of impaired stream channels, and more than 20,000 miles of gullies (USDA Forest Service 1959).

Restoration of damaged watersheds and emergency treatment of newly burned areas continued through the 1960's. Rehabilitation projects treated about 40,000 acres of eroding land; stabilized several hundred miles of streambanks, shorelines, and gullies by planting trees and grasses; and controlled erosion on about 2,000 miles of abandoned, but eroding, old trails and roads each year.

The following case examples illustrate the range and performance of watershed management and protection activities. In 1947, California's Angeles National Forest, in cooperation with the Soil Conservation Service, strengthened its forest fire control capabilities and the protection of highly flammable mountain brush on steep, erosive slopes by installing water storage facilities. In areas with growing water needs, the protection of the "worthless" brush on areas with high watershed value was viewed as more important than a stand of choice timber on areas of low watershed use and benefit (USDA Forest Service 1947-1948). They also installed stream improvements in certain parts of steep mountain channels to better control streamflow, stabilize stream channels and banks, and reduce streamflow damage.

In 1949, two extensively burned areas on California's Los Padres and Cleveland National Forests received emergency rehabilitation treatments. Fixed-wing aircraft quickly reseeded thousands of acres of denuded lands to grass. Where the terrain was too hazardous for fixed-wing aircraft, helicopters were used. In 1950, the entire North Fork of the Swift Creek watershed on Wyoming's Bridger National

Forest was withdrawn from grazing with full cooperation from local ranchers. Heavy grazing in past years had so depleted the watershed's forage cover that runoff from rains was a source of critical flooding to the downstream town of Afton. Erosion and sediment were also causing widespread damage, especially to the town's water distribution system and even to plumbing fixtures in homes and to irrigation facilities in the surrounding area. This rehabilitation effort continued for a full decade.

In 1958, the Siuslaw National Forest on the Oregon coast was engaged in stabilizing coastal sand dunes to protect roads, campgrounds, small lakes, and streams from dune encroachment. On New Hampshire's White Mountain National Forest, four municipal watersheds were being rehabilitated to stabilize soils in ways that would steadily improve the quality and yield for domestic water supplies.

Watershed foresters monitored the performance of their projects. For example, after the completion of a 3-year rehabilitation project on the Castle Creek watershed of Colorado's San Isabel National Forest, they reported that surface runoff had been slowed to a point where Castle Creek no longer carried silt. Meadow-type vegetation was returning to bottomlands where the water table had been restored by gully stabilization and contour trenches. Castle Creek, which used to flow after each rain and then dry up, was slowly returning to a yearlong live stream supporting fish and wildlife.

Soil Surveys Initiated

In 1960, all national forest regions initiated systematic soil surveys after they had pilot tested the most cost-effective way to carry them out (USDA Forest Service 1961b). Soils training schools were estab-



Job Corps enrollees building gabions for stream improvement and watershed protection on the Middle Fork of the Red River, Daniel Boone National Forest, Kentucky.

lished and a soils handbook was prepared and published. National forest managers needed to know more about soil capabilities and limitations and how they related to national forest management activities and uses. By 1970, detailed soil surveys had been conducted on more than 20 million acres of National Forest System lands. With the advice of soil scientists, soil and water management problems were being minimized on more than 500 projects per year. Similarly, data from hydrologic and geologic surveys were used to improve national forest resource use and management.

Water Storage Development

National growth and development after World War II unleashed an unprecedented rate of dam construction in the United States. More than 35,000 dams were completed between 1945 and 1969. Many served multiple purposes such as irrigation, flood control, water supply, recreation, and hydroelectric power (Frederick 1991). Although some water storage facilities were built on eastern national forests, much of this construction spilled over to western national forest lands, where many sites had been identified as power sites available for public or

private development. By 1951, large, multiple-purpose dam projects such as the Hungry Horse project on Montana's Flathead River and the Detroit Dam on Oregon's North Santiam River created huge reservoirs, often flooding national forest lands and being filled, in part, by runoff from nonflooded national forest lands. Often, national forests were given the responsibility for managing the recreation sites and uses around such large reservoirs.

Local communities were also reaching into national forests for additional water supplies. Private power companies were constructing large reservoirs and power-generating plants. Farmers and ranchers continued to build many small irrigation and stock-watering reservoirs on national forests. In Alaska, also in the 1950's, the more accessible of the 200 available power sites were being studied as water and power sources for pulp mills.

Although other agencies were constructing these water developments and were responsible for managing them, national forest managers were faced with the impact of these developments. Some of the larger reservoirs were submerging thousands of timber-producing acres, which required national forest managers to conduct impact studies and surveys to coordinate the various other forest resource uses with the dam-building projects. Twenty-nine such surveys were completed on national forests in 1961, and work was advancing on an additional 35 more. This number doubled by 1962 and continued to increase to more than 400 by 1970. During this period, such studies were renamed impact surveys and expanded to include all water-development construction projects. The surveys provided information on adaptive measures

to mitigate resource damage that occurred during dam construction (USDA Forest Service 1945-1970).

Barometer Watershed Projects To Increase Streamflow

In the late 1950's, research demonstrated that watershed streamflows could be increased by reducing or changing the density of forest cover. To determine whether watersheds could be managed in ways that would increase waterflows, the Forest Service in the early 1960's established a series of barometer (gauged) sample watersheds in areas where water supplies were scarce. Such projects were established on 50,000- to 100,000-acre watersheds on 40 national forests. Streamflow gauges determined baseline and altered waterflows before and after a variety of management practices were implemented. Such practices included snow fencing or timber cutting in patterns to increase snow depth and subsequent snowmelt runoff, conversion of brush cover to grass, identifying pollution sources and methods to reduce pollution, and developing rehabilitation plans for eroding areas. Twenty-one barometer watersheds had been designated by 1965. When



District ranger and the mayor of Ely, Nevada, examining 1958-59 contour trenching and crested wheatgrass seeding project done at Ward Mountain, Humboldt National Forest, to stop erosion and the repeated flooding of the town of Ely. Photo taken in 1965.



Santa Fe Canyon Reservoir, Santa Fe National Forest, New Mexico, 1947, with city of Santa Fe in the background. Watershed protection was the highest priority use for the land, and it was closed to all other uses.

they were fully instrumented, they would sample the effects of resource management and development practices on water quality and yield.

Throughout the 25-year postwar period, most soil and watershed activities were carried out in coordinating other uses. At the end of the 1960's, of the 360 soil and water FTE's, 310 were engaged in coordinating soil and water protection and management with other uses or in conducting inventories to provide basic information on soil and water resources and conditions. Only 50 FTE's were involved in implementing soil and watershed management practices directly on national forest land (USDA Forest Service 1992a).

Wildlife and Fish Management

The 1945 to 1960 Period

At the end of World War II, big game populations on national forests had generally risen to their highest levels in the 20th century — twice as great as those on other ownerships (USDA Forest Service 1947–

1948). By 1945, their numbers exceeded 2 million, nearly quadruple the 1921 estimate when the first big game population survey was done on the National Forest System (Thomas et al. 1988). They included deer, elk, moose, antelope, bear, bighorn sheep, and mountain goats and constituted a third of the Nation's big game population (USDA Forest Service 1947–1948). Between 1945 and 1960, national forest deer populations increased by more than a million and elk rose from 160,000 to 296,000 in the nine Western States — Washington, Oregon, Idaho, Montana, Wyoming, Utah, Colorado, Arizona,

and New Mexico. Increases in other big game populations were smaller. Bighorn sheep numbers had declined to a low of about 9,500 in 1940, but in 1960 they numbered 12,000 (Thomas et al. 1988).

National forests also supported a wide variety of small game and birds such as squirrels, ruffed grouse, and wild turkey. Furbearers were widespread. As a result of protection and restoration efforts, beaver were increasing rapidly in some locales. There were more than 80,000 miles of fishable streams — some of the best trout waters in the country. Game fish were common in the waters of 1.5 million acres of natural lakes or impoundments. Because national forests provided unrestricted access for hunting and fishing and were located in almost every State, the Forest Service predicted public demand for hunting and fishing on the national forests would grow rapidly after World War II (USDA Forest Service 1945).

The number of hunter and angler visits to national forests rose from 3 million in 1945 to more than 22 million by 1960 — an average growth of more than 13 percent per year (USDA Forest Service 1945–1970).

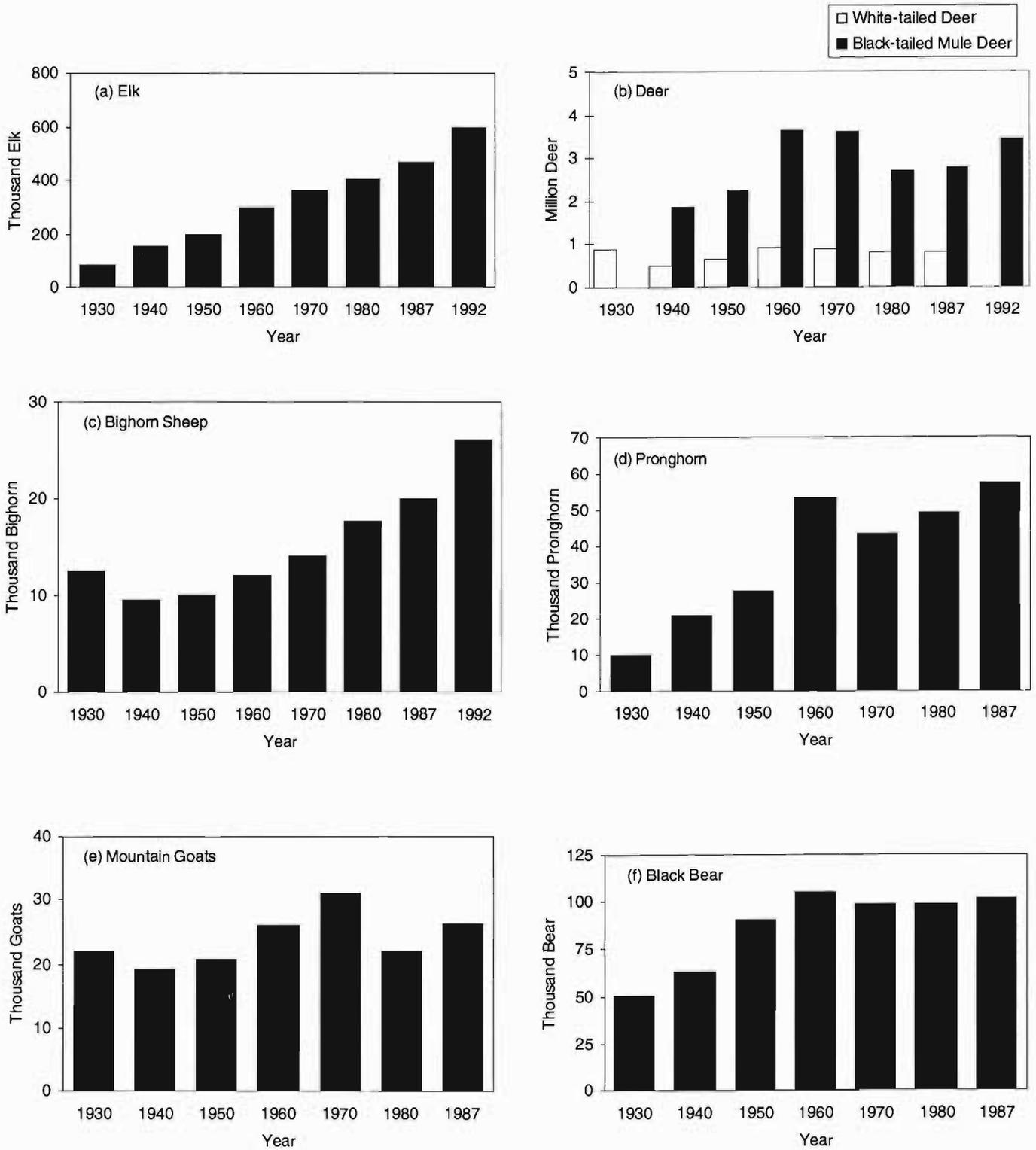


Figure 9. Selected trends in national forest big game populations, 1930–1992

Source: Thomas et al. 1988.

Between 1945 and 1960, fishing visits outnumbered hunting visits by two to one. In 1950, big game hunters outnumbered small game hunters by about two to one. Hunting visits to national forests between 1947 and 1958 increased nationwide at 10 times the rate of State hunting license sales. Fishing visits increased at 3.5 times the rate of State fishing license sales nationwide (USDA Forest Service 1959). Thus, national forests were becoming the frequent and preferred hunting and fishing locales for an increasing number of American sportsmen and sportswomen. This trend was influenced not only by the quality of national forest hunting and fishing opportunities, but also by the spread of urbanization and industrial development and other changes in land use; by improved ease and speed of transportation; and by increased posting of private lands. The number of big game animals taken each year rose from less than 300,000 before 1950 to more than 650,000 in 1960. During the same years, big game populations nearly doubled from 2.2 million to 4.2 million. Turkeys also increased, and their harvest rose from negligible numbers in 1945 to 10,000 in 1960. By 1960, the acreage of lakes that supported sport fish rose to 2.5 million acres as national forest impoundments increased. Sport-fishing stream mileage remained more or less stable at about 80,000 miles (USDA Forest Service 1945-1970).

Several important factors during the preceding 40 years influenced the buildup in national forest game populations until 1945 (particularly deer and elk, but other species as well). The gradual strengthening of State game-protection laws was perhaps the most important. Game populations increased each year as the laws limiting the taking of game were effectively enforced. The management of game populations and regulations governing hunting and trapping on national forests and other lands were strictly the province of the individual State governments. Although these were zealously guarded State rights, States often deputized national forest officers as State game wardens to aid in the enforcing State game laws on national forests. National forest officers, on the other hand, often kept track of wildlife population trends, and State authorities often consulted them on proper hunting, fishing, and trapping seasons and bag limits. The national forest managers' role was limited to managing wildlife and fish habi-

tats — including making habitat condition surveys. But because habitat management had clear implications for wildlife and fish populations, the province of the States, national forest managers purposefully sought working agreements with State fish and game commissions and agencies.

National forest managers restored and improved domestic livestock and wildlife forage in many places. Wildlife habitats were improved by timber cutting. The annual extension of timber harvests to more and more areas created large amounts of open spaces and forest "edge" where choice game browse plants grew. National forest managers cooperated with State wildlife managers to restock game and other animals, such as beaver and birds, where their populations had been seriously depleted or lost. Wildlife populations were also improved by States' establishment of management areas and refuges in cooperation with national forests.

The buildup in game populations to 1945 and thereafter brought full stocking to many western deer and elk ranges, and overstocking to others. Where big game ranges were overstocked, the natural food supplies were bound to be reduced and deer and elk numbers could be decimated by starvation and disease. Wildlife overstocking, much like livestock overstocking, damaged range and forest vegetation and sods. In some areas and situations, competition with livestock for forage became a serious problem, even though deer and elk tended to frequent the rougher country and more timbered range while the livestock favored the grasslands. Severe winter weather conditions caused competition for the food supply where both shared the same rangeland and their total numbers were out of balance with available forage. Deer and elk faced the threat of starvation and decimation while livestock weights were reduced. Where the number of permitted livestock needed to be reduced, the grazing industry was understandably dissatisfied.

During the war years, most national forest wildlife specialists either had entered the military or had been assigned to more urgent wartime duties, curtailing many wildlife maintenance projects and much of the management work. By 1945, there was an accumulated workload for stream and lake sur-

veys, game inventories, and wildlife habitat studies. Escalating hunting and fishing use and accelerating timber harvests further magnified wildlife management demands. To address this growing workload, the recruiting and staffing of wildlife specialists in the regional offices and on many national forests became a prime priority.

National forest and State game managers saw controlling game numbers as a solution to excess game populations. Their principal control tools were planned hunting seasons and managed hunts to reduce wildlife numbers to the capacity of their habitats and compatibility with other uses. Public opinion was slow to accept such an approach after several decades of public support for building up game populations. State officials, on this account, frequently delayed applying such population-control measures. National forest managers, nevertheless, cooperated with State officials to reduce problem herd populations. In 1949, for example, the national forests of Utah, Nevada, southern Idaho, and western Wyoming cooperated with State wildlife authorities to plan and carry out 95 special hunts on overpopulated big game ranges. Reducing excess game populations continued to be a high priority through the 1945 to 1960 period. Where there was competition between big game and domestic livestock, stockowners became important participants in finding mutually acceptable solutions. In such situations, national forest managers generally worked with the stockmen and sportsmen as well as the States to find a mutually acceptable balance among such uses and users (USDA Forest Service 1945–1970).



Wild turkey feeding at a foodpatch in deep snow, Manistee National Forest, Michigan, 1959. Turkeys were introduced in 1957 by the Michigan Department of Conservation.

The number of new cooperative wildlife habitat management projects with States on national forests expanded between 1945 and 1960, while established cooperative projects such as protecting the nesting sites of the endangered California condor and the joint study and management of livestock and deer with the State of Arizona on the Grand Canyon National Game Preserve of the Kaibab National Forest continued. The cooperative beaver restocking efforts on West Virginia's Monongahela National Forest, begun in the 1920's, led to the first beaver trapping season in 1948. Earlier cooperative wild turkey restocking in Colorado national forests led to the first open hunting season in 1950.

In the 1950's, national forest and State cooperative wildlife and fish management areas in Florida, Georgia, Alabama, Tennessee, North Carolina, and Virginia provided good hunting and fishing where game and fish had previously been absent or very scarce. These areas received intensive management. The States usually collected fees from hunters and

anglers and, in turn, shared those fees with the national forests to improve and maintain fish and game habitats. This form of cooperative supplemental State financing was first initiated in the West in 1950 on the Three Bar Quail Management Area of Arizona's Tonto National Forest, where management provided numerous small water developments for quail, fencing to exclude livestock, and access roads for hunters to reach previously inaccessible quail habitats.

In the 1950's, State fish and game departments and many other organizations stepped up their participation in direct habitat improvement work on national forests. By 1959, for example, States were helping with new fish and wildlife habitat improvement projects on 69,450 acres of national forest and assisting in constructing 199 small water developments on 92 miles of fishing streams. In addition, States and national forests were jointly maintaining existing fish and wildlife habitat improvements on about 160,000 acres of national forest land and 150 miles of fishing streams, nearly 900 established small water developments, about 1,000 acres of human-made lakes, and more than 300 study enclosures. Cooperative work included wildlife openings, food and cover plantings, water developments, browse regeneration, stream improvement structures, bank stabilization, new fishing lakes, and access roads and trails.

In the West, States cooperated with national forest managers on efforts and projects focused on timber harvest planning, assessing critical deer and elk winter habitat needs, and studying the relationship between logging and fish and game habitat in Colorado and Oregon. In the East, cooperative efforts focused on habitat improvements for deer and small game. On North Carolina's Pisgah National Forest, studies found that selection cutting or clear-cutting of limited areas in hardwood forests produced abundant deer browse compatible with timber management. On Wisconsin and northern Michigan national forests, extensive openings were being left unplanted to provide sharptail grouse range. On Pennsylvania's Allegheny National Forest, cooperative projects provided openings in dense forests for small game such as rabbits and grouse.

Wildlife Habitat Management and Staffing: 1945–1959

Wildlife habitat management plans had been completed on two-thirds of the national forests by 1957, and the balance were scheduled for completion by the end of 1959. In response to the rising timber harvest levels, many national forests had developed or upgraded coordination guidelines and increased staffing to better integrate wildlife and timber management. In the Southeast, for example, prescriptions for timber stand improvement included wildlife habitat protection and improvement measures. By 1959, all regions had two or more full-time wildlife or fisheries management specialists, and some had assigned full- or part-time wildlife specialists to individual or groups of forests that had heavy wildlife and fisheries workloads. Such staffing improved technical direction of wildlife management projects and coordination of fish and wildlife objectives with other resource uses.

Strengthening of Wildlife Management in the 1960's

The MUSY Act in 1960 established legislatively, for the first time, that wildlife and fish habitat management were valid purposes for designating and administering national forests. In enacting this legislation, however, Congress made it clear that the established division of responsibilities between the States and the Federal Government for managing wildlife and fish populations and habitats on Federal lands, respectively, would remain unchanged.

The MUSY Act reinforced the traditional understanding that national forest wildlife priorities would continue to reflect State priorities, which placed heavy emphasis on game and sportfish management. Within the National Forest System, however, the MUSY Act recognized wildlife and fish resources as coequal with other renewable natural resources, but did not provide any guidelines for integrating wildlife and fish habitat management with the other resources, except for requiring sustained yields of these resources (Wilkinson and Anderson 1985). During the 1960's, this improved status strengthened the role of wildlife and fish management within the National Forest System and contributed to both funding and staffing improvements. Funding rose



Wildlife guzzler furnishes a steady supply of water for wild birds and animals. Installed on the Rita Blanca National Grasslands, Texas, by the Texas Game and Fish Commission, 1963.

slowly, to more than \$12 million (constant 1991 dollars) by 1969, and staffing rose to nearly 300 FTE's. Wildlife support and coordination activities with other resource management activities accounted for more than 70 percent of the funding and more than half of the staffing (USDA Forest Service 1992a).

All national forest regions intensified wildlife and fish management training for staff specialists and district rangers. Its primary focus was on more effective integration of wildlife and fish habitat management with other resource uses and management, particularly with range and timber. Some range and wildlife management specialists received field training at interregional schools on coordinated game-livestock range analysis. Some timber management specialists similarly participated with wildlife management specialists in field training schools on

timber-wildlife habitat management coordination techniques. These specialists, in turn, conducted on-the-ground training for resource management personnel on their own forests and districts.

During the 1960's, national forest managers and wildlife and fish specialists, in cooperation with State managers and experts, renewed their emphasis on developing and updating wildlife and fish habitat management plans. These plans provided intensified guidelines for on-the-ground management activities that coordinated wildlife and fishery requirements with timber management, grazing, and watershed improvement. By 1976, more than 1,200 such habitat management plans were providing continuity in managing wildlife and fish and their habitats.

Direct wildlife habitat improvement work increased steadily, from 69,000 acres per year in 1959 to 230,000 in 1970. During the late 1960's, State cooperation and support expanded accordingly and the States' share of financing rose to an average of 50 percent of project costs. Improvements included permanent openings for forage production, prescribed burns, seeding and planting of food and cover plants, releasing forage plants, and fencing key game areas. Nearly 2 million acres of direct habitat improvements were installed during the 1960's.

National forest wildlife and fishery managers and staff experts annually installed fishable stream habitat improvements where needed throughout the 1945 to 1970 period. These included installing channel structures, improving spawnbeds, removing stream barriers, fencing stream channels, and removing rough fish. Nearly 5,000 acres of new lakes were also constructed in this period — adding to the million or so acres of human-made reservoirs supporting cold and warm freshwater fisheries. Lake improvement activities included stabilizing water levels and banks, controlling aquatic plants, developing fish shelters, removing debris, and removing nongame fish that had little or no direct economic or recreational use value.

National forests also placed more attention on improving waterfowl habitats. Minnesota's Chippewa National Forest and Michigan's Hiawatha National Forest, in cooperation with State conservation agen-

cies and national resource associations and the Department of the Interior's Bureau of Sports Fisheries and Wildlife, initiated special wetland improvement projects. Waterfowl habitat improvements on national forest wetlands rose from less than 200 acres in 1962 to 4,000 acres in 1969. During the 1960's, the cooperative effort improved more than 30,000 acres of wetland habitats (USDA Forest Service 1945-1970).

National forest wildlife managers and biologists, likewise, gave growing management attention to nongame species, particularly rare, endangered, and unique species. In 1963, a special 4,010-acre Kirtland's warbler management area was set aside on northern Michigan's Huron National Forest to preserve this "bird of fire" (Radtke et al. 1983). Successful forest fire control had progressively reduced the Kirtland's warbler nesting habitat in young jack pine stands. After fires, jack pine (a pioneer species) reseeded readily on sandy soils. Although 500 pairs were counted in the 1951 and 1961 censuses, it was clear that the Kirtland's warbler nesting habitat was disappearing. In 1964, the Huron began a systematic schedule of prescribed burns, almost a full square mile (about 640 acres) in that year, to create and sustain future habitats. This joint effort with the Michigan Department of Natural Resources set aside 7,630 acres of State lands to manage as Kirtland's warbler habitat.

Throughout the 1960's, national forests cooperated with the Audubon Society to provide ways and means to protect dwindling populations of bald eagles and osprey. In 1969, central Oregon's Deschutes National Forest,

cooperating with the Oregon State Game Commission, the Department of Fish and Wildlife, and the Department of the Interior's Bureau of Reclamation, established an osprey management area at the Crane Prairie Reservoir to develop habitat and nesting sites for osprey — probably the first of such osprey habitat management in the country (USDA Forest Service 1970). California's Los Padres National Forest continued to maintain the 53,000-acre Sespe Condor Sanctuary to protect the nesting areas of the 40 surviving California condors — the largest birds in North America.

By 1970, before the enactment of the Endangered Species Act, national forests had classified 47 wildlife and fish species as rare or endangered, and 68 others had been identified as unique to national forests. Endangered wildlife included the Puerto Rican parrot, gray wolf, red wolf, grizzly bear, black-footed ferret, and southern bald eagle. Fish species included the little Colorado spinedace and the



District ranger checks dam and spillway at Nicholson Creek Green Tree Reserve, Witherbee Ranger District, Francis Marion National forest, South Carolina, where duck habitat has been improved for hunting.

Paiute, greenback, and Gila cutthroat trout. Among the rare species were the Kaibab squirrel, glacier bear, California bighorn, lesser prairie chicken, and Arctic grayling. Special management or management plans had been developed for 30 of these species, and plans were being considered for 56 others.

In Alaska on March 27, 1964, a catastrophic earthquake — the most powerful ever recorded on the North American continent — damaged coastal and some inland areas of the Chugach National Forest on Alaska's coast south and east of Anchorage. Some of the impacted areas sank up to 8 feet, drowning shoreline vegetation and trees and flooding seawater onto dry-land big game ranges and freshwater spawning areas at the mouths of streams. Other areas were raised several feet, causing some waterfowl habitat to become high and dry and destroying many nesting sites. Earth movements also caused sedimentation damage to salmon spawning gravels and blocked salmon access to their former spawning streams throughout Prince William Sound, jeopardizing commercial fisheries. National forest managers promptly evaluated the resource impacts of the earthquake. In cooperation with the Alaska Department of Fish and Game, management activities for the next few years rehabilitated spawning habitats in several damaged streams, including installation of fish ladders where land movements had caused stream obstructions. In the Copper River Delta, nesting sites lost to landlift were replaced with new waterfowl nesting sites on some of the land inundated by the seawater (USDA Forest Service 1964–1965; USDA Forest Service 1983).

The quality and diversity of national forest wildlife and fisheries habitat management grew in all dimensions in the 1960's. By the end of the decade, even though there was much room for further improvement, the Public Land Law Review Commission cited national forest wildlife management as the most active Federal effort in wildlife habitat improvement. (Public Land Law Review Commission 1969).

1960's Trends in Wildlife and Fisheries Use

Hunting and fishing visits continued to increase, to 30 million by 1965. In that year, however, the units of use changed to the 12-hours-on-site wildlife/fish

user day (WFUD) to better measure the actual amount of use. The user-day equivalent of 30 million visits became 24 million WFUD's, which were about equally divided between hunting and fishing. A hunting visit was just about equal to a full WFUD, and a fishing visit to half a WFUD. In 1969, hunting use reached 14.9 million WFUD's. The estimated annual harvest of big game stabilized at around 660,000 animals. Given the continued increase in hunter use, this harvest rate represented a decline in hunter success per WFUD. Many small game species, upland game birds, and waterfowl were harvested in much greater numbers than big game. Fishery use rose to 14.1 million WFUD's. The total use of 29.0 million WFUD's by hunters and anglers represented a 3.5-percent annual growth rate since 1960, substantially more than the U.S. population growth rate (USDA Forest Service 1945–1970).

The nonconsumptive use of wildlife became increasingly important and began to be reported in the 1960's. Nonconsumptive uses included bird-watching, wildlife observation, photography, and related activities and were estimated at 10.1 million WFUD's by the end of the 1960's. The aesthetic appreciation of wildlife, though not included among the nonconsumptive uses, was assuming greater importance to the camper, the hiker, and the boater, who considered encounters with wildlife as valuable parts of their recreation experience. Total WFUD's, including nonconsumptive use, reached nearly 40 million in 1969, almost 25 percent of the total RVD use on national forests (USDA Forest Service 1970).

Emergence of a National Policy for the Environment in 1970

The growing environmental movement of the 1960's culminated when President Nixon signed the National Environmental Policy Act (NEPA) into law on January 1, 1970. The new legislation opened the way for more formalized and widespread public participation in national forest planning and management and required preparation of fuller and more vigorous explanations of management alternatives as a way to avoid or reduce adverse effects of management activities on the environment. NEPA declared that it was national policy to encourage production

and enjoyable harmony between people and their environment; to promote efforts to protect or eliminate damage to the environment and the ecological systems and to stimulate human health and welfare; and to enrich the understanding of ecological systems and natural resources. It also established the Council on Environmental Quality (CEQ).

The action-forcing part of NEPA was section 102(2)(c), which required responsible officials to prepare detailed environmental impact statements (EIS's) for every recommendation or report on proposals for legislation or other major Federal actions that significantly affected the quality of the human environment. Henceforth, responsible officials were to consult with and obtain the comments of any Federal agency with jurisdiction by law or expertise over any reported environmental impacts. Copies of such statements and the comments and views of the appropriate Federal, State, and local agencies authorized to develop and enforce environmental standards were to be made available to the CEQ and public.

Insofar as National Forest System activities were concerned, the Forest Service, at the time, saw NEPA as an extension of the MUSY Act of 1960 and the Organic Act of 1897 (USDA Forest Service 1972). NEPA made environmental considerations a full partner with economic and technical forest management matters. Even though economic and social factors were to be considered, they were not NEPA's main thrust. Its primary focus was on environmental considerations and informing the public about environmental effects. The Forest Service set about designing procedures to implement NEPA's requirements for full public disclosure of the environmental consequences of significant Federal actions. The NEPA document prepared on the Monongahela National Forest's clearcutting issue became one of the Forest Service's first EIS's.

The 1960's Open Major Issues for Timber and Multiple-Use Management

Several major events in the 1960's, associated with both planned activities and natural phenomena, brought national forest management national and

multiregional attention and opened major timber and multiple-use management issues. Four are reviewed here as a setting for national policy issues that emerged in the 1970's and are addressed in Chapter 4. Two of the events were resolved in the short run through adaptive management and research initiatives. Two others became the focal points of prolonged national debate and major policy changes.

Timber Management and Fish Habitat

In the winter of 1964 and 1965 on the Payette and Boise National Forests in west central Idaho, heavy rain on snow resulted in massive water-caused erosion from logged areas and from logging and access roads on steep, stream-cut sideslopes of the South Fork of the Salmon River drainage. The massive erosion washed prodigious amounts of sediment, estimated at 1.5 million cubic yards, into the South Fork and its tributaries. This sediment severely degraded prime spawning gravel and rearing habitats for one of the largest remaining and nationally important populations of Columbia River Basin summer Chinook salmon. Other species were also affected. The watershed area covered more than 1,000 square miles, an area slightly larger than the State of Rhode Island, with elevations ranging from 2,700 to 9,280 feet. The soils in the South Fork drainage were shallow and coarse textured and, therefore, highly erodible when disturbed, particularly on steep, stream-cut sideslopes.

The massive landslide was the culmination of several decades of accumulating degrading influences from a variety of land management activities. Before 1940, the same watershed had been damaged extensively by uncontrolled dredge, placer, and hydraulic mining and by domestic grazing activities. In the mid-1940's, 350 miles of road were built in the drainage, with little attention to the erosion hazard. From the mid-1940's to the mid-1960's, 800 additional miles of road had been built — many across the very steep and fragile slopes — to log some 325 million board feet of timber on about 7 percent of the drainage area. As roads rose to higher elevations, they undercut erosive slopes repeatedly, making them highly susceptible to severe slippage and slides when soils became oversaturated (Payette National Forest et al. 1989; Platts 1971).

As a result of the massive erosion, the Payette and Boise National Forests imposed a moratorium on logging and road construction in the upper South Fork drainage. Small-scale erosion control efforts began immediately. These efforts focused on reducing the massive road-failure potential, particularly of logging roads, on steep slopes. During the latter 1960's and early 1970's, more than 500 miles of logging roads, almost half the total road system, were closed and revegetated. Main access roads were also revegetated and their drainage systems were improved. These control measures, together with the stream's natural sediment flushing action and later management actions to control or mitigate any unexpected acceleration of erosion, were designed to significantly reduce, in time, the amount of sediment in the South Fork and its tributaries and, therefore, to reclaim fish habitat (Payette National Forest et al. 1989).

Clearcutting: Hardwoods and Wildlife on the Monongahela National Forest

In the eastern United States in 1964, local interests on West Virginia's Monongahela National Forest, primarily squirrel and turkey hunters, began to raise questions about the clearcutting of central hardwoods, primarily oak-hickory forests, as the Monongahela implemented its new timber management plan. The plan defined even-aged management as the "primary" system for managing all of the Forest's CFL — 750,000 out of 860,000 acres. The decision to favor even-aged management, and particularly clearcutting, emerged from a growing awareness among foresters that selection cutting, the favored silvicultural practice for managing hardwood stands in the eastern United States before 1964, was often not reproducing high-value, shade-intolerant species such as yellow poplar, cherry, red oak, and others. Research findings, documented in *Timber Management Guide for Upland Central Hardwoods* (Central States Forest Experiment Station and North Central Region, 1962) in the early 1960's, had also established scientifically that even-aged management, including clearcutting, regenerated shade-intolerant hardwoods more effectively than selection cutting. These convincing results received the strong support of the Forest Service's Washington Office timber management staff, who in turn directed national

forest managers on the Monongahela and all other eastern national forests managing hardwood timber stands to study the research on the ground at the Vinton Furnace Experimental Forest in Ohio and to participate in even-aged management field training sessions. Later, national direction established even-aged management as the primary system of hardwood management across the eastern United States, even though some biologists raised questions about its implementation, though not its credibility as an effective system for timber-stand regeneration and timber production. In updating its timber management plan, the Monongahela National Forest aggressively endorsed this strong central direction and readily received approval for its plan from the Washington Office (Weitzman 1977).

The real user concerns were not so much with even-aged management as a silvicultural system or clearcutting as a regeneration practice, but how the clearcuts were being applied — their large size, the concentration of clearcut areas, their impact on squirrel and turkey high forest habitats, and their impairment of hunting opportunities and experience. There were also concerns about the visual effects and watershed impacts of large clearcut areas. Despite the complaints, the Monongahela National Forest continued to implement even-aged management as a technically sound and practical system for harvesting and regenerating hardwoods, including several large clearcut timber sales in close proximity to each other. These actions responded, in part, to continuing strong demands for timber sales and mounting pressures from Congress and the public to meet housing needs (Weitzman 1977). Such sales were also planned to take advantage of existing roads to avoid the costs and environmental effects of building more extensive road systems. Sale area sizes were often designed to increase the efficiency of the logging opportunity.

In 1964, the West Virginia House of Delegates assembled a committee of natural resource professionals from the West Virginia University College of Forestry and the State Department of Natural Resources and asked them to study the new even-aged management practices. After studying national forest management objectives and reviewing the selected cutover areas on the Monongahela, the committee

concluded that “there appears to be no reason to be critical of the present practices” (Weitzman 1977). But this review had only included sales from an area where the clearcuts were small enough and their nature technically sufficient to be generally acceptable to forestry professionals. In 1967, the West Virginia Legislature called for a second committee, this time made up of legislators only, five each from the House and Senate, to evaluate the Monongahela’s management practices. Their report was critical of national forest timber management practices and asked that the Forest “cease and desist from the clearcut practices” and “that the selection cutting practices be re-employed” (Weitzman 1977). Neither the Monongahela National Forest nor the 1968 West Virginia Legislature took any follow-up action on this report.

In early 1970, the West Virginia Legislature, responding to continuing citizen complaints, passed a third resolution, this time appointing a Forest Management Practices Commission to study the effects of clearcutting on national forest lands. The Commission included both legislators and citizen members knowledgeable in conservation and forestry. The Chief of the Forest Service, in turn, named a special in-service review committee to examine and report on the Commission’s study of the Monongahela’s timber harvesting practices. Because of the importance of even-aged management to National Forest System management and its controversial nature, the Forest Service prepared a draft EIS based on the review committee’s assessment, filed it with the CEQ, and circulated it to other agencies and the public. The Forest, the Eastern Region, and the Washington Office carefully studied comments from the State Commission and other sources. The Final EIS, released in December 1970, suggested the need for several changes in current practices which the State Commission’s report had also suggested. The Forest Service’s EIS specifically concurred with the State Commission’s recommendation that individual clearcuts normally be less than 25 acres and agreed to follow it. It further declared that high-quality forest culture required a variety of cutting methods, including clearcutting, to produce different timber stands for a variety of wildlife associated with different timber-stand structures and conditions. The Washington Office transmitted the report of the review

committee and its recommendations to the Monongahela National Forest with direction to take corrective action. However, the Monongahela’s managers could only make “limited progress because (as the report indicated) the limitations in staffing, funding, and policy were beyond local control” (Weitzman 1977; USDA Forest Service 1972).

Despite repeated efforts to reconcile the clearcutting question, the controversy continued and became polarized and highly controversial during the 1970’s, resulting in a major Federal court suit and an appeal that eventually led to new legislation for the management of national forests in 1976 — the National Forest Management Act (NFMA).

Elk – Timber Management Conflicts

Before 1960, big elk managers in the Rocky Mountains perceived that elk populations were often too large for the carrying capacity of the available winter range and, therefore, a major problem. In such situations, hunting seasons were long and often allowed hunters to harvest more than one animal. Logging was usually seen as beneficial where new forage areas were created, and logging roads often provided hunters access to areas with low elk harvests and large elk populations. During the 1960’s, however, hunters and wildlife biologists began to suspect possible adverse effects on elk related to logging, road access, and loss of tree cover. Little was known about elk response to timber harvests and roads, but strong views emerged in many parts of the West about the reductions in local deer and elk herds despite improved forage supplies in newly roaded areas. Some concerned observers suggested that elk moved to adjacent undisturbed areas. Others expressed concerns that increased access and elk hunting efficiency would lead to shorter seasons, a lower quality of hunting experience, and even herd reductions (Lyon et al. 1985).

In 1970, a proposed timber sale that would have modified elk summer habitat in the Little Belt Mountains on Montana’s Lewis and Clark National Forest led to a meeting of concerned State, national forest, and private resource managers and biologists to discuss the potential impact of elk winter concentrations on State-owned and private lands. That meeting led directly to the design and initiation of a



Elk herd on spring range, Upper Gallatin River near the northern boundary of Yellowstone National Park, Gallatin National Forest, Montana.

long-term Montana Cooperative Elk-Logging Study in 1970, with seven different study areas located throughout western Montana. Ultimately, the research was highly successful in analyzing elk behavior and habitat needs in managed timber areas and led to improved timber management and roading practices on a broad landscape management scale to favor elk habitat.

The Emergence of the Bitterroot Controversy

During the 1960's, the timber management practices on Montana's Bitterroot National Forest became the focus of unrelenting criticism from a growing number of Bitterroot Valley residents. Their concerns centered on the visual effects of an increasing number of clearcuts on the steep slopes surrounding the valley. Other concerns included soil erosion, water runoff, wildlife habitat damage, and reduced property values. Farmers feared for their irrigation water supplies. Real-estate people were troubled with the effect of highly visible clearcuts on scenic landscapes and property values. At the core of these

concerns was a perception that the rate of timber harvest was too high and that the forest was being overcut (Bolle 1989; Popovich 1975).

In 1967, these concerns drew the attention of Montana's Senator Lee Metcalf, a Bitterroot Valley resident. He explored the problem with the University of Montana forestry faculty and, in 1968, in preference to a full congressional investigation, he encouraged the University to look into it at the local level. In the spring of 1969, the regional forester, acting jointly with the director of the Intermountain Forest and Range Experiment Station, responded to a written critique by a coalition of Bitterroot Valley

conservationists and to criticisms in the local press by appointing a task force to assess the problem internally. It was a thorough, comprehensive examination addressing specific charges that clearcutting and terracing on steep mountain slopes were injurious to water quality, physically unappealing, and unnecessary; that roads were improperly constructed; that much of the Bitterroot Valley forest should not be logged; and that the allowable cut was higher than could be sustained.

About the same time, Senator Metcalf saw no reason for the University committee, chaired by Dean Arnold Bolle, to hold off on its independent investigation. The University committee, tentatively set up in 1968, had spent some time evaluating the problem and the information role it could perform. The Senator respected the Forest Service study and had encouraged it. However, he felt the preponderance of local criticism was a strong reason for the University committee to give another point of view and perhaps some corroboration to the work of the national

forest task force. In December 1969, he formally requested the University committee to study "the long-range effects of clearcutting, and the dominant role of timber production in the Forest Service policy" (Bolle 1989; Wilkinson and Anderson 1985; Popovich 1975).

The Bitterroot National Forest report was released in April 1970, well before the "Bolle Report," as the University committee's report came to be known. The national forest report concluded that the Bitterroot Forest had exceeded its allowable cut and recommended greater control over timber management through land-use planning. Although there were some dissenters, the Bitterroot report was praised both by national forest supporters and critics. The Bitterroot report had addressed the concerns primarily as a specific resource management problem. The Bolle Report, issued 6 months later in November 1970, shaped its findings and recommendations from a policy viewpoint as Senator Metcalf's request suggested. This approach was instrumental in elevating clearcutting practices on national forests to a major national policy issue in 1971 and later years (Bolle 1989; Wilkinson and Anderson 1985; Popovich 1975). The national aspects of the Monongahela and Bitterroot National Forest clearcutting issues are discussed further in Chapter 4.

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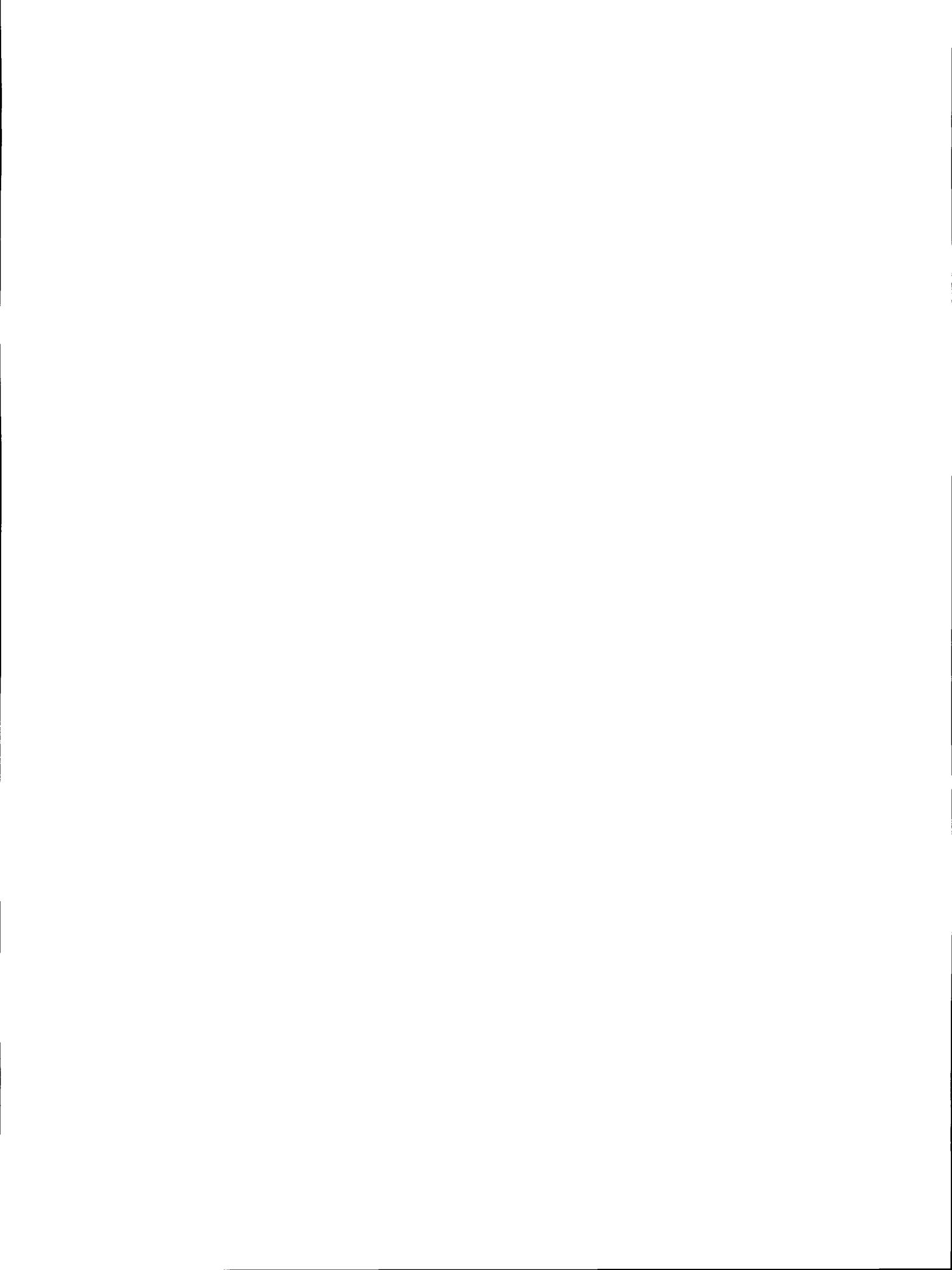
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Chapter 4 Policy Issues and Management Conflicts Challenge Multiple-Use Planning and Management During the 1970's

The National Setting

National demands for timber, energy, water and water quality, beef, wildlife and fish, and opportunities for outdoor recreation and wilderness experience continued to increase dramatically during the 1970's. National awareness of environmental systems — their composition, structure, and functions — and the public interest in the need to sustain them for the needs of future generations likewise increased as the environmental movement continued to advance. These burgeoning demands and the growing public awareness of environmental concerns intensified pressures on all the uses of national forest lands and resources as well as the calls for preservation and management adjustments to keep their environmental systems healthy, diverse, and productive.

In this setting, conflicts over the use and management of national forests opened up national policy issues and debates that burdened and challenged the Forest Service throughout the 1970's. At the field level, national forest managers struggled to respond to the rising demands for use and, as well as they could, to the national policy issues and growing management challenges. This chapter addresses the major policy issues and debates of the 1970's. Chapter 5 reviews the actual performance of national forest land and resource management at the field level.

Huge increases in lumber and plywood prices beginning in the late 1960's and continuing throughout the 1970's raised the concern and efforts of the Administration and Congress to expand timber supplies from national forests. Controlling this inflation became a priority because lumber and plywood prices were adding disproportionately to the national inflation problem. In 1968, President Johnson proposed the construction of an additional 26 million housing units in the next decade — fully a million more units per year, than those built annually between 1950 and 1968. The housing goals not only called for a decent home for every family; the low-income housing target became an important component of the Administration's national poverty program. Such goals, in turn, were seen as a growth

opportunity for both the housing and timber industries. Rising lumber and plywood prices increased housing costs and were seen as a threat to achieving these goals.

The controversy over clearcutting on national forests was elevated to a national policy issue. In order to raise and maintain the allowable cut, the timber industry sought legislation to increase funding to manage national forest timber resources more intensively. Wilderness interests and environmentalists opposed national forest timber harvest increases and turned to litigation under NEPA and related legislation to achieve their national forest management and wilderness designation goals.

The Forest Service, in an effort to overcome a growing uncertainty about the management of *de facto* wilderness areas, particularly as it related to timber harvest planning, initiated the Roadless Area Review and Evaluation (RARE) process to speed up the designation of wilderness areas and release nondesignated roadless areas for multiple-use management. A court challenge aborted the RARE process. Wilderness planning was slowed to a snail's pace. Roadless areas could not be entered without NEPA-based environmental analysis. As a result, timber harvesting was increasingly concentrated on already roaded timber lands. This contributed fuel to the issues of clearcutting and the general adequacy of national forest management.

Wilderness, environmental, and conservation interest groups became polarized against commodity producers over the proper use and management of the national forests. The issue was exacerbated by acknowledged shortfalls in the implementation of clearcutting on some national forests. The Forest Service estimated that the 1970 national forest allowable cut, 12.9 bbf, could, with more intensive management, be increased by 7 bbf by 1978. It also firmly believed that the increase could be realized with greater funding and guarantees that those increases would remain available in future years. As NEPA's environmental quality implications became clear, the potential allowable cut was further qualified as the most timber that could be made available without unacceptable environmental impacts.

The year 1970 introduced a decade of new direction and guidelines for managing multiple uses on national forests; it became a decade of adaptation by national forest managers. Court suits over national forest planning and management multiplied. Congressional efforts at substantive legislation to resolve the polarization between commodity and amenity values failed. However, consensus emerged on procedural legislation and guidelines for long-term national planning for the National Forest System, research, and State and private forestry programs — the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) — and for the planning and management of the individual national forests — the National Forest Management Act of 1976 (NFMA).

This chapter reviews the management conflicts over and the emergence of new national policy for the use and management of national forests and how that policy changed procedures and guidelines for planning and managing multiple uses. It also reviews the performance of the Forest Service's hierarchical organization and decentralized management in addressing these issues.

Administration and Congressional Efforts To Expand National Forest Timber Supplies

Housing Goals, Timber Demands, and Price Responses

The enactment of the Housing and Urban Development Act of 1968 increased the concerns of Congress and the Administration about expanding timber supplies from national forests and other sources. It reaffirmed the Housing Act of 1949's goal — "The realization as soon as feasible of the goal of a decent home and a suitable living environment for every American family." Congress determined that the Johnson Administration's goal of 26 million housing units could be substantially achieved. The 1968 housing legislation directed the President to present a 10-year detailed plan and schedule to achieve his goal and to report on its progress annually. If performance failed to meet scheduled targets, the President's report was to explain why housing targets could not be met and what steps needed to be taken to achieve rescheduled targets in subsequent years.

This legislation was extraordinary in two ways. It established national housing goals in quantitative terms for a fixed time period — an unprecedented approach in national policy. It also required monitoring public and private performance in meeting scheduled annual targets and revision of plans and targets in the event of a shortfall.

Increasing the Nation's housing inventory by 26 million units was an ambitious initiative; it responded to the need to replace aging housing and meet housing needs of the maturing postwar Baby Boomers. At spring 1968 congressional hearings, officials of the Department of Housing and Urban Development (HUD) testified on the feasibility and economic effects of the Administration's proposed housing goal. They felt that there was no reason that industries supplying major building materials, such as lumber and plywood, could not supply the additional requirements to meet the President's goal.

USDA also participated in the development of the President's housing proposal. After the proposal was sent to Congress, the Secretary of Agriculture's planning, evaluation, and programming staff evaluated the timber supply and demand impacts of the proposed increased housing construction. It determined that the increase would double 1965–67 timber prices and increase lumber and plywood prices by about 6 percent per year (USDA 1968). It reported that increases in softwood timber harvest from Federal lands were the most effective way for the Federal Government to increase timber supplies and dampen lumber and plywood price inflation, and that rapid increases in Federal timber harvests would raise issues with public groups interested in natural beauty and wilderness objectives.

The Secretary of Agriculture transmitted the special study findings and his timber program recommendations for the President's fiscal year 1970 budget to the President's Office of Management and Budget (OMB) in September 1968. The recommendations proposed modest increases in national forest timber sales, reforestation, and timber stand improvement and restoration of the forest road construction program that had been sharply reduced in FY 1969 as an anti-inflation measure; increased funding for recreation, with smaller increases in other nontimber

resource areas; small increases in all Forest Service research program areas; and technical assistance to encourage greater timber harvesting on nonindustrial private lands. The President's FY 1970 budget retained the pattern of proposed increases, but reduced their amount due to other national priorities and tight budget ceilings designed to contain general inflation.

In the meantime, housing construction rose steadily from an annual rate of 1.4 million units in January 1968 to 1.7 million units in the *first quarter* of 1969 (fig. 10). During the same period, the relative price of softwood lumber rose similarly, but more rapidly (fig. 11). By March 1969, it was 50 percent higher than the average, largely stable lumber price level between 1950 and 1968. But U.S. lumber production did not rise — it stayed at the average annual level of the previous 17 years, 29 bbf.

Softwood plywood relative prices were at their historically lowest level in 1967. They had declined steadily since 1950, by 45 percent, while plywood production had risen each year to almost 5 times the 1950 production — largely as a result of plywood substitution for the softwood lumber boards traditionally used for sheathing, subflooring, and roof

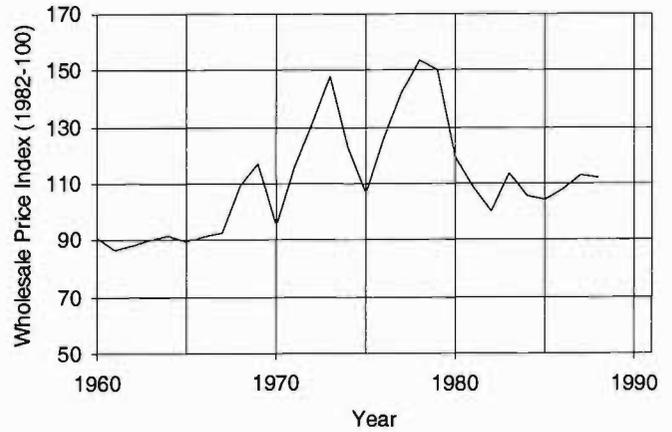


Figure 11. Wholesale price trend for softwood lumber, 1960–1988

Index = average current market price of all softwood wood lumber divided by the producer price index for all communities.
Source: USDA Forest Service 1990.

enclosure in housing construction. The plywood itself was more costly, but it cost less to install. By March 1969, plywood relative prices had risen to 100 percent above 1967 levels, but plywood production had risen only 15 percent.

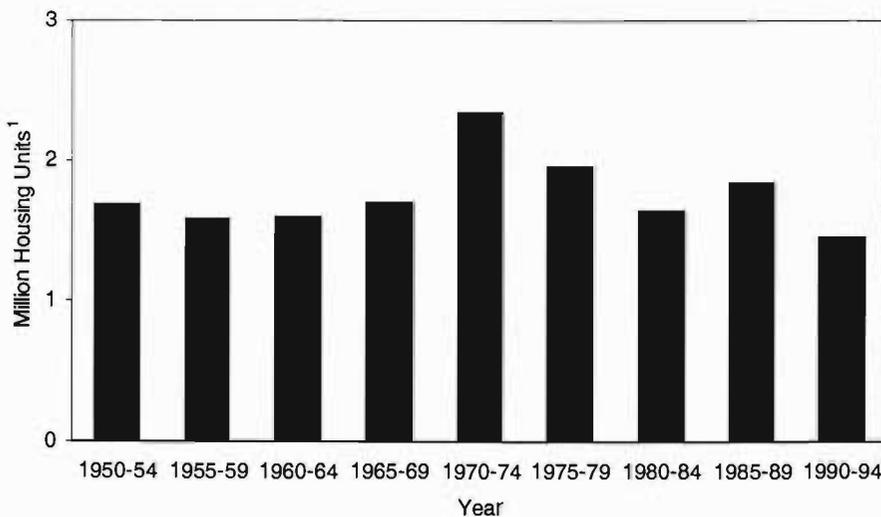


Figure 10. Average new housing units constructed annually per 5-year period, 1950–1994 (includes new housing starts and mobile home shipments)

Source: USDA Forest Service; U.S. Bureau of the Census.

The timber industry quickly interpreted these sharp rises in lumber and plywood prices without corresponding rises in lumber and plywood production as a critical short-term softwood sawtimber shortage. Price increases on national forest timber were much greater, and, in part, reflected some speculative bidding in the timber industry. Timber and housing industry officials quickly informed the Administration and Congress of the timber supply shortage, rising timber prices, increasing lumber and plywood costs, and the increasing cost of

housing construction (American Enterprise Institute 1974; Le Master 1984).

The Administration's Initial Response to Rising Timber Demands and Prices

National elections brought a new Republican Administration in January 1969, with a new set of policy officials. By early March 1969, the new Director of the Budget, responding to USDA's special study and the lumber and plywood price market signals, and to evaluate possible policy and program changes for FY 1971 and subsequent budgets, requested the USDA to prepare a careful analysis of timber supply alternatives and their budgetary and social implications. At the same time, the new Cabinet Committee on Economic Policy appointed the Interagency Task Force on Softwood Lumber and Plywood under the Budget Director to study the price, demand, and supply situation and recommend appropriate short-term actions to ameliorate the price pressures.

The task force analysis for the short term was quickly completed and its recommendations approved by the President — all within 2 weeks. It called for easing short-term transportation bottlenecks in lumber and plywood shipments; increasing FY 1969 Federal timber sales by a billion board feet, mainly from national forests, but also 10 percent from BLM lands; closely supervising defense wood products procurement; and negotiating with Japan to reduce log exports from the West Coast.

In the early spring of 1969, due to mortgage credit shortages and rapidly escalating interest rates (fig. 12), there was a sudden, unexpected decline in housing construction, which caused lumber and plywood prices to fall sharply. The lumber and plywood shortage and price problem promptly dissipated for the rest of 1969 and remained dormant through the 1970 general economic recession and reduced housing construction. The task force, nevertheless, believed that timber supplies and prices would be a continuing problem for national housing goals and directed the Forest Service and the BLM to analyze possible timber sale increases on their lands — giving equal weight to ensuring environmental quality.

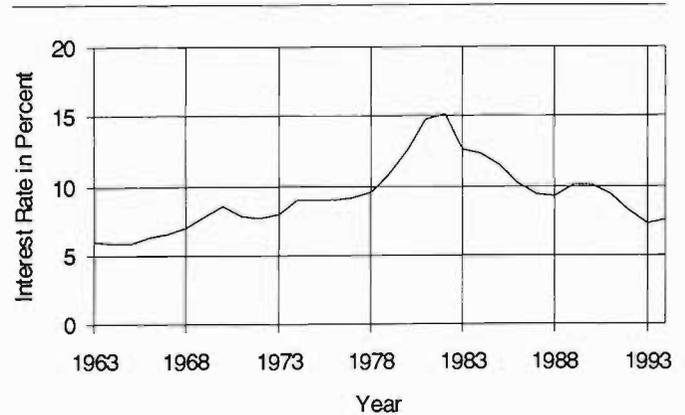


Figure 12. Trend of new home mortgage interest rates, 1963–1994

Source: Economic Report of the President 1995.

The planned FY 1969 public timber sale increases were not realized. Actually, national forest saw-timber sold in FY 1970 dropped 1.2 bbf below the 1968 sales level of 10.8 bbf — a decrease caused by the extremely high appraised prices generated for national forest timber by the rising housing construction and lumber and plywood prices in 1968 and early 1969 and the low timber demand following the sudden drop in housing construction and lumber and plywood prices in the balance of 1969 and 1970. The timber industry appealed the situation to the Secretary of Agriculture, and almost all of the planned but unsold FY 1969 national forest timber sale offerings were reoffered in FY 1970. To reduce any future lags between national forest timber sale price appraisals and a rapid decline in lumber and plywood prices, the Forest Service adjusted its method of updating appraisal prices to reflect the current timber market. With these adjustments, timber sold on national forests rose to 12.3 bbf in 1970. The planned sale volume for FY 1970 was 12.7 bbf (USDA 1972).

Congressional Response and the Timber Supply Act of 1969

In the spring of 1969, both houses of the 91st Congress held hearings on lumber price increases, rising housing costs, and the problems of lumber production. They focused on the adequacy of the President's proposed actions, the need for additional

forest roads, and the long-term alternatives for expanding timber supplies. The more than 40 witnesses included representatives from HUD, the housing industry, and a cross-section of timber product manufacturers as well as "government and private witnesses," all of whom Senator John Sparkman of Alabama, chairman of the Senate hearing, said "hold the solution to the problem." The latter included representatives of the Forest Service, the BLM, and nonindustrial forest owners and wilderness, recreation, and wildlife advocates.

There was little disagreement about the issue. It was succinctly defined by the question raised by the President of the National Homebuilders Association: *How is the housing industry going to get the lumber and plywood to construct an average of 2.6 million units per year to 1978, the goal of the 1968 Housing Act, when the industry can not get enough timber and wood products to produce 1.5 million units in 1969?* The Senate hearing concluded that national forest timber harvests, with 50 percent of the Nation's softwood sawtimber inventory, were much below their potential. The Senate's report on the hearings emphasized that national forest timber production could be substantially increased and assure future supplies if "the necessary investment was made in intensive forest management on a continuing basis" (U.S. Senate 1969).

Shortly after the hearings, the timber industry, to substantially increase annual national forest timber production, drafted a legislative proposal to establish a fund from national forest timber receipts to finance silvicultural practices. The proposal reflected the findings of the Forest Service's Douglas-fir supply study on alternatives for increasing timber supplies on national forest lands in the Douglas-fir region of western Washington and Oregon and northern California (USDA Forest Service 1969b). The findings showed that the allowable cut could be substantially increased if guaranteed sustained annual investments could be made for reforestation, timber stand improvement, thinnings, and other practices to increase the intensity of timber management, and for adequate road access to accomplish them. Chief Edward Cliff enunciated this finding. The principal emphasis of the industry's proposal was on increased sustained annual investment (Le Master 1984).

Annual appropriations for forest management were typically viewed as postponable because the return on timber investments was seen as occurring only in the long term. Congress readily justified such postponements using inflation control and other short-term financial budget pressures as a rationale. Nevertheless, the timber industry proposal was favorably received by several members of Congress. It was introduced under the common title of the National Timber Supply Act of 1969 in both the Senate and House in April 1969 and the House Subcommittee on Forests scheduled hearings on the House version (H.R. 10344) for May 1969. There was widespread, bipartisan support for this bill, which was cosponsored by 56 Congressmen.

The hearings on H.R. 10344 drew testimony from 63 witnesses, including representatives of 10 environmental, conservation, and wilderness interest groups. All 10 opposed or called for substantial modification of the bill's strong timber orientation. The timber industry supported the bill vigorously. The Administration generally opposed establishing a permanent trust fund because such funds reduced future budget flexibility. As the hearings drew to a close, however, the USDA proposed minor funding revisions and amendments to ensure funding increases for managing the nontimber multiple uses and resources that would be affected when timber sale levels were increased.

Conservation groups saw H.R. 10344 as a threat to future wilderness designation and the development of recreational and other nontimber national forest resources and a hazard to the best allocation of available funds among national forest uses and services. The executive director of the National Wildlife Federation submitted testimony that made it clear that the Federation would use all its energy and resources to "go to the people" if the timber industry persisted in its efforts to increase Federal timber harvests where it would be "unwise" from the point of view of all land values (Le Master 1984).

The Sierra Club said it supported more intensive management on certain national forest lands, but only under the following conditions: sound, ecological forest principles would be followed rather than the maximum production of timber in the shortest

time; strict provisions would be made to ensure protection of all multiple-use values, even where timber was the main objective; intensive management would occur only on lands that everybody plainly agreed should be managed for timber; and areas having outstanding scenic and wilderness values, long identified and stated by conservation groups locally and across the country, would be excluded from H.R. 10344 policy direction.

The environmental, conservation, and wilderness interests thus saw the Timber Supply Act as giving timber dominance over other resources that were to be given equal consideration under the MUSY Act of 1960. Both the Sierra Club and the Wilderness Society saw H.R. 10344 as foreclosing designation of *de facto* wilderness areas, largely roadless areas that a national forest had defined as capable of growing commercial timber products and providing other multiple uses (Le Master 1984).

Responding to the hearings, the House Forests Subcommittee extensively revised H.R. 10344 to address the objections of conservation, environmental, and wilderness interests while maintaining its key feature: a "high timber yield fund" based on "all the unallocated receipts from the sale of timber and other forest products, to sustain intensive timber management practices on national forests." The revised bill was replaced by a "clean" bill, H.R. 12025. After the Subcommittee and full Committee adopted additional amendments, including a broader title — the National Forest Conservation and Management Act — it was favorably reported by the Subcommittee in September 1969 by a vote of 23 to 1 (Le Master 1984).

Although much of the bill's interest and urgency was lost with the collapse of lumber and plywood prices in the spring of 1969, the timber industry saw it as a victory (AEI 1974). In December 1969, however, the Sierra Club, the Audubon Society, the Izaak Walton League, the National Rifle Association, the Wildlife Management Institute, Trout Unlimited, Friends of the Earth, and the Committee on Natural Resources sent out telegrams and letters warning that H.R. 12025 "threatens America's national forests, scuttles historic multiple-use practices, and undermines prospective parks, wilderness, open space, and

recreation areas." They also initiated a grassroots campaign to encourage their members to send letters and telegrams to Congress (Le Master 1984).

Final debate and House action on H.R. 12025 were scheduled for late February 1970. The resolution to debate the measure was defeated by a vote of 225 to 150 with 52 abstentions. Opposition from conservation, environmental, and wilderness interests contributed importantly to this defeat. The bill died without a discussion of its merits on the House floor. Other contributing factors were the return of lumber and plywood prices to 1967 levels, restoration of adequate timber supplies in early 1970, and a first cresting of popularity of the new environmental movement. The expressed opposition of Wayne Aspinall of Colorado, Chairman of the House Committee on Interior and Insular Affairs and Chairman of the Public Land Law Review Commission (PLLRC) authorized by the House Committee in 1964, was also a critical factor. He agreed with the motives for the introduction and support of H.R. 12025, but considered any action on the legislation at that time to be untimely. He favored a more balanced solution of the timber supply problem based on the PLLRC report, which was to be released shortly and was not yet available to Congress. Aspinall's approach favored classification of national forest lands by dominant uses, including commercial timber production, as opposed to the multiple-use approach. But this idea never made any policy headway. The PLLRC report was largely ignored. Its recommendations were commodity oriented and out of step with environmental concerns and NEPA policy direction (Le Master 1984).

Emergence of the Forest and Rangeland Renewable Resources Planning Act in 1974

In 1971 and 1972, housing construction rose to new peaks, 2.6 million and 3.0 million units, respectively, then dipped back to 2.6 million units in 1973. Lumber relative prices rose by 50 percent; plywood prices by 40 percent. They contributed disproportionately — several times their weight in the wholesale price index — to the general inflation that the President's Economic Stabilization Program was trying to control. The program's credibility was being affected by the magnitude of lumber and plywood price increases (Fig. 13) and by reported irregularities and

distortions in the industry's response to price-control efforts. At the same time, the Government was seen as a major contributor to both the demand problem (through the housing goals) and the supply problem (through inflexible national forest timber supplies).

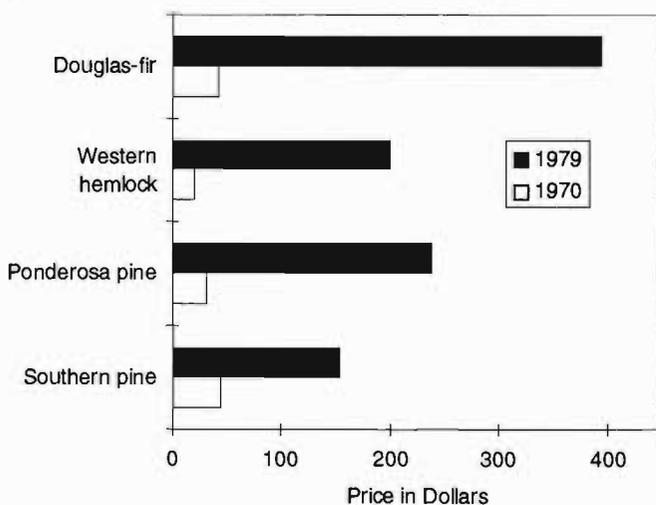
In March 1973, more than 2,000 members of the National Association of Homebuilders and the National Lumber and Building Materials Association staged a mass meeting in Washington, D.C. They were strongly supported by the National Forest Products Association. They "marched" on congressional and Federal agency offices to dramatize the seriousness of the lumber and plywood supply problem for homebuilders, who were increasingly unable to get framing materials — a problem that the President of the Homebuilders Association said was intensified by the failure of the national forests to make the full allowable cut available.

Between 1971 and 1973, a period of rising lumber and plywood demands and prices, there were repeated efforts to pass legislation to increase present timber supplies by intensifying the management of national forest timber. In 1971, Congressman Charles Griffin of Mississippi introduced a bill, H.R. 156, essentially identical to the Timber Supply Act of 1969, but it failed to get a hearing. At about

the same time, Oregon's Senator Mark Hatfield introduced the American Forestry Act, S. 350. It would have authorized a forestry incentives program to encourage forest development on nonindustrial private and State-owned lands; a forest land management fund for Federal lands based on timber sale receipts, similar to that in the Timber Supply Act of 1969; and an American Forestry Policy Board to counsel the Secretaries of Agriculture and the Interior on forest land policy. Senator Lee Metcalf of Montana introduced the Forest Lands Restoration and Protection Act, S. 1734, as an environmental analog to Senator Hatfield's bill, and Congressman John Dingell of Michigan introduced the same act as H.R. 7383 in the House. The latter bills focused on establishing rigorous regulatory requirements for both private and public forest lands, including the licensing of foresters and requiring that licensed foresters prepare mandatory harvest plans for private lands. "Sound forestry practices" were spelled out in detail for Federal lands, including the use of long rotations and the "even-flow principle" defined as "perpetual yield of approximately equal annual amounts ... in quantities which do not decline and which may increase."

In 1973, during the 93rd Congress, Senator Sparkman introduced the Wood Supply and National Lands

(a) National forest stumpage for selected softwood species



(b) All softwood lumber, plywood, and wholesale commodities

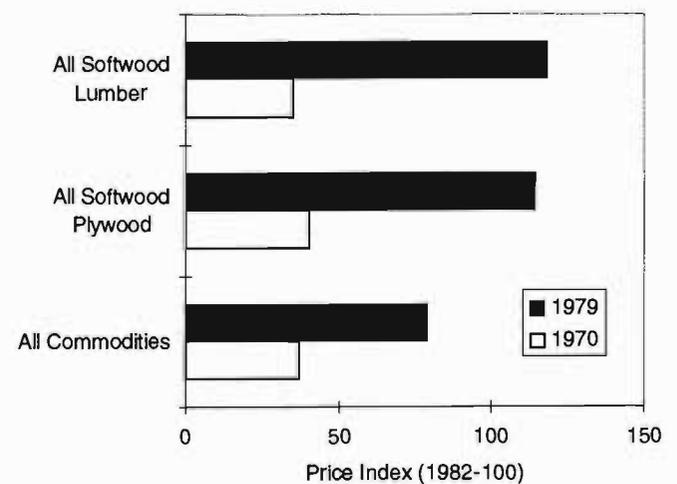


Figure 13. Price increases for softwood lumber, 1970–1979

Source: Ulrich 1990.

Investment Act, S. 1775, an updated version of the Timber Supply Act. Senator Hatfield introduced a revised version of the American Forestry Act as S. 1996. Both were referred to the Senate Committee on Agriculture and Forestry, which was deeply involved with a bill for a forestry incentives program for private nonindustrial lands and another bill banning log exports from Federal and non-Federal lands in the Pacific Northwest. The forestry incentives bill had wide support among most interest groups, and this consensus contributed largely to its eventual enactment. It authorized annual appropriations of \$25 million to share forestry practice costs on non-industrial private woodlands of 500 acres or less.

The export of softwood logs from the West Coast to Japan became a public issue in the late 1960's, when softwood log exports threatened to rise above 2 bbf per year. Although almost all the export volume came from non-Federal lands, the Secretaries of Agriculture and the Interior in April 1968 issued joint orders restricting the volume of unprocessed timber that could be harvested and exported from national forests and BLM timberlands to 350 million board feet. No restriction was placed on the amount of "processed" timber that could be exported. The Secretaries' export quota was legislated and became effective January 1, 1969, and expired on December 31, 1973 (Hines 1987).

The proposal to ban log exports was seen as addressing symptoms rather than causes and was not considered a cure for the timber supply issue it addressed. It paved the way for other nations to retaliate. Even so, when the log export quota on Federal land expired in 1973, a provision attached to the Department of the Interior and Related Agencies Appropriations Act in 1974 and each year thereafter continued to prohibit the export of "unprocessed" timber harvested from Federal lands (Hines 1987).

The timber industry strongly supported both timber supply bills (S. 1775 and S. 1996). USDA supported neither. Reflecting the traditional position of OMB on the uncontrollable aspects of permanent trust funds, USDA insisted that it did not need a special fund based on national forest receipts to increase Federal forest management funding. The Sierra Club,

Friends of the Earth, the Audubon Society, the National Wildlife Federation, the Wilderness Society, and the American Forestry Association likewise opposed both bills for their own reasons.

Instead of pursuing the highly polarized — conservation vs. timber industry — timber supply bills, the Committee on Agriculture and Forestry turned to a new proposal — S. 2296, the National Forest Environmental Management Act, which eventually became the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA). The bill was written as a procedural measure rather than policy direction. Senator Hubert Humphrey of Minnesota introduced it as an amendment to the 1973 Farm Bill. His purpose was to provide a participative, long-term planning approach to national forest management that would reduce the extreme differences between the timber industry and the environmental, conservation, and wilderness interests and the distrust of the Forest Service that had emerged in both groups in the preceding decade. He also wanted the process to circumvent the conventional short-run fiscal expediency in OMB's approach to Forest Service appropriations. Thus, S. 2296 did not specify any substantive policy or program goals for managing national forests; instead, it provided a process to develop management goals and a means to fulfill them using a modified budget process. Based on the President's commitment to support these management goals, this process could potentially ensure sustained and sufficient funding (Le Master 1984).

The Committee found S. 2296 too complicated and comprehensive to be added as an amendment to the already complex 1973 Farm Bill and proposed introducing a separate bill to explore the interest and support it would attract. Senator Humphrey agreed, but advised the Committee staff that the bill would need to have clear evidence of broad support. Responding to this guidance, the Committee staff, under the leadership of James Giltmier, invited concerned interest groups, including the timber industry, trade associations, conservation and environmental organizations, and the Forest Service, to define areas of agreement on the management of national forest lands. The groups included the American Forestry Association, the American Plywood Association, the Citizens Committee on Natural Resources, the Indus-

trial Forestry Association, the National Forest Products Association, the National Wildlife Federation, the Sierra Club, the Society of American Foresters, Trout Unlimited, the Western Timber Association, and the Wildlife Management Institute. Participation was voluntary, informal, and free of any procedural requirement, and soon was down to reviewing and discussing S. 2296 line by line. In the process, the Forest Service disposition toward the bill shifted from "cooperative skepticism" to "enthusiastic support." Groups often characterized as preservationists, who were not originally included on this committee, later became major contributors (Le Master 1984).

Encouraged by the wide participation in the S. 2296 revision, Senator Humphrey introduced it in November 1973. The forestry community of interest widely endorsed and supported it. The title of the bill became the Forest and Rangeland Renewable Resources Planning Act (RPA). It was literally the first legislative act to come before President Ford at a time when there was extreme tension between Congress and the Administration (Hirt 1994; Le Master 1984). OMB had sent a letter recommending that he veto it. The Secretary of Agriculture urged that he sign it, and he did so on August 17, 1974.

To assist in long-range planning, the RPA required the Secretary of Agriculture to conduct a comprehensive inventory and prepare an assessment of the Nation's forest and rangeland renewable resources every 10 years. The assessment was to summarize the inventory and analyze current and future demands and supplies for renewable resources from all forest and rangeland ownerships and describe Forest Service programs and responsibilities and discuss important policy considerations, laws, and regulations influencing forest and rangeland management. In addition, the RPA required the Secretary to prepare and transmit to Congress, by way of the President, a recommended renewable resource program every 5 years that provided for the protection, management, and development of the National Forest System, cooperative forestry assistance, and forestry research.

The program included specific needs and opportunities for investments, outputs and benefits, and management goals over a 50-year planning period.

Congress, for its purposes, apparently considered 5 years the useful life of the RPA program, as they requested that it be updated every 5 years. Congress also required the President to submit a detailed statement of policy, intended to be used in framing Forest Service budget requests — a document that Congress could revise or modify. Congress has chosen to change this statement of policy only once, in 1980.

Sections 5 and 6 of the RPA specified three requirements for national forest lands and resources: A continuing, comprehensive inventory; the integration of national forest management plans with the national RPA program and coordination with corresponding State and local plans and those of other Federal agencies; and the use of a systematic interdisciplinary approach to integrate physical, biological, economic, and other considerations into national forest planning. In this way, the RPA linked, for the first time, national program planning directly to national forest land and resource management.

The RPA legislation did not explicitly provide for public participation, but Senator Humphrey called for a goals-oriented, open, participative planning approach to RPA. On September 19, 1974, he met with the interested citizens who had helped develop the Act and encouraged them and their organizations to participate in and support its implementation. To those present, he pointed out:

The Act gives you the means to set goals for the long-term and the short-term. This gives us the mechanism for sound planning.... The budget process is going to give us the muscle to reach our aspirations.... The President is entirely free to exercise his discretion, and I expect him to do just that. Likewise, Congress can do the same.... We are bringing program formulation to the people, and it will be up to them to embrace it.... We called this meeting to let you know you count; in order to make sure your ideas count; and to open the door for continued cooperation (Humphrey 1974).

The RPA was received with euphoria in forestry circles and viewed by some as a panacea for the forest resource issues that had been repeatedly analyzed and hotly debated for more than 5 years. The long-term planning it provided could have been, and

had been, carried out under previously existing authorities, with one difference: the RPA provided for congressional endorsement of and interest in the policy analysis, program planning, and budget proposals the Forest Service developed under the RPA.

The RPA, in effect, was the solution the Forest Service sought to the ineffectiveness of its national program planning which was submitted directly to Congress in 1959, and its updated version, which was sent to Congress with a Presidential transmittal in 1962. Richard E. McArdle, Chief of the Forest Service from 1952 to 1962, who led the preparation of those early long-range program plans, strongly endorsed the RPA legislation in a Senate hearing in February 1974 (American Enterprise Institute 1974).

Administration Efforts To Increase Timber Supplies: 1970–1979

While Congress struggled with various legislative proposals to help national forest management respond to the Nation's needs, the timber and housing industry interests, and the environmental and conservation concerns, the Administration continued its own efforts to increase national forest timber supplies. In late 1969, the White House Interagency Task Force on Softwood Timber and Plywood completed its analyses of long-term alternatives for increasing timber supplies. But the White House, responding to the enactment of NEPA in January 1970, directed the Task Force to delay its report and work with the newly created Council on Environmental Quality (CEQ) in the Executive Office of the President to give appropriate emphasis to environmental matters and work for legislation to increase timber supplies in ways that protected the environment. As a result of the polarization during the debate on the Timber Supply Act of 1969, the Task Force and Council judged that it would be next to impossible to obtain legislation. They felt the existing law was sufficient if it could be adequately funded and if the Forest Service and other Federal resource agencies could address the environment.

President Nixon endorsed and released the Task Force's final report in June 1970. The report found that the housing goals would require substantial increases in softwood timber supplies, without

which wood product prices would rise substantially above 1962 to 1967 levels. The Forest Service felt that national forest allowable cut increases beyond an additional 7 bbf above the 1970 level would seriously threaten multiple-use and environmental objectives.

President Nixon directed the Secretaries of Agriculture and the Interior to work with CEQ to prepare plans for increasing the timber supply while meeting sustained-yield, multiple-use, and environmental quality objectives. He directed OMB to review any additional funding for such increases for consistency with overall national budget priorities. He further recommended that annual Federal timber sales be flexible and responsive to swings in demand; that USDA press ahead with programs to increase timber supplies from State and private lands; and that the Departments of Housing and Urban Development, Commerce, and Agriculture accelerate efficiency gains in wood product utilization. President Nixon also directed the naming of an advisory panel of outstanding citizens to study the entire range of problems to ensure that inadequate timber supplies did not preempt achieving national housing goals (Nixon 1970).

Responding to the President's direction, as a first step toward achieving the 7-bbf potential increase the Forest Service and the Task Force had reported attainable on national forests, the Forest Service prepared, and USDA proposed to OMB, a supplemental appropriation for FY 1971 to initiate a national forest investment program to increase softwood sawtimber harvests. This proposal was not approved. The 1970 timber demands had fallen to previously normal levels as a result of interest-rate increases and a decline in housing construction. OMB's review, obviously, reflected a very short-term view. In FY 1972, competing national priorities for the available Federal budget and constraints on budget outlay ceilings to reduce general inflation precluded any proposals for an accelerated national forest investment program. Although timber sales were programmed at the 1971 level, Congress approved additional funding to supervise the industry's accelerated harvest of previously bought, but uncut, national forest timber.

In 1971, the Cabinet Committee on Economic Policy reconvened the Task Force on Softwood Lumber and Plywood as housing construction and lumber and plywood prices rose to record levels in 1971 and 1972. President Nixon finally appointed his Advisory Panel on Timber and the Environment. This time the Administration viewed rising lumber and plywood prices as policy problems that affected the credibility of the President's Economic Stabilization Program.

Because raw materials such as timber were not subject to price controls and could be reflected in end-product prices as production costs, lumber and plywood prices were particularly difficult to regulate. For example, softwood prices for standing timber (stumpage) rose about 50 percent on national forests and 50 percent on private lands in the South while lumber and plywood prices rose only 12 and 16 percent, respectively. During the same period, the wholesale prices for all commodities increased by only 4 percent. Wood product prices continued their strong increases in 1973 and reached their highest levels in 1978 and 1979, years when timber stumpage prices and speculation were also at their highest, new household formations were nearly 2 million per year, and construction of new housing units exceeded 2 million per year.

Despite its earlier analyses of housing goals and the timber supply issue, the President's recommendations, and the Administration and Forest Service responses, the reconvened Task Force found that none of the President's recommendations had been implemented except his appointment of an Advisory Panel on Timber and the Environment. Thus, the Task Force quickly concluded that further analyses would add little to the assessment of the timber supply issue or to its proposed solution. It recognized that funding was the key to short- and long-term timber supply increases from Federal lands and urged the Director of the Cost-of-Living Council, which was administering the President's Economic Stabilization Program, to make every effort to find a solution to the inflating lumber and plywood prices and the timber supply issue.

For the FY 1973 programs, budget constraints to contain inflation again squelched any chance that the Forest Service could intensify its management

and increase its timber sales. National forest timber sales and harvests remained at FY 1972 levels during FY 1973, but the Secretary of Agriculture and the Director of the Cost-of-Living Council announced plans to increase timber sales by a billion board feet by FY 1974. After a delay, Congress finally approved this proposal and the Administration requested a \$15 million supplemental appropriation to fund it. The Natural Resources Defense Council, the Sierra Club, and the Wilderness Society responded with a suit to enjoin the Forest Service from increasing FY 1974 timber sales, and in February 1974 a Federal Court ruled that the congressionally approved billion-board-feet sales increase was illegal without an EIS.

The President's FY 1975 budget included the proposed billion-board-feet increase that Congress had funded. In April 1974, the same environmental and wilderness groups, plus the National Parks and Conservation Association, filed suit against the increase. They asked for a declaratory judgment that the entire FY 1975 Forest Service RPA national forest program beginning on July 1, 1974, violated NEPA by failing to file an EIS. The National Forest Products Association, sensing the suit would shut down or delay timber harvests, became an intervener in the suit. The Association denied that the proposed FY 1975 budget was a legislative proposal or other Federal action that would significantly affect the environment under NEPA. The suit was settled when all parties agreed that the 1975 RPA assessment and program would serve the purposes of an EIS.

Report of the President's Advisory Panel

President Nixon endorsed the Advisory Panel's report in September 1973. The report supported increased timber harvests from national forests, but only with assured sustained financing for the intensified management needed to achieve higher timber harvest levels. It recommended a generous withdrawal of roadless areas qualified for wilderness preservation as well as withdrawing lands with fragile soils and steep, erodible slopes from the timber harvest land base. It supported expanding recreation areas and protecting water supplies, wildlife, and rare and endangered species. The Panel asked that commercial forest lands (CFL) not set aside for wilderness or other uses be designated for timber

production and recommended a National Forest Policy Board to advise the President, the Congress, and the Nation.

The American press widely interpreted the Panel's report and the President's endorsement as recommendations to increase national forest timber harvests. The timber industry praised the report; environmentalists severely criticized it. The New York Times, like the Sierra Club and other environmental groups, viewed the allowable cut on national forests as already too high and, therefore, saw the President's endorsement of a harvest increase as "reckless" policy. The environmental interests took sharp exception to the Panel's support of clearcutting and designating CFL not withdrawn for wilderness or other uses for timber production. The American Forestry Association and the Forest Service likewise opposed designation of nonwithdrawn lands for timber production and the proposal for a National Forestry Policy Board as well. The Ford Administration, reporting the Panel's recommendations and follow-up actions to Congress in 1974, also opposed the Policy Board. Because the RPA process involved the public, the Executive Branch, and the Congress and provided a framework for a systematic, orderly analysis of an array of complex issues, the Ford Administration viewed it as a sufficient opportunity for review and development of forest policy.

Some of the press viewed the Advisory Panel's qualification that national forest harvests be accelerated only if more Federal funds and staff were provided as a stumbling block to both the Administration and the Congress (Washington Star-News 1973; Science 1973). The American Forestry Association (AFA) was more sanguine:

The biggest needs of the national forests ... are adequate funding and a long-range plan ... and while recommendation nineteen proposes an increased annual Federal expenditure for forest development ... of \$200 million, AFA believes ... it should be reaffirmed in each of the other 19 recommendations in words that the White House, the Office of Management and Budget, and the Congress could clearly understand.... (American Forests 1973)

William E. Towell, Executive Vice-President for the AFA, wrote elsewhere:

The name of the game is funding. It does little good to get new forestry programs authorized unless the money is provided.... Somewhere in the wave of new environmental enthusiasm traditional forestry and wildlife conservation programs have not kept pace in the struggle for tax dollars. New [environmental] projects ... have drained off available funds. These efforts are all good and deserve our attention, but we cannot continue to slight fundamental forestry and wildlife activities.... If money is the name of the game, then let's get our signals straight for the opening kickoff (Towell 1973).

An Independent Effort for Consensus

In the foregoing setting, Marion Clawson, a member of the President's Panel and author of its report, continued his pursuit of a successful resolution to the timber supply and funding issue. In May 1974, he organized the Resources for the Future Forum on "Forest Policy for the Future: Conflict, Compromise, Consensus" (Resources for the Future 1974). Forum organizers were convinced that a substantial consensus on forest policy was both desirable and possible and would be advanced by an exchange of views among concerned persons and interest groups through an open, mutually shared search for a constructive forest policy. Resources for the Future invited more than 200 participants from Congress, the Executive Branch, the timber and building industries, labor unions, universities, and environmental, conservation, and wilderness organizations.

The Forum did not define policy issues in advance. Instead, it addressed the future demand for forest products and services and conflicts and strategies in forest land management in the first two sessions. A third session addressed the administration and financing of forestry programs. The final session was "A Search for Consensus."

The former president of Resources for the Future and U.S. Congressman from Virginia, Joseph L. Fisher, defined consensus as "not a perfect agreement on figures or statements, but rather a shared understanding of what the issues are, pros and cons of the solutions proposed, and the directions in which to go" (Fisher 1974). He identified the question of how much forest land for wilderness versus how much land for timber production as the principal issue on which consensus was lacking. In dealing with this

issue, he thought the country was on the right track, but moving ahead with much backing and filling and grinding of gears. He attributed this difficulty to a lack of confidence and trust among antagonists; it would not be dispelled easily.

The closing session centered on areas of present and potential agreement and those where agreements did not seem possible. William Towell proposed that the interest groups concentrate their efforts on areas of present agreement and avoid areas of major differences. He recommended expansion of program funding for national forest programs as the highest priority issue on the basis of widespread agreement among forest conservation groups that these programs were underfinanced and out of balance with each other and total funding needs. A representative of wilderness interests suggested that the area of concentration be on issues where differences were the greatest. Wilderness did not require major budget expansions; thus, in his view, funding was not an area for a common effort. The Sierra Club could not go along with the AFA's long-range planning and funding goals until the wilderness issues were resolved. The wilderness representative said, "you cannot get agreement with environmentalists for more funding if it represents a threat to wilderness and old-growth forests" (Fisher 1974).

The consensus discussion ended without agreement following a strong statement from William P. Hagenstein, Executive Vice President for the Industrial Forestry Association and former president of the Society of American Foresters. He felt the Nation already had plenty of good forest policies, and he cited many. He concluded that the principal need was to give the Forest Service the tools it needed to get the job done. This appeared to be an endorsement for greater Forest Service funding for all resource purposes including designating new wilderness areas, intensifying forest management, and expanding the Federal timber harvest.

The RPA's enactment a few months later effectively shifted the approach to resolving the national forest management and funding issues. The Forest Service would conduct the RPA assessment and program planning process and prepare a national forest program and the accompanying EIS with public partici-

pation. The USDA would review it and approve it. It would then be reviewed by OMB and the President, who would transmit it to Congress along with his statement of policy for its implementation. All Forum participants would have the opportunity to participate in the RPA process.

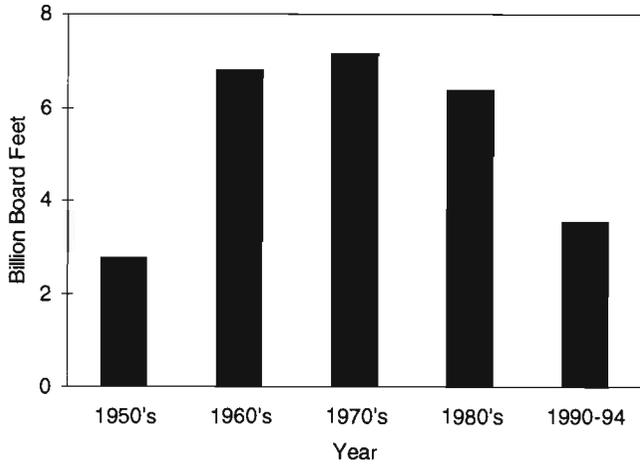
The Performance of Timber Supplies and Housing Goals in the 1970's

During the 1970's, national forest timber sales averaged 11.0 bbf per year — a reduction of 300 million board feet from the average annual sales volume of the 1960's — and did not vary much from year to year (fig. 14) Thus, when housing construction was at record levels, averaging 2.15 million units, and total timber product consumption rose 30 percent, national forest timber sales did not contribute to any increase in timber supplies.

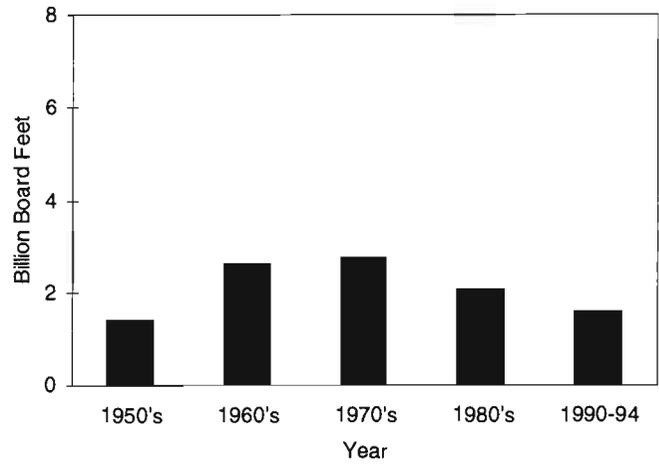
The average annual timber industry harvest of national forest timber in the 1970's was 11.4 bbf per year — 400 million board feet more than the average annual sales volume. The industry achieved this high average annual harvest level by accelerating harvests of national forest timber it had bought and had not yet cut in the first half of the 1970's. In the latter half of the decade, however, the timber industry reduced its harvest to an average of 10.6 bbf per year — 400 million board feet less than the average annual timber sales volume for the decade — even though housing construction in the 1977 to 1979 period was near peak levels.

Although much of the pressure to expand national forest timber supplies had come from the western forest timber products industries, the West did not share equally with southern or Canadian producers in the expanded softwood lumber and plywood markets. As the U.S. timber and construction industries geared up to meet the national housing goals of the 1970's, total annual softwood lumber and plywood consumption in the United States increased by 18.3 bbf, or 34 percent, from 38.6 bbf in 1969 to 51.9 bbf in 1978. Softwood lumber net imports, primarily from Canada, supplied 42 percent of the increase, or 5.6 bbf. Southern softwood lumber and plywood production provided 5.7 bbf of the increase, or 43 percent. The balance of the increase in consumption, just 2 bbf, or 15 percent came from the western

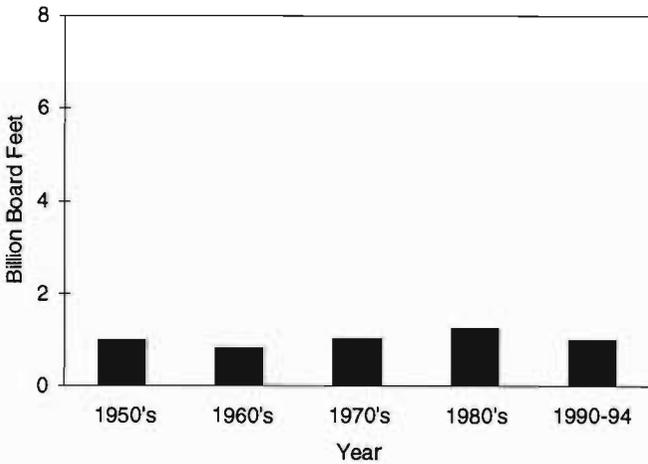
(a) Pacific Coast (Forest Service Regions 5, 6, and 10)



(b) Rocky Mountains (Forest Service Regions 1, 2, 3, and 4)



(c) South (Forest Service Region 8)



(d) Northeast (Forest Service Region 9)

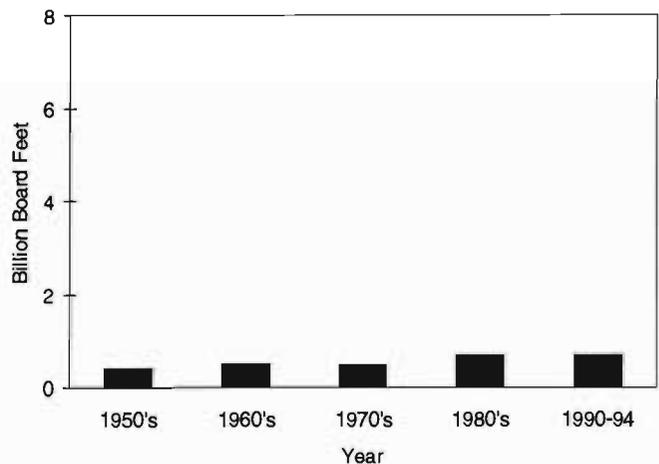


Figure 14. Average annual national forest harvest by decade for major U.S. regions, 1950–1994¹

¹First half of the 1990 decade only.
Source: USDA Forest Service.

regions. In the Western States, both industry and other private landowner softwood timber inventories were generally declining, which limited their capacity to expand their timber supplies. Log exports, mainly to Japan, increased from 2.7 bbf in 1970 to 3.8 bbf in 1979, which also limited the expansion of domestic supplies from western mills. Thus, in the 1970's, western national forests became a potential source of increased timber supplies that could, with a higher intensity of timber management, be made

available to the western timber industry. However, national forest timber sales for the 1970's actually remained slightly below those for the 1960's.

More than 21 million new housing units, including mobile homes, were added to the national housing inventory between 1969 and 1978 — a substantial fulfillment (more than 82 percent) of the 26 million unit goal of the 1968 Housing Act. A record number of families obtained new housing during this period.

Housing contractors built more homes than ever. Residential construction jobs expanded and workers were fully employed. Realtors sold more new homes than in any previous decade. Financial institutions made a record number of new housing loans. Forest industries had no complaint about profits. Lumber dealers sold record amounts of lumber and plywood. National forest timber harvests were slightly reduced from the 1960's, the number and area of designated wildernesses were expanded, and *de facto* wilderness and roadless areas were being protected by NEPA requirement for an EIS. National recreation areas, national trails, and wild and scenic rivers were expanded in number and area.

The Clearcutting Issue Leads to New Guidelines for Managing Multiple Uses

Clearcutting had become a controversial public issue on a number of national forests during the late 1960's and reached national proportions in 1970. Congressional hearings in 1971 produced new administrative guidelines for clearcutting on national forests, and these were first applied in 1972. However, a court suit in 1973 to enjoin clearcutting on West Virginia's Monongahela National Forest led to a ruling that clearcutting practices were inconsistent with a literal interpretation of the 1897 Organic Act's timber harvesting guidance. The result was an injunction in the Fourth Circuit Court against such cutting, which applied to all national forests in Maryland, West Virginia, Virginia, North Carolina, and South Carolina. If this injunction had been extended to all national forests, it would have reduced timber availability from western national forests by 50 percent. A search for legislative solutions to the clearcutting issue eventually resulted in the passage of the National Forest Management Act of 1976 (NFMA). The process of resolving the clearcutting issue is reviewed here.

Early National Forest System Response to Clearcutting Critiques: 1970

Opposition to clearcutting on national forests emerged in the late 1940's and 1950's as harvest levels steadily rose and clearcutting as a method for harvesting and regenerating commercial timber stands became more widely used. During the

1960's, the opposition to clearcutting became more widespread over the National Forest System and more intensified in certain regions and on certain national forests. In 1970, clearcutting became a national issue with four focal points of sharp controversy: West Virginia's Monongahela National Forest, Montana's Bitterroot, the Bridger and several other forests in Wyoming, and Alaska's Tongass.

Most of the opposition came from local citizens and a variety of local use and interest groups, who often had the support of local and State conservation, recreation, and wildlife, and related interest organizations. By 1970, however, the clearcutting issue had engaged the attention and activities of national environmental and conservation groups as well as Representatives and Senators who represented the local interests.

Critics' objections were wideranging. They argued that clearcutting destroyed wildlife habitat and caused erosion that damaged fisheries and degraded soil and water; produced unsightly landscapes and degraded scenic values; destroyed plant and animal diversity; threatened irrigation water supplies; involved overcutting in violation of the sustained-yield principle; and impaired various recreation uses and experiences. Critics also felt that national forest managers were slow in responding or unresponsive to their concerns and seldom consulted with them before implementing clearcuts. In 1965, the growing opposition led the Forest Service to mount a program to explain to the public its view of clearcutting as an effective tool of the even-aged silvicultural management method for wood production, forest regeneration, and resource management. This effort attempted to clarify apparent public misperceptions about clearcutting. The Forest Service misread its audience, because citizens believed clearcutting was a real problem for other reasons. In fact, the effort polarized some of its critics (Weitzman 1977; Cabbage et al. 1993). In many ways, the rising controversy suggested that national forest management was losing its way in heeding the guidance of Gifford Pinchot (1907):

There are many great interests on the national forests which sometimes conflict a little. They must all be made to fit into one another so that

the machine runs smoothly as a whole. It is often necessary for one man to give way a little here, another a little there. But by giving way a little at present they both profit by it a great deal in the end.

National forests exist today because the people want them. To make them accomplish the most good the people themselves must make clear how they want them run.

In-Service Evaluation of the Clearcutting Issue on Selected National Forests

As the controversy over clearcutting intensified on the Monongahela, Bitterroot, and four national forests in Wyoming, the Forest Service appointed special task forces to review the clearcutting critics' charges and evaluate the applied management practices and their effects. These evaluations were commissioned by the regional forester for the Northern Region for the Bitterroot; jointly by the regional foresters for the Rocky Mountain Region and the Intermountain Region for the Bridger, Teton, Bighorn, and Shoshone National Forests in Wyoming; and by the Chief of the Forest Service for the Monongahela in West Virginia. No study was undertaken on Alaska's Tongass National Forest, where the Sierra Club sought an injunction against the long-term timber sale contract — 8.75 bbf in a single long-term sale — and a declaration that the Tongass had violated the MUSY Act by administering its lands predominantly for timber production. The basic harvesting method was clearcutting.

The Forest Service staffed each of these studies with experts who had not been involved with the clearcutting in question or the public issue. The experts represented a range of resource management activities. They were directed to provide an impartial, but thorough, analysis. As they initiated their investigations, they consulted with national forest managers responsible for each forest and with local citizens critical of clearcutting. They also received written responses and statements from the citizen critics.

The task forces found and reported evidence of substantial shortcomings in the way clearcutting was applied. For example, the Bitterroot Task Force reported, "Clearcutting has been overused in recent years. In many cases esthetics have received too little consideration. It is apparent to us that a pre-

occupation with timber management objectives has resulted in clearing and planting on some areas that should not have been clearcut" (USDA Forest Service 1970). The Monongahela Task Force reported that emphasis on timber management was leading to an imbalance among its resource programs (Weitzman 1977). The Wyoming National Forests Task Force reported similarly:

We found much evidence of good management, but we also found indications of serious shortcomings. There was some evident damage to wildlife habitat and to soil stability. More frequently, a potential for such damage was clear.... Damage to the scenic quality of the landscape, however, was unmistakable.

The report further elaborated:

The conflict between timber and other values is evident. These operations, carried out some years ago, have been roundly criticized, not only by the public but also by members of the timber industry and the Forest Service.... We believe there have been inadequacies in planning, in execution, and in evaluation of management actions on all four of the Wyoming Forests.... (USDA Forest Service 1971a).

All of the reports found shortcomings in multiple-use planning. The Bitterroot Task Force reported:

Multiple-use planning ... has not advanced far enough to provide firm management direction necessary to insure quality land management and, at the same time, to provide all segments of the public with a clear picture of long-range objectives. (USDA Forest Service 1970)

The task forces recognized and reported that management shortcomings affirmed many of the local citizens' concerns about clearcutting. They made straightforward recommendations to remedy these shortcomings and avoid them in the future. But they also acknowledged that much of the management they observed on the study forests was quite adequate.

The task forces looked for deficiencies in management planning and implementation. They found that the emphasis on achieving short-term production targets often took precedence over longer-term land management. The Bitterroot Task Force report stated



Timber regeneration harvest, Snoqualmie National Forest, Washington, 1970. Immediate foreground shows excellent reproduction of Douglas-fir, western red cedar, and noble fir following 1952 clearcut. Background shows more recent clearcuts logged with high-lead cable systems. Intermediate ground shows a shelterwood harvest.

it this way: "there is an implicit attitude among many people on the staff of the Bitterroot National Forest that resource production goals come first and that land management considerations take second place." The Bitterroot report found that such emphasis was not unique to the Bitterroot and that it did not originate at the national forest level. It attributed this emphasis to "rather subtle pressures and attitudes coming from above" (USDA Forest Service 1970).

The task forces saw that the pressure to sell the full allowable cut each year to make more timber available and ease the housing materials shortage was most insistent. The Washington Office required weekly timber sale accomplishment reports to keep the Secretary of Agriculture, Congress, and outside groups informed of progress in meeting timber cut

commitments — evidence of pressure from above to meet timber targets — although at the time such production control was normal in most well-managed business enterprises. Other factors contributing to shortfalls in forest resource management were related to lack of basic resource information; lack of specialized skills at the forest level in important disciplines such as landscape management, wildlife biology, soils, and hydrology; and shortfalls in quality control (no or insufficient monitoring of management activities). In a search for deeper causes, the task forces identified underlying problems of heavy workloads; shortages and frequent transfers of professional staff; youthful, less-experienced staff; and insufficient financing.

The Wyoming Task Force found that foresters with inadequate training and experience in silviculture and multiple-use coordination were making field on-sale layout and harvesting decisions because senior foresters were burdened with too many other essential duties, including NEPA compliance appeals, to give detailed assistance to these field tasks. Heavy current workloads limited opportunities to evaluate and monitor the effects of past management. The Task Force found this deficiency most obvious in assessing regeneration success, which was often found wanting.

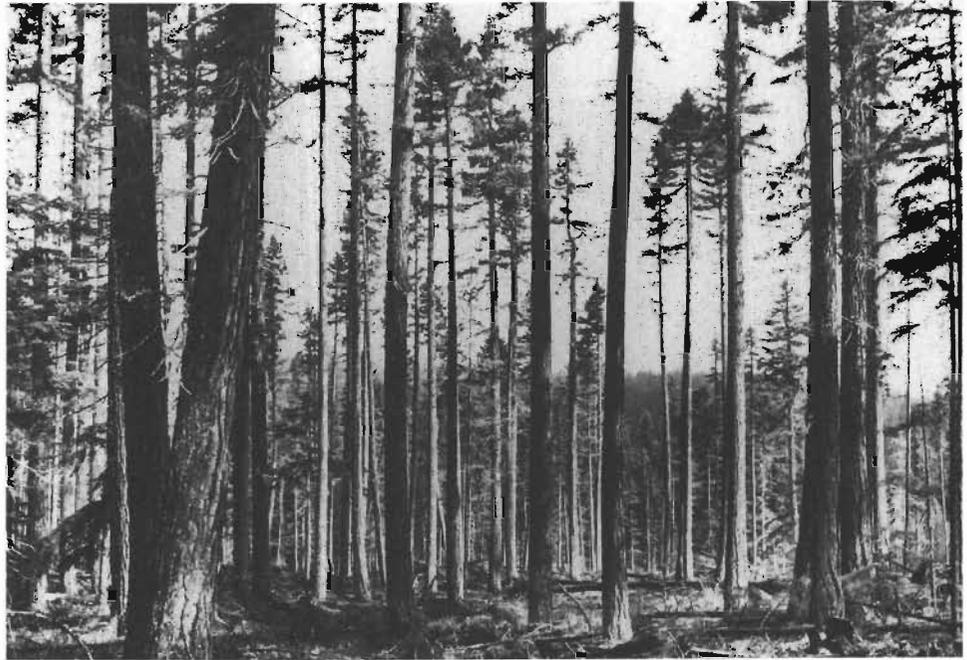
The Bitterroot Task Force's check on the depth of experience and strength of the Forest's land management capability found that the average length of service of professional employees was 11.5 years within the Forest Service, but only 3 years and

2 months on the Bitterroot. The shortness of this experience was associated with the Forest Service's rapid growth in the 1960's — a transitional and unavoidable problem. However, the district ranger's short tenure on the forest was also associated with the Forest Service's practice of frequent transfers to broaden and accelerate the development of its foresters as managers. Broad experience was important for managerial strength in senior positions, but frequent transfers also contributed to less depth of experience for executing on-the-ground fieldwork.

The task force reports revealed that the National Forest System and Forest Service research had adequate knowledge and capability to recognize and evaluate poor management practices and multiple-use coordination after the fact. The difficult challenge was to correct the different practices and coordination procedures and avoid such shortcomings in the future. The Forest Service Washington Office directed the regions and forests to take corrective action at the local level. But the speed and thoroughness of this local action was limited by staffing, funding, and policy that were beyond local control (Weitzman 1977). From this perspective, the Congress, the Administration, USDA, and the Forest Service's Washington Office were part of the problem (as well as part of its solution).

Chief Cliff Gives Emphasis to the Ecosystem Approach and Training

By 1970, the Forest Service hierarchy was well aware of the growing public concern and the rising number of open conflicts over how the national forest resources, especially timber, should be used and



Shelterwood harvest, Mt. Hood National Forest, Oregon, 1970. Harvest removes enough trees for Douglas-fir to regenerate itself and leaves enough trees to provide a seed source and shade to protect seedlings from frost damage. Overstory will be harvested when seedlings are established.

managed and the need for change. Chief Ed Cliff highlighted the challenge for more effective multiple-use and resource management in this way, when he spoke to the regional foresters and station directors on January 19, 1970, as quoted in the Bitterroot National Forest Task Force Report:

I am convinced that with an ecosystem approach to multiple-use management, our forests and rangelands can contribute to a better living for present and future generations by providing security and stability to regional economies and rural communities. It can also provide a high-quality environment, recreation opportunities, fish, wildlife, water, forage, and timber, and be in harmony with the needs of lesser organisms. But the use of the resources must be balanced with the constraints of stewardship responsibility for we are dealing with a limited land and natural resource base (USDA Forest Service 1970).

In June 1970, the Deputy Chief of the Forest Service, M.M. "Red" Nelson, wrote to regional foresters, advising them to help improve the ecological skills

of national forest professionals and suggesting some first steps to do so:

Much is happening in ecology. The ecosystem concept is being dusted off. It now forms a popular and conceptually sound basis for management planning. Energy flows in the ecosystem give us one way to look at and predict the impacts of management actions. Functional ecology is now being emphasized above descriptive ecology in our better universities. In the face of this dynamic situation, we need to examine how well-honed our ecological skills are.

Another vehicle we are testing is taped briefs of research that we should be aware of. The task of achieving agency leadership in ecology has got to include personal commitment by each Forest Service professional. Each of us has got to do what he can do to update our own professional competence. One way is by selected reading (Nelson 1970).

The readings included the six up-to-date references on ecology, ecosystems, and resource management: *Readings in Conservation Ecology*, edited by George W. Cox, 1969; *Perspectives in Ecological Theory*, by Raymond Margalef, 1969; *Environmental Conservation*, by Raymond P. Dasmann, 1968; *The Ecosystem Concept in Natural Resource Management*, edited by George M. Van Dyne, 1969; *Concepts of Ecology*, by Edward J. Kormondy, 1969; and *Ecology and Resource Management: A Quantitative Approach*, by Kenneth E.F. Watt, 1968. Regional foresters passed this guidance on to national forest supervisors:

The ecosystem has always formed a sound basis for natural resource management planning. Energy flows in an ecosystem are analogous to cost-benefit flows in an economy. There is plenty of economic conscience in the Forest Service. Our ecology conscience could stand improving. The Washington Office is distributing the new book by Dr. Edward J. Kormondy entitled *Concepts of Ecology* to help us relate this subject to our responsibilities. We heartily

endorse this approach to increased professional competence and agency leadership. The book by Kormondy is attached for your use (Cravens 1970).

A Nationwide Field Evaluation of National Forest Timber Management

During 1970, Chief Cliff directed a team of Forest Service experts representing water, timber, wildlife, and landscape (and other recreation resources) to prepare a nationwide field evaluation of timber management practices and related national forest activities. The team's report was to highlight problem situations and pave the way for responsive actions that would attain and maintain a high level of timber productivity and environmental quality. Nothing less would be acceptable. In October 1970, when the team was evaluating timber management practices on national forests, the Chief wrote in an interoffice memorandum to all Forest Service employees:

Our programs are out of balance to meet public needs for the environmental 1970's and we are receiving mounting criticism from all sides. Our direction must be and is being changed.... The Forest Service is seeking a balanced program with full concern for the quality of the environment (Cliff 1970).

The report, *National Forest Management in a Quality Environment: Timber Productivity*, was completed and delivered to the U.S. Senate in April 1971, as the Subcommittee on Public Lands was holding hearings on management practices on public lands. The report identified 30 problem situations where national forest clearcutting practices were being misapplied or producing undesirable adverse effects that needed to be responded to. Cliff advised the Subcommittee that the Forest Service was ready to make the changes in policy and practices the study recommended (Cliff 1971). Making these changes, however, would require more detailed information on



Edward P. Cliff. Chief of the Forest Service, 1962-1972.

what had to be done in each of the 30 problem situations. (Cliff 1971; USDA Forest Service 1971b).

Congressional Hearings Elevate Clearcutting to a National Issue: 1971

National forest managers, however, were not to have the time to define and develop the changes Chief Cliff had identified. The clearcutting controversy was suddenly elevated to a "full blown" national issue in late 1970 and early 1971 and became the subject of hearings by the U.S. Senate Interior and Insular Affairs Committee's Subcommittee on Public Lands, chaired by Senator Frank Church of Idaho. An event that contributed to the national escalation of this issue was the completion of a report on the management of the Bitterroot National Forest prepared by the Select Committee of the University of Montana Faculty ("A University View of the Forest Service," November 18, 1970) and the Subcommittee's wide distribution (20,000 copies) of that report (U.S. Senate 1970). Montana Senator Lee Metcalf, a member of the Subcommittee and a resident of the Bitterroot Valley, had requested the report. He felt the University study would give an appropriate external review of the Bitterroot Valley citizens' complaints about the Bitterroot's timber management practices and serve as a useful complement to the largely technical internal Forest Service study.

The study objective was defined in this way: "to determine what the Forest Service ought to be doing, what it was doing, and whether its actions indeed departed from what it ought to be doing" (Bolle 1989). The University of Montana Select Committee elevated its analysis and report to a policy evaluation of the actual management practices against the management of multiple uses as defined in the MUSY Act. The University report used the Bitterroot Task Force report as a starting point for its factual findings. While it acclaimed the Task Force critique of timber management practices, it felt the Task Force gave "short shrift" to related range, watershed, wildlife, and recreation issues (Bolle 1989) and cited the "psychological impossibility of objectively criticizing one's own efforts" (Popovich 1975). The Select Committee saw the real problem as timber primacy dominating and controlling Forest Service activity. It interpreted this as a clear departure from

the congressional policy of multiple use as defined in the MUSY Act. The Select Committee's report charged that "Multiple use management, in fact, does not exist as the governing principle on the Bitterroot National Forest" (U.S. Senate 1970).

The Select Committee found that the Bitterroot's terracing and planting practices following clearcuts on low-productivity fragile mountain slopes, the specific target of much of the Bitterroot Valley residents' criticisms, to be uneconomical and therefore, unjustified, even though they were usually effective for regeneration. In place of this extreme and costly practice, the Select Committee recommended "timber mining" — the harvesting of the commercially valuable timber and suspension of any purposeful regeneration efforts altogether. The Forest Service unrelentingly rebutted this recommendation. It was also questioned by many foresters and Bitterroot Valley residents, who saw "timber mining" as an absolutely alien approach to forestry (Popovich 1975).

The Select Committee found that clearcuts were too large and often used where other silvicultural systems were more suitable. The Committee found that congressional appropriations were inadequate for balanced resource management and insufficient to remedy the problem. It saw a need to add economists and other resource specialists to the Bitterroot management staff, the need to openly solicit public participation and become more responsive to it, and a need to find ways to reward and retain competent timber sales supervision and other field operations employees as opposed to promoting them to office jobs removed from field activity.

The release of the University report in late 1970 at a national press conference brought startling results. Virtually overnight the earnest concerns of the Bitterroot Valley residents were flashed coast to coast. Not only did stories appear in the national press, but seemingly in every newspaper in the Nation and some in Europe and Africa (Bolle 1989). The report findings became startling nationwide news and contributed to escalating the clearcutting controversy to a national issue. National attention was focused on both national forest management and the Forest Service as a natural resource managing agency.



Selection forest with uneven-aged structure being formed by periodic partial harvests in a northern hardwood stand, Nicolet National Forest, Wisconsin, 1970. Next planned harvest was scheduled for 1985.

The Senate Subcommittee on Public Lands scheduled hearings on clearcutting for 5 days during 1971 (U.S. Senate 1971). More than 90 witnesses were heard; many more provided written statements. The Subcommittee also received thousands of letters from all parts of the country expressing interest in the future of the Nation's forests. Witnesses included Members of Congress, environmentalists, State officials, professional foresters and other scientists, timber and housing industry representatives, the Forest Service, BLM, and HUD.

The Subcommittee's attention was directed primarily to clearcutting practices on national forests, especially the examples in Montana, West Virginia, Wyoming, and Alaska because of the concentration of complaints about national forest practices in those States. The testimony included descriptions of perceived adverse effects of clearcutting from more than 40 national forests, mainly in the West. Environmentalists vehemently attacked clearcutting practices. But the Forest Service, the timber industry, and the Society of American Foresters strongly defended the silvicultural practice of clearcutting to regenerate

certain species. Some clearcutting critics proposed a permanent moratorium on all clearcutting on Federal lands. Clearcutting supporters felt no congressional action was needed to restrict its use (U.S. Senate 1971). Despite this polarity, clearcutting as a useful regeneration practice was acknowledged by almost all witnesses. Its "misuse," however was condemned universally (Bolte 1989).

The Senate Subcommittee summed up the weight of the testimony as it reflected on national forest management, the performance of national forest managers, the role of Congress in funding national forest

programs, and the need for new direction in implementing clearcutting practices. It accepted testimony that indicated that timber production had become a priority in Federal forest land management. It recognized that some critics viewed this emphasis as inconsistent with the spirit and intent, if not the letter, of the MUSY Act and NEPA. It also accepted that some critics saw national forest managers as relatively slow and unresponsive to the awakening national concern about timber harvest impacts on environmental quality. Others, however, had testified that national forest managers had been very progressive in considering multiple values and benefits. The Subcommittee, nevertheless, felt that national forest responses to environmental pressures were somewhat defensive and less than enthusiastic and aggressive. It also reported that national forest managers were having difficulties on that account in communicating with environmental critics and that the Forest Service's image was suffering as a result (U.S. Senate 1972).

The Subcommittee acknowledged that the critics were rightly critical of "government's" failure to



Commercial thinning in young Douglas-fir stand, Siuslaw National Forest, 1970. Commercial thinning removes excess commercial trees to reduce losses to natural mortality in overly dense stands. Growth of remaining trees will accelerate.

consult with the interested and affected public before, rather than after, timber management decisions were made. It reported that the "government" needed to become more attentive to increased public interests and concerns about the use and management of the public's natural resources. This included awareness that the "government" was not the owner, but the responsible manager of a public trust. The Subcommittee cited similar recommendations by the Forest Service itself from its 1971 report, *Forest Management in Wyoming* (USDA Forest Service 1971a).

The Subcommittee also recognized that the Forest Service was not a free agent and was obligated to carry out policy and direction from the Administration and Congress. The Forest Service had been pressured by such direction and had become polar-

ized between the increasing demands of wilderness interests and environmentalists and the unrelenting demands for more timber products (U.S. Senate 1972). The Subcommittee gave the Forest Service credit for its repeated efforts to make the case for a balanced program but recognized, as evidenced by much of the hearing testimony, that funding for a balanced program had been inadequate and not fully responsive to the MUSY and NEPA statutes. The Subcommittee found that the tendency of Congress to key national forest appropriations to timber receipts influenced the Forest Service to gravitate toward timber activities. The Subcommittee encouraged the Forest Service to complete and submit the *Environmental Program for*

the Future, which was still being developed, to provide a basis for balanced funding between commodity and noncommodity programs and uses and for achieving sound environmental objectives (U.S. Senate 1972).

Church's Clearcutting Guidelines: 1973

The summary of the Subcommittee report suggested policy guidelines, which became known as the "Church Guidelines," for implementing clearcutting practices and determining allowable cuts which it hoped would be quickly adopted and implemented. The Subcommittee's concerns focused on preventing land and related resource damage and on ensuring early regeneration of cutover areas. The guidelines identified four types of situations where clearcutting should not occur: highly scenic areas; areas with fragile soil, steep slopes, or other conditions subject

to major injury; areas that could not be adequately restocked within 5 years after timber harvest; and areas where clearcutting was preferred only because it would give the greatest dollar return or unit output. They provided that clearcutting be used only where it was silviculturally essential to achieve management objectives; that clearcut size be kept to the minimum needed to achieve multiple-use and silvicultural objectives; that a multidisciplinary review of potential adverse effects be made before implementing clearcutting practices; and that clearcut areas be blended into the natural terrain.

The guidelines also provided that allowable cuts be reviewed to ensure that the lands on which they were based were available and suitable for timber production consistent with the clearcutting guidelines; that any increases in the allowable cut attributed to more intensive practices be made only where the funding for such practices was assured and adequate to carry them out on schedule; and that when planned practices were not adequately funded, allowable cuts were to be reduced accordingly. Timber sale contracts were to specify all actions that needed to be taken to minimize or avoid the adverse environmental impacts of timber harvesting. Although the Church Guidelines did not have the force of law, the members of the Subcommittee on Public Lands unanimously urged the Forest Service to administratively adopt these guidelines for the national forests. Chief Cliff agreed to do so (Le Master 1984). The guidelines were later incorporated into the National Forest Management Act of 1976.

Other responses to the clearcutting issue had been considered but not implemented. For example, the Senate and House introduced several bills to ban clearcutting for 2 years while a congressional commission conducted a study. Senator Metcalf introduced a separate bill that would have required national forests to prepare "timber harvesting and land management plans" and, before deciding to clearcut, to assess its effects on all other resource values, its compatibility with maintaining and enhancing the environment, and the long-term effectiveness of alternatives to clearcutting (Wilkinson and Anderson 1985). The Forest Service and USDA opposed this bill. They argued that legislative restrictions on timber harvesting were

"unnecessary and undesirable" because steps were already being taken to limit clearcutting to situations where it was the most effective, though not necessarily the least-cost silvicultural treatment. The Forest Service cited its national report on the 30 problem situations and the Forest Service's recommended solutions for them. The classification and withdrawal of areas unsuitable for timber production was already underway. An action plan responding to the 30 problem situations and solutions was completed and published 3 months after the Subcommittee report and the Church Guidelines on clearcutting were published.

In 1972, the CEQ considered recommending that President Nixon issue an Executive Order that would have required the Secretary of Agriculture to regulate timber harvesting on areas prone to serious erosion, lack of prompt regeneration, or harm to scenic, recreational, and wildlife values. It based its proposal on the findings and recommendations of a national forest clearcutting investigation contracted with five forestry schools by the Senate Subcommittee on Public Lands and other interests (Wilkinson and Anderson 1985). CEQ, however, withdrew its proposal at USDA's request and in response to intensive timber industry lobbying that an Executive Order had the force of law and would result in lawsuits to stop timber harvests.

In adopting the Church Guidelines, the Forest Service was able to maintain its administrative freedom to internally redirect national forest timber harvesting practices and clearcutting guidelines. This brought an apparent, but temporary, truce to the clearcutting controversy. Clearcutting opponents, however, remained firm and uncompromising. In 1973, they successfully brought suit against the Forest Service for violating Organic Act of 1897 provisions which, they argued, literally and effectively precluded even-aged timber management and, therefore, clearcutting (Le Master 1984).

Emergence of the National Forest Management Act of 1976

In May 1973, barely a year after the Church Guidelines had been published, a court suit to enjoin three planned timber sales that proposed clearcutting on the Monongahela National Forest dramatically

reopened the clearcutting issue. The 1973 court suit, filed in Federal district court by the West Virginia division of the Izaak Walton League, charged that the proposed Monongahela timber sales were in violation of the Organic Act of 1897's authority for selling and harvesting timber. The 1897 Act authorized the Secretary of Agriculture to designate and appraise "dead, matured or large growth of trees" on national forests and sell them providing that "such timber, before being sold shall be marked and designated and shall be cut and removed." The plaintiffs argued that the trees in the proposed sales were not dead, physiologically mature, or of large growth; would not be individually marked prior to cutting; and would not be completely removed after cutting (Le Master 1984).

The court suit was not just a local complaint. It was a joint effort of the Natural Resource Defense Council (NRDC), the Sierra Club, and the Izaak Walton League (Sweetland 1978). The NRDC examined a number of forests, including the Bitterroot, before focusing on the Monongahela National Forest for the purposes of the suit (Bolle 1989). The plaintiffs' purpose in this suit was broader than just stopping clearcutting. They wanted to focus the attention of Congress on timber management and sought a strict interpretation of the law with respect to clearcutting (Sweetland 1978).

The Forest Service was confident of a favorable outcome. Its attorneys did not contest the findings of fact, but argued the case on issues of law. On the day the suit was filed, the District Court for the Northern District of West Virginia issued a restraining order against sales involving clearcutting on the Monongahela Forest. Because a district court ruling favorable to the plaintiffs seemed likely, Senator Humphrey and Senator Herman Talmadge of Georgia, while awaiting the ruling, accepted a staff proposal to clarify the legal language of the Organic Act with an amendment to the draft RPA bill. The Forest Service and the timber industry both objected to introducing such correcting language in the draft RPA bill, so the proposal was dropped (Sweetland 1978).

In November 1973, the district court issued an opinion in favor of the plaintiffs. The Government

attorneys had argued that changing silvicultural requirements and national timber demands required an unrestricted definition of "matured," as used in the Organic Act. The Forest Service view of "matured" hinged on a flexible, economic interpretation. The district court, however, saw the original usage in a physiological context and also advised that if modern times required the Organic Act to be changed, Congress should do it (Clary 1986; Cabbage et al. 1993).

The Forest Service decided to appeal the district court's decision in the Court of Appeals for the Fourth Circuit. It also asked Senator Humphrey to amend the Organic Act by providing corrective language in the draft RPA bill. Senator Humphrey referred the Forest Service to Senator Talmadge, who responded that the Forest Service had requested that such language be removed from the draft RPA bill and would have to live with that decision (Sweetland 1978). In August 1975, the court of appeals affirmed the West Virginia district court's decision (Wilkinson and Anderson 1985).

The fourth circuit decision immediately raised two dilemmas for the Forest Service: (1) how extensively the decision would eventually be applied and (2) whether to appeal the decision to the Supreme Court. The district court decision created a real threat of mill closures in areas dependent on national forest timber — primarily the West. In the fourth circuit's five-State jurisdiction — Maryland, West Virginia, Virginia, and North and South Carolina — the Forest Service quickly found that most national forest timber harvest practices were in violation of the court order, compelling the Forest Service to reduce its timber sales for the balance of FY 1976 to 20 million board feet in the five-State area. Harvesting would be limited primarily to salvage of dead and dying trees. This reduction, however, did not involve a large impact on mills and employment in these States because national forests were only a small part of the timber supply (Sweetland 1978; Le Master 1984).

Because western national forests made up 34 percent of the western timber supply, an extension of the decision to the West would have caused many more serious impacts. Application of the Mononga-

hela decision to the West could have reduced the national forest share of western timber supplies by 50 percent. This would have led to significant mill closures and unemployment and resulted in an increase of more than 15 percent in long-term wholesale lumber prices and even greater inflation in wholesale plywood prices. Short-term price impacts would be even more severe. A solution became urgent. The Federal District Court for Alaska adopted the Monongahela decision in ruling on a second court suit on the Tongass National Forest, filed by Zieske, to enjoin clearcutting on one of the ongoing long-term timber sales. This clearcutting restriction on timber that had been sold went beyond the Monongahela decision, which had enjoined only planned sales (Sweetland 1978; Le Master 1984).

The Forest Service initially pursued a Supreme Court appeal of the Monongahela decision. The Forest Service also weighed other legislative options. An appropriations bill rider to correct the Organic Act's language was rejected. The proposal for a separate bill to do the same was likewise dropped. A legislative 2-year moratorium on implementing the court decision was prepared and considered, but it was seen as a "quick-fix" approach and not acceptable to Congress. Amending the Organic Act or RPA legislation to go beyond revising the Organic Act's language and provide national forest timber harvesting guidelines received more extended consideration. In the end, the Forest Service decided to amend the RPA legislation. (Sweetland 1978).

The Forest Service and the Administration worked on a draft amendment to RPA for several months in late 1975 and early 1976. Participants in addition to the Forest Service and USDA included the CEQ, the Council of Economic Advisors, the Domestic Policy Council, and OMB. There was continual difficulty in obtaining agreement, particularly from OMB. As the time for hearings on other bills introduced by members of Congress neared, the Administration agreed to cease seeking agreement and instead to report on the legislation that would be proposed by Congress. It also agreed, at the request of Forest Service Chief John McGuire, that the Forest Service would prepare a draft paper on the appropriate content of such legislation and share it with the Senate Committee on Agriculture and Forestry and any other members

of Congress who wished to use it. The staff modified and combined the Forest Service draft proposal with materials it had previously prepared for Senator Humphrey, who then introduced the unified draft as S. 3091.

Senator Humphrey had asked his staff for a bill that would permit professional forest land managers sufficient flexibility to manage the national forests and, at the same time, support the principles of multiple use and sustained yield. As first introduced, the Humphrey bill had five sections. Its principal component was section 3 — an amendment to section 5 of the RPA, on land management planning. It proposed that the Secretary of Agriculture provide for public participation in the preparation and review of individual national forest land management plans. It also directed that the Secretary promulgate a number of regulations, including guidelines for national forest land management plans relating to suitability of lands for resource management, including timber harvesting; using the system or systems of silviculture for growing and harvesting trees and products, protecting the forest, and managing water, soil, fish and wildlife, range, esthetic and recreational resources, including wilderness; special or unique requirements for coordinating the multiple uses and protecting all resources; ensuring sustained yield of the various resources; and preparing and revising resource plans using an interdisciplinary review.

The authors of the Humphrey bill believed that conflicts over the use and management of the national forests could be resolved or avoided through proper land management planning with active public participation (Sweetland 1978; Le Master 1984). A counterpart to the Humphrey bill was introduced in the House as H.R. 12503. Members of Congress introduced a total of 10 additional bills to respond to the fourth circuit court's decision on clearcutting: seven in the House and three in the Senate. The hearings, however, focused on just two Senate bills, S. 3091, sponsored by Senator Humphrey, and S. 2926, sponsored by Senator Jennings Randolph of West Virginia.

The Randolph bill was a comprehensive reform proposal with numerous specific prescriptive standards for timber management. Unlike the Humphrey bill,

which was drafted by the Senate Committee staff with considerable Forest Service input, the Randolph bill was written by a citizens' committee with Senate Committee staff support. Senator Randolph believed that Congress "must set standards and procedures that will insure the preservation and productivity of our forests." He felt this responsibility should not be left to the discretion of the Secretary of Agriculture or bureaucrats and technocrats who "already rule and regulate too much." It was the duty of Congress to set standards, outline procedures, put curbs on the Secretary's discretion, and make goals clear and prohibitions certain. The citizen members of the committee who wrote the bill included Arnold Bolle, chairman of the Select Committee that had written the University of Montana report on the Bitterroot National Forest for Senator Metcalf in 1970; Ralph Smoot, a Forest Service retiree; Dr. Leon Minckler, a silviculturist and an advocate of the uneven-aged hardwood timber management with the State University of New York College of Environment and Forestry; representatives of the Sierra Club's Legal Defense Fund and the Izaak Walton League of America; and the private attorney who represented the plaintiffs from the Izaak Walton League in the West Virginia district court suit. The bill proposed legislative standards and limitations on determining lands from which timber could be sold; estimating sustained yield; using even-aged and uneven-aged management; clearcutting; harvesting immature timber; marking and designating timber for sale; supervising timber harvests; converting tree species; length of timber sale contracts; protecting soil, fish, and wildlife resources; preparing and controlling forest management plans; and accounting methods for timber sales (Sweetland 1978; Le Master 1984).

The Forest Service opposed Randolph's bill and supported Humphrey's, which tracked closely with many of the provisions the Forest Service had suggested in its draft statement of content for appropriate legislation. The Forest Service also worked closely with Senator Humphrey's staff during the hearings, markup, and conference actions on S. 3091. Other supporters of S. 3091 included the timber industry, SAF, AFA, the National Wildlife Federation, the Wildlife Management Institute, the National Association of State Foresters, and the International Association of Game, Fish and

Conservation Commissioners. Witnesses who supported the Randolph bill included representatives of the Izaak Walton League, the National Audubon Society, the Sierra Club, and the Coalition to Save Our National Forests. The testimony of the panel representing the International Association of Game, Fish, and Conservation Commissioners was particularly damaging to the Randolph bill. Its five panelists each testified that enactment of S. 2926 would "tie the hands" of professional land managers. In the Senate, all but two of the senators testifying supported the Humphrey bill. In the House, all congressmen giving testimony on the proposed bill, other than Senator Randolph, supported the Johnson bill, the House counterpart to Humphrey's bill (Sweetland 1978; Le Master 1984).

The Senate passed the Humphrey bill after making extensive revisions, most of which reflected some aspect of the Randolph bill, but with less specificity. For example, the Randolph bill specified a maximum size of clearcuts. The amended Humphrey bill did not, although the Senate Committee made it very clear that they expected the Secretary of Agriculture to write specific guidelines on clearcut size in the legislation's implementing regulations. The House approved a generally less restrictive bill. Since the House and Senate had passed somewhat different bills, they had to go to conference for reconciliation.

Three issues made reconciliation challenging: the form of congressional guidance for managing national forests, timber harvesting from lands not suited for timber production, and constraints on the amount of timber national forests could sell each year — the nondeclining flow provision.

The first issue was resolved by adopting the approach and many of the planning guidelines from the Senate bill. The regulations for implementing the guidelines were to be promulgated by the Secretary of Agriculture and would include the Church Guidelines (Le Master 1984).

The issue of harvesting on lands unsuited for timber production was resolved by making it clear that such lands would not be identified solely on the basis economic criteria but "take account of physical, economic, and other pertinent factors to the extent

feasible." There would be no timber harvesting on lands unsuited for timber production for 10 years, except where harvesting was needed to meet other resource objectives or salvage. After 10 years, such lands could be reviewed for timber harvest suitability and, if found suitable, could be returned to timber production (Le Master 1984).

The issue about the nondeclining flow provision related to its inflexibility. Washington State Congressman Tom Foley made a strong point that, unless more flexibility was provided, there would be powerful political opposition to wilderness designation on national forests. A basic understanding that a strict nondeclining flow policy would reduce the possibility of offsetting an allowable cut reduction on one forest due to wilderness designation with an increase on another led to an agreement to modify the Senate's version.

The National Forest Management Act (NFMA) was signed into law by President Ford on October 22, 1976 (Le Master 1984). NFMA reaffirmed the policy objectives of the MUSY Act and explicitly added wilderness to the multiple-use purposes of national forests (Le Master 1984).

NFMA brought the persistent clearcutting issue to a new climax and a new, but transient, truce for the balance of the 1970's. The Act also transformed the administrative Church Guidelines into national forest management legislative direction and added several more guidelines for managing multiple uses. In theory, NFMA provided the first set of national, comprehensive written standards and guidelines for planning and managing multiple uses on national forests. Although it was the concerns and issues raised by environmental interests and many local users of national forests that led to the enactment of NFMA, national forest managers, nevertheless, remained important participants and contributors to writing its guidelines. National forest managers made an important initial contribution by developing and administering the Church Guidelines and subsequently in developing NFMA's implementation standards and guidelines, which were to be incorporated into forest plans as soon as possible. Until such forest plans were completed, approved, and implemented, national forest lands continued to be

managed under existing plans. The development, review, and revision NFMA plans provided for and fostered public participation. The Secretary of Agriculture appointed a committee of scientists from outside the Forest Service to provide scientific and technical advice and counsel in promulgating the NFMA's implementing regulations and to ensure the use of an effective interdisciplinary approach. The Forest Service was given 2 years to promulgate these regulations. The final regulations were actually issued 3 years later and went into effect in November 1979.

NFMA plans were to determine forest management systems and harvesting or use levels and procedures for all the uses identified in the MUSY Act and be consistent with its definitions for "multiple use" and "sustained yield" as well as with the availability and suitability of lands and resources for the various multiple uses. The regulations would spell out guidelines for identifying the suitability of land for the various uses and the appropriate direction for resource management; obtaining resource inventory data; developing methods of identifying special situations involving hazards to resources such as riparian areas, unstable lands, or endangered species; ensuring that both the economic and the environmental aspects of alternative resource management systems be considered; providing for a diversity of plant and animal communities; ensuring evaluation of the effects of each management system through continuous monitoring and assessment in the field and related research on those potential adverse effects to avoid substantial or permanent impairment of land productivity; and permitting timber harvest increases where they were supported by intensified management practices. Timber harvests, however, were subject to the Church Guidelines, which were specifically spelled out (with minor changes) in NFMA.

NFMA also endorsed the nondeclining flow policy that had emerged from the 1969 Douglas-fir study findings. The nondeclining flow policy permitted national forest harvest increases only where such increases could be sustained in the long term without any decreases. However, NFMA allowed temporary harvest increases in the nondeclining flow policy, where they were needed to meet "overall multiple-use objectives." Such departures had to be

consistent with the multiple-use management objectives of each forest plan. The ceiling for nondeclining flow harvests was the quantity of timber that could be harvested in perpetuity — on a sustained-yield basis. The long-term sustained-yield level would be determined by the average annual growth that the next tree crop would produce with the current management intensity. Rotation age would be based on the culmination of mean annual increment (the age at which the average annual cubic volume growth of a timber stand reaches its maximum level). The basic requirements for national forest multiple-use planning were now written in law. The plans emerging from them would be legal documents and their implementation would be subject to appeal and judicial review.

The NFMA requirements reflected much of what national forest managers had been trying to achieve in repeated revisions of the multiple-use planning process during the 1970's (as discussed in the next chapter). The ultimate test of these new multiple-use planning and national forest management standards and guidelines lay in the future, in the way NFMA guidelines worked out on the ground, and in whether the public would perceive the benefits they provided as generally worthwhile.

Wilderness Planning and Designation

By 1970, the national forest component of the National Wilderness Preservation System included 61 wilderness units totaling 9.9 million acres and 27 primitive areas totaling 4.4 million acres. As directed in the Wilderness Act of 1964, six primitive areas had been evaluated and revised, and their wilderness designation recommendations were before Congress. The remaining 21 areas were undergoing evaluations that were scheduled to be completed and presented to the President and Congress by September 1974 (USDA Forest Service 1975).

During the 1970's, the national forest wilderness planning process continued to come under intense public scrutiny and judicial review. Much of the controversy between wilderness advocates and national forest managers was about the designation as wilderness of lands not included in national forest

primitive areas and the restriction of wilderness designation to lands meeting the Forest Service's pristine criteria for wilderness. For example, in 1992, when Colorado's White River National Forest proposed to extend logging to East Meadow Creek, a largely undeveloped area directly west of the Gore Range – Eagles Nest Primitive Area, it was strongly protested by wilderness proponents. The area had been accessed by a truck trail for bark beetle control and therefore did not meet the Forest Service's pristine wilderness criteria. The regional forester sought compromise solutions, but they were not accepted. Eventually, in 1969, the Sierra Club, 12 citizens of Vail, and several conservation organizations filed a court suit for a preliminary injunction against the Forest Service. The plaintiffs argued that the Wilderness Act provided that "nothing herein contained shall limit the President in ... recommending the addition of any contiguous area of national forest lands predominately of wilderness value." The district court ruled in favor of the plaintiffs in 1970 and the Tenth Circuit Court upheld the ruling in 1971. The Supreme Court declined to hear a further appeal (Roth 1984).

Similar controversy over the development of the Lincoln Back Country on Montana's Helena National Forest emerged in 1960 and continued into the early 1970's. When residents of the town of Lincoln and people who used the area for hunting, fishing, hiking, and camping got wind of the Forest's plans to develop areas for timber and general recreation, they repeatedly and successfully opposed alternative plans and efforts for its development. A one-lane dirt access road accessed the area from the west and east and apparently had disqualified it as a primitive area, even though it was separated from the Bob Marshall Wilderness — the jewel of the national forest wilderness system — only by the Scapegoat Mountains. In 1969, the U.S. Senate expanded the Lincoln Back Country area to include the Scapegoat Mountains and proposed it for wilderness designation in the same year. The Chief of the Forest Service placed the area's development plans on hold until the Helena, Lolo, and Lewis and Clark National Forests could take another look at its future. In 1971, these national forests drafted a wilderness proposal, which the regional forester endorsed. In 1972, the House passed legislation designating the

area as the Scapegoat Wilderness. The Scapegoat Wilderness became the first *de facto* wilderness designated by Congress that was not previously classed as a primitive area (Roth 1984).

Roadless Area Review and Evaluation (RARE)

National forest managers recognized early on that Congress could and would add "other suitable lands" to the primitive areas they had set aside for the national forest component of the National Wilderness Preservation System (USDA Forest Service 1966). In 1964, the four-person national forest team drafting the policy guidelines for implementing the Wilderness Act recommended that national forest roadless areas not included in primitive areas be studied for possible wilderness designation. Three years later, Chief Cliff directed regional foresters and national forest managers to inventory all previously unclassified roadless areas larger than 5,000 acres for wilderness potential. National forest managers were having trouble determining where they could plan and carry out timber sales in roadless areas and where such management would be opposed by wilderness advocates who filed lawsuits or by Congressmen who proposed wilderness. They needed to sort out which roadless areas were available for development and which would be recommended to Congress for wilderness designation (Roth 1984). To avoid aggravating Congress, development activity was stopped on all areas where wilderness legislation was pending.

By 1971, regional foresters had inventoried a total of 1,449 roadless and undeveloped areas containing 55.9 million acres. Except for two areas in the East and one in Puerto Rico, all areas were in the West. The national grasslands and eastern national forests were generally excluded because they did not meet the "pristine" criteria — a disappointment to many environmentalists (Roth 1984).

Chief Cliff, in the same year, initiated Roadless Area Review and Evaluation (RARE) for all areas of more than 5,000 acres not previously classed as primitive areas. This action coincided with the Colorado district court's decision in the East Meadow Creek case. Regional foresters were to recommend areas with wilderness potential to the Chief. The Chief, in turn, would select areas for wilderness study and

announce them in 1973. RARE had five specific objectives: to obtain the most wilderness relative to costs, to disperse the system over the United States, to represent as many ecosystems as possible, to obtain the most wilderness with the least impact on timber, and to locate wilderness areas as close to cities as possible (USDA Forest Service 1974a).

National forest supervisors and regional foresters asked organizations and individuals to express their views and suggestions on additions, deletions, and revisions to the areas they inventoried for wilderness potential and to identify those they felt should receive more in-depth wilderness consideration. The total public involvement effort for RARE became one of the most extensive undertaken by any Government agency to that time. It included mass mailings to key people and organizations; presentations to public and private groups; reports to and meetings with other Government agencies; communications by radio, television, and newspaper media; conferences with advisory boards and groups; advice from *ad hoc* committees; and public discussion sessions. The Forest Service provided maps of roadless areas and undeveloped lands to help the public review and comment on potential wilderness candidate areas. National forest managers even discussed individual candidate areas with the public. In all, 300 meetings attracted 25,000 people and provided more than 50,000 oral and written comments (Karr 1983; Roth 1984; USDA Forest Service 1974b).

In June 1972, regional foresters submitted their recommendations to Chief Cliff, and in January 1973, Chief McGuire released a draft EIS identifying 235 proposed wilderness study areas. This draft EIS generated 8,000 written comments from a wide range of interested people. Some areas were dropped. But, on the basis of public comments, recommendations from members of Congress and other Government agencies, and improved data, other areas were added to the final list of new study areas. In the spring of 1973, 274 areas encompassing 12.3 million acres were selected for further study. National forest managers or Congress had previously identified some 4.4 million acres for further wilderness study; the EIS analysis and recommendations had added 7.9 million acres (Roth 1984; Karr 1983; USDA Forest Service 1974b).

The selection of these areas became a turning point both for the RARE initiative and the acceleration it was intended to give to wilderness designation and the release of undesignated roadless areas for timber management and other development. When the regional foresters submitted their wilderness study area proposals to the Chief in 1972, the Sierra Club filed a NEPA lawsuit with the Federal district court in San Francisco. This suit slowed the RARE process. The plaintiffs argued that the RARE review of the California roadless areas was grossly flawed, in violation of NEPA, and asked for a preliminary injunction to halt all timber sales and other developments in those roadless areas. In 1972, the court issued a temporary injunction in favor of the plaintiffs. The court viewed wilderness as a management option on all inventoried roadless areas and assumed that any management decision to develop resources on any of these areas would significantly affect a roadless area's wilderness potential. The apparent "non-decision" or "non-action" as claimed by the Forest Service in not designating a roadless area as wilderness was seen by the court as a partial decision to make timber on such areas available for harvesting (Wilkinson and Anderson 1985). Therefore, the court ordered any timber harvesting, road building, or other actions that would alter the wilderness character of the RARE roadless areas to cease and prohibited making any contracts that would change the wilderness quality of such areas without first preparing a NEPA EIS. This became known as the "Conte Decision."

The Forest Service agreed to comply with the court order, even though it greatly increased the complexity, cost, and data needed for evaluating the wilderness study areas as well as resource management planning for the remaining roadless areas. On this basis, the Federal court dismissed the suit without prejudice, ruling that the plaintiffs' suit was premature because no national forest decisions had yet been made that could be judged as damaging (Karr 1983). With the passage of time, national forest managers conceded that RARE had been flawed by not fully meeting all NEPA requirements, while environmentalists came to acknowledge that it was an important step in building the public's awareness of *de facto* wilderness areas and their full extent (Roth 1984).

For the next few years, the wilderness study area evaluation and recommendation process slowed to a snail's pace as national forest managers prepared individual comprehensive NEPA EIS's for each selected study area. The slowness of the process brought frustration to many people at a time when early decisions on resource use in the roadless areas were needed, particularly for oil and gas development, timber harvesting, and mineral exploration (Karr 1983).

During the mid-1970's, RARE was conducted in conjunction with the unit planning process. The 12.3 million acres of roadless areas selected for further wilderness study received "detailed and in-depth" evaluation. The balance of the roadless areas, 43.6 million acres, did not qualify for intensive study for wilderness designation. The process continued to move slowly as national forest managers acted to overcome the recognized shortcomings in the earlier RARE efforts. For example, some contiguous areas had been subdivided and reviewed separately rather than as a whole. Boundaries of some inventoried areas had fallen short of their actual state of roadlessness. Some roadless areas had been completely missed. Some regions used their own variation of National Forest System-wide criteria, introducing inconsistency into the review process (Wilkinson and Anderson 1985).

Eastern Wilderness and Congressional Disavowal of the Pristine Doctrine

While the Forest Service was striving to accelerate wilderness designation in the West, public pressure was growing for designating wilderness areas in the East. Interest mounted in 1970 as Congressmen from West Virginia and Alabama introduced bills to designate wilderness on national forests in their States. During RARE, national forest managers had begun to discuss options for managing undeveloped areas in the East that did not meet their pristine criteria for wilderness. In the summer of 1971, they agreed upon a concept of "wild areas" as distinct from wilderness areas. Wild areas would be used mainly for recreation enjoyment, whereas wilderness areas would be set aside primarily as a resource of wilderness for the Nation as a whole. Wild areas, therefore, would require their own enabling legislation. Unlike wilderness areas, wild areas needed primitive recreation

facilities and some development to protect the environment, but, they would exclude grazing and mining. The Associate Chief of the Forest Service announced the wild area concept and the Forest Service's intention at the September 1971 Conference of the Sierra Club on Wilderness to solicit broad public participation in the process of creating such a system. This initiative helped set a general public campaign for eastern wilderness in motion (Roth 1984).

In September 1972, the Senate passed the National Forest Wild Areas bill, S. 3973, which was widely perceived as a statutory expression of the national forest "purity" doctrine for wilderness (Roth 1984). It distinguished between the wild areas of the East, which would be restored to a primitive state, and the western wilderness areas, which had to be unspoiled by human activity.

Congress ultimately rejected the purity or pristine argument. Wilderness areas did not have to be "untrammelled by man." So long as any evidence of past human activity was "substantially unnoticeable," undeveloped areas could qualify as wilderness. Congress enacted the Eastern Wilderness Act in December 1974, establishing 16 new eastern wilderness areas totaling 210,000 acres and 17 eastern wilderness study areas. The Eastern Wilderness Act differed from the Wilderness Act of 1964 only in authorizing the condemnation of private lands that fell within the eastern wilderness boundaries (Roth 1984; Le Master 1984).

In the 6 years between 1972 and 1978, Congress added 3.08 million acres to the National Wilderness Preservation System. Wilderness interests continued to challenge the Forest Service's "pristine" criteria and were often instrumental in delaying timber sales and, in some cases, precluding timber management altogether (Karr 1983; Roth 1984). In 1976, wilderness interests proposed that Congress directly designate several areas scattered throughout the West that had not been included in the RARE wilderness study selections. These areas had not conformed to some aspect of the pristine criteria. For example, some areas had been excluded because they were close to urban areas and did not meet the "sights and sounds" standard.

In January 1978, Congress designated 17 such areas totaling 1.23 million acres with the passage the Endangered American Wilderness Act. The final committee report on this legislation directed the Forest Service to dispense with its pristine doctrine for wilderness designation, since accessibility of wilderness-quality lands to nearby urban centers actually enhanced their value as wilderness (Roth 1984). Wilderness designation, however, remained slow, even though the average area designated per year in the mid-1970's exceeded that of the late 1960's and early 1970's by almost three times.

RARE II

RARE II emerged in 1977 with the inauguration of President Jimmy Carter and a new administration favoring environmental action. President Carter named Rupert Cutler, an active wilderness advocate supported by the Sierra Club, the Wilderness Society, and other environmental interests, as the Department of Agriculture's Assistant Secretary for Natural Resources and Environment. In this role, Cutler oversaw Forest Service and National Forest System programs and management. The new administration's appointments distressed some members of the timber industry. So, when they had the opportunity to meet with the Secretary of Agriculture and his new assistant secretary, the industry implored them to accelerate the roadless area process. The industry wanted early relief from the continuing uncertainty over national forest timber supplies and the effects RARE had on the industry's plant investment and operating decisions (Roth 1984; Le Master 1984).

USDA responded with a second Roadless Area Review and Evaluation, which became RARE II (the first RARE process was renamed RARE I). In April 1977, Assistant Secretary Cutler announced RARE II to congressional committees that were holding hearings on the proposed Endangered American Wilderness Act of 1978. He promised that RARE II would step up the rate of national forest roadless area recommendations for wilderness preservation and reduce the uncertainty about available timber supplies and related industry investment decisions (Le Master 1984).

RARE II used the NEPA process and went beyond selecting areas for further in-depth wilderness study.

To help resolve as much of the uncertainty as possible about the future use and management of extensive roadless areas, the nationally led forest planning and decision process would actually recommend areas for wilderness designation and others, not so designated, for "release" for nonwilderness use and management. Areas that could not be clearly allocated to one of these two categories would be designated for further planning. Based on the internal feasibility analysis of the RARE II proposal by national forest managers, there was only a very slim chance that a nationally led NEPA study and EIS would resolve the wilderness issue. More likely, the EIS would be challenged in court and the roadless areas would be slowly allocated through separate legislation for entire States. And that is what actually occurred!

Even though national forest leadership was not enthusiastic over the RARE II process and would not have undertaken it on its own, the Forest Service responded positively and constructively to USDA's policy direction to implement it. RARE II's objectives were to "round out" the national forest portion of the National Wilderness Preservation System (for which the 1975 RPA had set a goal of 25 million to 30 million acres), to reduce the study time for most inventoried roadless areas, and to expedite release of areas with primary multiple-use values other than wilderness (Roth 1984; Le Master 1984).

The Assistant Secretary reserved the overall direction of the effort and final decisionmaking to himself and established a three-person executive staff in his office to provide the strategic planning and leadership for RARE II. The Forest Service role was limited to implementing the process and recommending the allocation of roadless areas for wilderness designation, further study, or nonwilderness use to the Assistant Secretary — an unprecedented USDA approach to major planning and decisionmaking for national forest management. The Assistant Secretary set an almost impossible completion deadline of December 31, 1978. He selected the Forest Service director of recreation to lead his executive staff, and he recruited the assistant director of recreation, a former wilderness planner who had been recruited from the National Park Service, and an officer of the Wilderness Society to fill it out. This staff developed a

NEPA-consistent design for RARE II. It had two stages: first, inventorying each roadless area for potential designation, and then evaluating each for allocation to wilderness, nonwilderness, or further planning. The design included various processes for informing people and organizations about RARE II, collecting resource data and public input critical to the inventory and evaluation stages, analyzing the resource data and public input for individual roadless areas, and making the decision itself.

These processes were designed from the top down and executed generally from the bottom up. They were characterized throughout the RARE II effort by two-way communications from the ranger district and national forest levels to the regional teams and the Washington steering group, and to the Assistant Secretary and his executive staff and back again.

This departmental approach to RARE II essentially withdrew the local national forest manager's authority to recommend the allocation of roadless areas to wilderness and nonwilderness and redelegated it to the Assistant Secretary. When RARE I collapsed due to the Conte Decision, the Forest Service agreed to introduce the NEPA approach into national forest planning and with that address the question of suitability of roadless areas for wilderness designation. The RARE II approach perceived the roadless area allocation problem to be a political problem to be resolved through the Administration rather than a professional management process — although the latter was necessary to develop the information needed for such resolution and decisionmaking (Karr 1983; Le Master 1984).

Chief John McGuire delegated the leadership for national forest implementation of RARE II to his Associate Chief Rex Ressler, who named the Deputy Chief for National Forest Systems, Tom C. Nelson, and several regional foresters to a steering group to oversee, staff, and manage the implementation process. Although the Chief also directed deputy chiefs and regional foresters to give top priority to meeting the tight deadline within the available existing resources, he did not provide additional staffing or funding. He further cautioned that RARE II not be carried out at the expense of the Forest Service's ongoing mission (Karr 1983).

The RARE II inventory stage was completed in the fall of 1977, following the massive public involvement. National forest managers prepared an initial roadless area inventory using the Wilderness Act's minimum wilderness designation criteria. During the summer of 1977, the public was invited to participate in more than 227 workshops throughout the Nation and to suggest changes to the inventory as well as criteria for evaluating areas for wilderness and nonwilderness. More than 50,000 people provided comments and suggestions. National forest staff collected and summarized resource inventory data. Forest supervisors and district rangers and their staffs conducted the public workshops. Most participants considered the workshops effective in reaching organized groups; however, some noted weaknesses in communications with State government, local people who were not affiliated with organizations, and nontraditional public. The inventory identified 2,686 roadless areas encompassing 62 million acres in 38 States (Karr 1983). This compared with the 1,449 areas and 56 million acres inventoried in RARE I. The large increase in the number of areas inventoried in RARE II mainly reflected the inclusion of hundreds of relatively small wilderness candidate roadless areas on eastern national forests that had not been included in RARE I. The total RARE II inventoried area, however, was only about 11 percent greater than that in RARE I.

The preparation of a draft EIS based on inventory data, public input, and other resource information began the evaluation stage. USDA issued the draft EIS for public review in June 1978. The draft EIS presented 10 alternative allocations for 2,686 roadless areas totaling 62.1 million acres. USDA did not identify a preferred alternative. The RARE II staff and national forest managers explained the RARE II process and its draft alternatives to the public in briefings, called "open houses," conducted across the country. At the briefings, they answered questions about the process and draft alternatives. The USDA asked the public to express and explain their preferences for allocating individual areas to wilderness, nonwilderness, or further planning. It also invited the public to identify its preferred allocation alternative for USDA consideration in deciding upon roadless area allocations and the decision criteria for determining suitability of roadless areas for wilderness

designation or management for multiple uses (Karr 1983).

Public response was immense, even exceeding the record RARE I public participation. Some 360,000 people provided more than 264,000 letters, reports, petitions, resolutions, coupons, and response forms. Most addressed preferences and reasons for allocating specific roadless areas, but many comments suggested alternative approaches and decision criteria. Respondents favoring nonwilderness allocations cited economic benefits and jobs, timber production, and access to resources as their criteria. Those favoring wilderness often cited scenery, solitude, the wilderness heritage, and additions for increasing both the diversity and quality of the National Wilderness Preservation System. However, the number of responses supporting nonwilderness allocations for roadless areas exceeded those for wilderness by of 3 to 1 (Karr 1983).

The final 10-step decision process used both the draft EIS information and its public response data. This resulted in the final EIS's selected alternative, which the Secretary of Agriculture released to the public on January 4, 1979. The final EIS recommended 624 roadless areas, encompassing 15.1 million acres, for wilderness; 1,981 areas with 36.2 million acres for nonwilderness; and 314 areas with 10.8 million acres for further planning. The wilderness allocation, when added to the 12 million acres already designated as wilderness, was developed to coincide with the 1975 RPA program wilderness goal of 25 million to 30 million acres. It also satisfied RARE II mid-level targets for wilderness accessibility and distribution as well as low-level targets for land form, ecosystem, and wildlife representation. Roadless areas with high wilderness attribute ratings were proposed by USDA for wilderness or further planning, except for those areas where such an allocation would result in substantial adverse local impacts on employment and community stability. Such areas were allocated to nonwilderness uses. Roadless areas with proven mineral or energy potential or with high potential for producing mineral and energy resources were allocated to non-wilderness or further planning to avoid foreclosing valuable mineral options without further evaluation. The decision process also reviewed the consistency

of allocations with the 1975 RPA program goals for timber, recreation, and grazing. It included several other criteria suggested by public responses. Each regional forester reviewed the allocations for meeting RPA program goals for his region. The Forest Service's Washington Office RARE II staff tested and adjusted regional allocations, as needed, to achieve consistency across regions in the use of the decision criteria and compared the preferred alternative with the 10 draft EIS alternatives to ensure its superiority. Rupert Cutler, working with his RARE II executive staff, USDA representatives, and the Chief of the Forest Service, made final decisions that took into account national policy criteria such as housing starts, trade balances, treasury revenues, inflation control, and national employment goals.

Wilderness interests such as the Sierra Club, the Wilderness Society, Friends of the Earth, and the National Audubon Society were acutely disappointed with the RARE II wilderness allocations. They felt they were too small. Commodity industry representatives, including the National Forest Products Association and the Rocky Mountain Oil and Gas Association, felt the wilderness allocations were too large (Le Master 1984).

USDA scheduled 2 months for the RARE II final EIS review and comment by other Federal agencies, members of Congress, and governors of States. President Carter considered their comments and suggestions when he announced his decision on April 16, 1979. He recommended 15.4 million acres for wilderness use, slightly more than was recommended in the final EIS; 36.0 million acres for non-wilderness use; and 10.6 million acres for further study (Le Master 1984). The recommendations reflected White House agreement with the forest products industry to not increase wilderness allocations in the Pacific Northwest. The industry, in turn, agreed to support President Carter's proposal for a national Department of Natural Resources that would include the Forest Service (Roth 1984).

Environmental interests were dissatisfied with the final EIS recommendations and convinced the Administration not to submit omnibus RARE II legislation to Congress. Environmentalists argued that they needed a free hand to address legislative

options for implementing RARE II and in dealing with Congress to repair some of RARE II's damage to their goals for further wilderness designation (Roth 1984).

From the beginning, all interests had widely supported the general purposes of RARE II. However, some of the public raised issues about its time limitations on public responses, data adequacy, and methodology. These critiques intensified with the release of the draft and final EIS's. In announcing his RARE II decisions, President Carter observed that the determination of national forest best uses had been slow and piecemeal and a source of frustration and controversy for all interests for many years. RARE II had provided a comprehensive nationwide review and evaluation of the national forest lands in question. He hoped his recommendations would help resolve the longstanding controversy over the use of roadless areas (Le Master 1984).

Omnibus RARE II legislation received little congressional support. It took Congress until the end of 1979 to decide upon a strategy to respond to RARE II recommendations. That strategy provided that each State's congressional delegation seek a consensus on wilderness designations within its own State and then introduce separate legislation (Le Master 1984). In the meantime, wilderness interests in the Northwest reacted angrily to the RARE II allocations, which they saw as singularly one-sided in allocating nearly 80 percent of all roadless areas to nonwilderness. In Oregon, 125 wilderness leaders convened for a full day to develop a strategy to address their issue in Congress (Roth 1984). In California, where the final EIS allocated 44 percent of the roadless areas to further study and 16 percent to wilderness, consistent with Californians' preference for a more gradual approach to wilderness designations, environmentalists and the State Department of Natural Resources were still dissatisfied. The State of California filed suit in the District Court of the United States for Eastern California in 1979. In January 1980, the district court ruled in favor of the State's finding that failure to address site-specific impacts, an inadequate range of alternatives, and insufficient opportunity for public comment were major RARE II EIS deficiencies. The ruling enjoined all development on California's 47 roadless areas prior to completion of a

Multiple-Use Planning Procedures Improved

site-specific EIS for each area. The Government appealed the decision, but the Ninth Circuit Court sustained the ruling in 1982 and extended it to Oregon, Washington, Alaska, Idaho, Montana, Nevada, Arizona, and Hawaii. This ruling essentially foreclosed the RARE II goal of releasing national forest lands not allocated to wilderness for non-wilderness uses and management (Karr 1983). It put national forest managers back in the same position that the earlier Conte Decision on RARE I had created — national forest managers had to do site-specific EIS's on roadless areas before releasing them to nonwilderness uses. RARE II, however, did provide a useful and comprehensive basis for State-by-State wilderness consideration, which probably would not have occurred in its absence.

Despite the findings in the California suit and the potential for the district court's ruling to slow down national forest planning and roadless area management, 50 RARE II wilderness bills were introduced in the 96th Congress by the end of 1980. More than half were proposals for designating wilderness for all or selected parts of 15 States. Nine were enacted into law, designating 4.5 million acres of wilderness in Idaho, Montana, Colorado, New Mexico, South Dakota, Missouri, Louisiana, and South Carolina, and 5.4 million acres in Alaska. These actions increased designated national forest wilderness from 15.3 million acres in 1978 and 1979 to 25.1 million in 1980.

To overcome the district court ruling that precluded the release of RARE II EIS roadless areas for non-wilderness uses, Congress wrote language into the wilderness designation legislation for Alaska, Colorado, and New Mexico that determined that their final EIS's had provided "sufficient" evaluation of the RARE II areas. This approach precluded further appeal of the RARE II EIS and permitted the release of nondesignated roadless areas for timber and other resource management. During the 1980's, this became the general State-by-State approach of Congress to additional wilderness designations and release of other areas for nonwilderness uses.

In the early 1970's, the regional multiple-use guides and district multiple-use management plans continued to be the basic mode and tools for allocating uses and managing resources on national forest lands. These plans focused on coordinating various uses by selecting management practices that would avoid or resolve conflicts, but they rarely addressed the question of the combination that would best meet American people's needs as called for in the MUSY Act (Wilson 1978). Another weakness was the implication that all or many uses could be carried out on every acre. Such situations rarely occurred in actual plans, but national forest managers' public information focused so heavily on coordination that they tended to leave this type of understanding with some people. The quality and thoroughness of this initial multiple-use planning effort varied widely within the National Forest System (Wilson 1978). On the Bitterroot, the Monongahela, and the four Wyoming national forests where clearcutting had become a national issue and the subject of intensive Forest Service evaluations, inadequate multiple-use plans or the lack of such plans were identified as important contributors. The Monongahela had not yet developed a plan in 1969 (Weitzman 1977). The Bitterroot Task Force evaluation found that the Bitterroot's multiple-use planning was not far enough advanced and that the plan contained too few coordinating directions (USDA Forest Service 1970). The Wyoming Forest Study Team (USDA Forest Service 1971a) reported similarly, "none of the Forests has attained the required level of planning refinement." Thus, major shortfalls were identified in three regions and on seven forests.

In 1973, the Forest Service undertook a new round of land-use planning that would replace the multiple-use plans with local unit plans, provide closer integration between national objectives and local land use priorities, and seek to fit multiple-use planning closely with NEPA requirements. This action responded to the continuing external criticism over multiple-use planning on national forests, a growing internal dissatisfaction with ranger district multiple-use plans, and the need for wilderness planning to

conform to NEPA requirements consistent with the 1972 Conte Decision. In 1973, the linkage between multiple-use land management planning, wilderness planning, and NEPA planning requirements spurred national forest managers to develop vastly more complete resource inventories and to assign soil scientists, wildlife biologists, hydrologists, and other specialists to collect and analyze basic resource information (Wilkinson and Anderson 1985).

This new generation of land management planning included a hierarchy of direction. The Chief promulgated Service-wide policy and objectives. The Washington Office drafted a national guide for developing regional and local unit plans and alternatives for long-term national forest funding — the Environmental Program for the Future (EPF). The EPF compared national forest uses and management levels and mixes that could be attained under low, moderate, and high funding over a 10-year period. However, these resource use and management levels and mixes were not linked in any specific way to the national forest land base. The Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) and the 1975 RPA program, which was largely built upon its planning concepts, superseded the EPF before it could be finalized.

Regional Planning Area Guides and Unit Plans for Multiple-Use Management

Regional foresters were directed to prepare regional planning area guides that discussed the resource management situation for relatively homogeneous subareas within their regions and provided regional coordinating guidelines and direction for preparing local land unit management plans within those subareas. These guides reflected public participation and input. They usually included estimates of resource use that each planning unit would be expected to provide — an attempt to identify the “mix of uses” appropriate for the resources of the planning area, a major shortcoming in the predecessor multiple-use plans and regional guides.

Unit Plans

National forest supervisors’ staffs, working with district people, prepared the unit plans. The authority to approve unit plans was originally delegated to the forest supervisor, but it eventually shifted to the

regional forester. Unit plans covered a large drainage or several drainages, and their size varied from 50,000 acres up to several hundred thousand acres. (Wilson 1978). A few national forests opted to consider the whole national forest as the basic unit for multiple-use management planning, and in this way anticipated the NFMA requirement for all forests do so.

Unit plans classified lands, somewhat analogous to zone classification in the multiple-use plans, for combinations of multiple uses according to their suitability to provide those uses. Unit plans also stratified the land base to a greater degree than multiple-use plans. The mix of planned and potential uses within individual management areas was also more complex and required more detailed management guidelines. For example, the 1978 unit plan for Oregon’s Umpqua National Forest — one of the few forests where the whole forest was the planning unit — involved more than 20 land-use allocations. There were eight watershed management areas, four recreation management areas, and two wildlife management areas. Most of the Umpqua’s lands, however, were allocated to general forest management, which emphasized timber production and included guidelines for coordinating timber management with the needs of sensitive riparian areas and specific wildlife habitats such as winter cover and other resource uses. Four streamside management zones were differentiated by stream size. The management guidance for one such zone required a 33-foot buffer strip on each stream bank with no programmed timber harvest and an additional 99-foot buffer strip where timber would be managed on a 200-year rotation (Wilkinson and Anderson 1985).

The Umpqua plan also included a soil resource inventory that identified and mapped about 250 soil types, which were grouped into resource analysis units based on site productivity, erosion potential, and reforestation capacity. Lands with high soil erosion risks that could damage fish habitats and other resources were identified as critical soil management areas. Resource specialists often examined soil characteristics and wildlife habitats intensively in establishing the unit planning management areas and guidelines. Interdisciplinary teams that prepared unit plans were typically staffed by foresters, wildlife

biologists, recreation planners, landscape architects, and transportation system planners. Economists and sociologists were only sometimes used (Wilkinson and Anderson 1985; Wilson 1978). Because unit plans included the preparation and public review of NEPA-required EIS's, they often included plan alternatives in draft plans prepared for public comment and for the regional forester's decision (Wilson 1978).

"Functional" Resource Plans Link to Unit Plans

Although unit plans did not replace "functional" resource plans, their improved quality and detail provided better information for coordinating and managing multiple uses, including more effective environmental protection. After 1973, when wilderness planning was integrated with unit planning and NEPA requirements, the unit plan process slowed greatly, but the quality of wilderness planning improved significantly (Wilson 1978).

The unit planning process and the plan outputs were a substantial improvement over their predecessor multiple-use plans, but they had their own shortcomings. There was still wide variation in the way unit planning was applied among the national forest regions and among forests within regions. National requirements were not well detailed or rigorous. The Forest Service's decentralized management system allowed for a wide range of interpretation of such direction at the regional level, as well as wide latitude for innovation at the forest level. A variety of approaches emerged and provided opportunities for the more effective planning methods to be more widely adopted, in time, within the National Forest System. However, this strength was also a shortcoming that caused confusion among national public-interest groups who could not identify any standards for comparing the effectiveness of unit plans among forests and regions. The lack of consistency in both form and substance was seen as one of unit planning's weakest features (Wilson 1978). Another weakness was the absence of the goals and objectives of a larger forest, regional, or national planning framework to which unit planning could be related.

Influence of RPA Legislation

The 1974 RPA legislation required, for the first time, that national program planning be linked directly with on-the-ground multiple-use planning at the forest and ranger district levels. Although the legislation did not detail how to achieve this linkage, it required national forests to use a systematic interdisciplinary approach to integrate physical, biological, economic, and other basic resource considerations and a detailed continuous inventory of national forest lands and resources to reflect changes in resource conditions, uses, and values. Because of the short time between the 1974 RPA enactment and the 1975 due date for the first RPA program, the first RPA program documents, submitted to Congress in December 1975, had very little linkage with or input from the national forests and ranger districts. The first RPA program was largely prepared in the Washington Office to respond to the 1975 RPA assessment projections for resource demands using the information developed for the draft EPF.

A primary objective for many people who had supported the RPA legislation had been to improve the Forest Service's ability to obtain appropriations over the long term to meet and balance national forest resource management goals and objectives. Senator Humphrey hoped that putting resource goals into a congressionally adopted "statement of policy" would lead to a stronger commitment for higher and more balanced appropriations. However, for the balance of the 1970's, budget proposals and appropriations fell behind the 1975 RPA programmed targets. Appropriations in 1980, measured in constant dollars, were about the same level as they were in 1971 and about 10 percent more than they were in 1976, which was actually below the 1971 level. Nevertheless, the increase in Forest Service budget authority in current dollars from 1976 to 1981 was 94 percent compared to 59 percent for the whole Federal Government. This indicates that the RPA may have helped the Forest Service achieve relatively more favorable budgets during a period of constrained Federal appropriations. Although comparison of national forest appropriations for six different resource objectives for the 5 years before and after the 1975 RPA showed small changes in the balance of appropriations, both negative and positive, there was little evidence that the 1975 RPA provided

any improvement in the balance of funding in the management of renewable resources (Le Master 1984; Wilkinson and Anderson 1985). Nevertheless, the RPA process made it possible for the Forest Service to have a broader and more open dialogue with congressional appropriations committees and public-interest groups than had previously been possible. In the past, OMB constraints on program and budget testimony had generally inhibited open dialogue between agencies and appropriations committees (McGuire 1996).

Influence of the National Forest Management Act of 1976

NFMA and its regulations went far beyond RPA direction to prepare local land and resource management plans that were linked to national goals and objectives. They spelled out the standards and guidelines for managing multiple uses on national forests. As required by NFMA, the Secretary of Agriculture appointed the Committee of Scientists to give technical and scientific advice and ensure that NFMA implementing regulations would include an effective interdisciplinary planning approach, and they began to help design the NFMA guidelines in May 1977. The Committee advised the Forest Service on the specific wording and merits of alternative implementing standards and guidelines. The Forest Service reviewed the draft NFMA regulations in 18 public meetings to ensure that they were scientifically and technically adequate. The *Federal Register* published a first draft for public comment and the Secretary of Agriculture held two public hearings. In September 1979, final regulations, promulgated by the Forest Service, were issued. They became effective in November 1979 — more than 3 years after the passage of NFMA (Le Master 1984).

The Committee of Scientists helped determine the technical quality of NFMA's guidelines. They ensured greater specificity and rigor than the Forest Service would have provided without their guidance and advice. They added an important dimension of public credibility to regulations that would otherwise not have existed. They strongly endorsed the land and resource planning rationale — derived in large part from the unit planning process — that the Forest

Service advanced as a starting point (Hartgraves 1994).

Planning guidelines and procedures for public participation, coordination with other public agencies, and an interdisciplinary approach to NFMA planning were included in the regulations. The planning process itself had the following interrelated steps for producing national forest land and resource management plans: define issues, concerns, and opportunities; identify planning criteria, including indicators of response to issues; collect data and develop information; analyze the current management situation and a baseline for the use of each resource, i.e., the capability of planning areas and their resources to supply the public's demands; specify alternative resource goals and objectives and related management guidelines; determine the effects of the alternatives and evaluate the costs, benefits, and environmental impacts; select a preferred alternative and implement it; and monitor and evaluate management and implementation.

Another component of the NFMA regulations set standards and guidelines for vegetation management, timber harvesting and scheduling, riparian habitat protection, soil and water conservation, and maintenance of plant and animal species diversity. These standards and guidelines included specific minimum management requirements for timber harvesting and other activities. The regulations also described the content and role of "regional plans" to linking national objectives with local level planning — a matter for which neither the RPA nor the NFMA provided guidance. The process, thus, became iterative. The national RPA program allocated national resource output objectives to the nine Forest Service regions. The regions, in turn, allocated their shares to the national forests. Each forest plan included at least one alternative that reflected the forest's share of RPA outputs. However, the allocated objectives were not binding on each final local forest plan. The regulations provided that forests would negotiate and adjust outputs within regions in the event some forests could not meet their allocations. RPA outputs could be reallocated among regions and ultimately used to update the national output objectives in the next RPA program update (LeMaster 1984; Wilkinson and Anderson 1985).

For each of the plan alternatives, national forests were to design land use and resource management objectives to individual management areas over the entire forest. One of the interdisciplinary team's functions was to help ensure that such objectives were fully integrated with each other and the management area resource capabilities. NFMA planning retained the classification and designation of forest zones with similar resource conditions for this purpose but renamed them "management areas" (Hartgraves 1994).

NFMA directed that existing unit plans remain the operational national forest management direction until the new plans were completed. Under NFMA, however, the entire national forest became the basic planning unit. This was done to eliminate a perceived bias that unit planning gave preference to developing plans and management for areas with less difficult management situations — a bias that deferred and concentrated planning and management of more challenging and complex areas to future resource managers. This was not considered a prudent approach to national forest planning and management (Hartgraves 1994).

Although national forest planning had tended to move in the direction of the NFMA guidelines, very few NFMA forest plans (less than 10) were completed and filed with the Environmental Protection Agency before 1985.

NFMA and its regulations established legal direction for developing and implementing national forest plans. NFMA standards and guidelines became a legal basis for evaluating national forest planning and management and the legal basis for national forest plan appeals and court suits, which were to number in the thousands in the 1980's (LeMaster 1984; Wilkinson and Anderson 1985). The national forest plans, in turn, became legal documents used to develop each forest's annual program and budget proposals, but congressional appropriations determined the extent to which the plans could be implemented each year.

The Emergence and Development of Public Participation

From the beginning, the National Forest System's focus on managing a variety of forest land uses required its managers to work with local users, their communities, and interest groups in planning and carrying out national forest management activities. Because of the important role national forests played in the life and work of local communities and their residents, many national forest managers were often recognized as local community leaders (Kaufman 1960; 1967).

Not infrequently, however, national forest managers also had to respond to conflicts with local users and citizen interest groups about national forest resource use and management. Such conflicts usually arose when decisions, based on Forest Service regulations, failed to serve some local interests or preferences. Some issues could be resolved through permits or contracts and their written standards and conditions of use. Often such issues provided opportunities to communicate and develop a fuller understanding among users and citizens about the merits of such decisions — an opportunity which frequently helped management actions become mutually acceptable to both parties. Some management decisions and actions were appealed to higher Forest Service levels, and a few were pursued through court suits (Kaufman 1960; 1967). Appeals and court suits remained relatively limited until the 1970's.

The largely comfortable working relationship between local citizens and interests and national forest decisionmakers changed after World War II. Rapid growth in population, geographic shifts in population distribution, better educated users, and accelerated economic growth gradually brought demographic changes to forest-based communities and States. Increases in mobility, leisure time, and personal income contributed to Americans' growing interest in outdoor recreation, wildlife, wilderness, and associated activities. These trends expanded public interests in national forest use and management and in time became increasingly diversified. At the same time, national forest commodity production grew rapidly in response to national goals and market demands for housing and lumber, minerals, and beef, and contributed strongly to local commu-

nity development. Increasing confrontation and conflicts between the new public interests and activities and expanding commodity production raised public concerns and brought increasing criticism of national forest management. By the late 1960's, the need to involve the public more effectively, to introduce the new planning and decisionmaking procedures, and to obtain better balanced funding among all the multiple uses was becoming increasingly evident to many national forest managers (USDA Forest Service 1977; Cliff 1970).

Although NEPA did not explicitly address the national forests, its policy direction applied where national forest planning and decisions affected the environment. NEPA required Federal agencies to undertake specific efforts to involve the public in their planning and decisionmaking processes. It called for documenting the information and analysis underlying each alternative considered and for public review and comment on the alternatives considered. The Forest Service responded to NEPA's public participation requirements and in January 1970, the Chief of the Forest Service issued *A Guide to Public Involvement in Decisionmaking*. In his transmittal he wrote:

The surge of public interest in the quality of the environment in the last few years has made conservation a national issue — one in which a great many people are now deeply concerned and want to become involved.... This new public concern provides us the opportunity to more fully inform an attentive public of the principles of conservation which have long been the basis for Forest Service management. And there is no doubt that increased public interest and involvement will also provide us with the opportunity to reach better land management decisions, both in terms of protecting and enhancing the quality of the environment, and in terms of meeting public needs for goods and services. It provides us with a unique opportunity to gain greater public recognition and understanding of these principles and ... the need for a balanced program in all aspects of forestry and forest land management.

The Forest Service is committed to seeking greater public involvement in its decisionmaking process; indeed, we welcome it. (Cliff 1970)

In May 1971, the Forest Service established the agency-wide Inform and Involve Program to bolster

its efforts at all Forest Service levels to inform the public and obtain their input on resource management decisions affecting the environment (USDA Forest Service 1972). As the Forest Service developed its public involvement methods during the 1970's, it also helped many other Federal and State agencies in their efforts to do so.

NEPA clearly shifted the emphasis on public participation and expanded its content and training. By 1977, the Inform and Involve Program had provided public involvement training to more than 1,500 Forest Service employees (USDA Forest Service 1977). In 1976, NFMA made public participation in national forest planning and management decisions explicit public policy. In 1977, the Forest Service published a draft *Inform and Involve Handbook* documenting public involvement methods and processes for a wide variety of situations. This handbook became the basic instructional aid for training national forest managers and staff in public involvement and a reference document for field managers.

The handbook described different methods for informing the public about Forest Service plans and actions and involving the public in planning and decisionmaking. It focused on sharing information with the public, collecting information from the public, and describing procedures for documenting, analyzing, and interpreting that input. Most of the public participation methods described in the handbook related to one-way communication of information to the public or one-way collection of information from the public. The handbook described the weak and strong points of these methods and their appropriateness for different objectives and activities. The handbook also described several interactive two-way communication methods. These were seen as viable public participation methods, but also as expensive, time-consuming, and difficult to manage — usually requiring neutral outside facilitators. Information resulting from these interactive methods was thought to more or less limit a manager's discretion because it tended to open the traditionally exclusive forest management decision process to the public. Generally, the handbook tended to protect the national forest manager's exclusive decision authority delegated by the Organic Act of 1897. Thus, public participation in the 1970's became a

process for fuller and wider sharing of information about national forest decisions and activities with the public interested in national forest management. Yet few decisions were changed as a result of this input, which made almost every special-interest group and some individuals disappointed, frustrated, and even angry. Environmentalists, seeing that decisions were basically not changed, began to rely on the court system to satisfy their grievances.

This dominant public involvement approach, did not preclude experimenting with other ways to provide a deeper public sharing in the decisionmaking process. For example, during the mid-1970's, when unit plans were the basic national forest management tool, several foresters on southern national forests introduced a "Charette" approach to obtain more effective public input for their unit plans. They were dissatisfied with the quality of the input that emerged from public meetings, where participants largely recited their positions on the use and management of national forest land planning units. They asked the question: "How can we get people to understand what they really want on a piece of land?" (Sweetland 1992). The "Charette" was a process for integrating and managing ideas and preferences from a group of people with different interests but an agreed upon common goal — to produce an integrated fitting of their varied interests into a workable design or plan. The participants were organized into workgroups. National forest staff and managers served as facilitators and consultants on legal, administrative, and technical limitations and bounds. They did not direct the workshop or influence its outcomes. The national forest role was only informational and procedural.

This process was initially developed and successfully implemented for unit planning on the national forests of Texas and then other national forests in the Southern Region. It worked well when the task and product were well-defined and there were well-defined differences among the represented interests, but it also required a common commitment to produce an integrated single design for national forest planning units. It was not an effective approach where one or more participants insisted and pressed adamantly for their particular preferences.

The South's Charette approach was an important step toward opening the Forest Service to wider use of consensus building and negotiating approaches to public participation in the 1980's. Although the Charette approach was documented and often presented and discussed elsewhere in the Forest Service, it did not have strong support from the Washington Office. There was a strong feeling that a consensus or negotiation approach to national forest decisions involved "giving some authority away," which was perceived by some national forest managers as a planning and decisionmaking weakness (Sweetland 1992).

Lessons from the National Issues of the 1970's

In the 1970's, the organization and administration of the National Forest System was still strongly hierarchical. The roles of the Washington Office, regional offices, forest supervisors' offices, and ranger district offices were clearly differentiated. National forest planning and management decisionmaking, however, was highly decentralized because national centralized planning and decisionmaking for 155 widely dispersed national forests (146 administrative units) and more than 700 ranger districts involving a wide range of forest and rangeland conditions and user interests was not a feasible option. *Management decisions needed to respond to local uses and users and be sensitive to local resource conditions.*

The philosophy of managing multiple uses called for equal consideration of all resources and the combination of uses that provided the greatest benefit to the American people. But *specific guidelines and standards for integrating the management of uses were very weak or lacking at all levels.* They were strengthened by the introduction of unit planning in 1973 and further improved by the passage of NFMA in 1976 and its regulations in 1979. In the 1970's, there were no reporting or evaluation systems for monitoring, assessing, and overseeing multiple-use management performance at any level of the Forest Service. Local resource managers had great flexibility, but also the burden of responsibility for managing multiple uses (fitting them according to the capabilities of ecosystems and compatibly with

existing uses where they overlapped or adjoined). The general National Forest System philosophy was to resolve national forest management issues (as opposed to policy issues) and problems at the lowest practical level.

Resource programs, budgets, operating divisions, Forest Service manuals and handbooks, and reporting systems were all organized by function. Planning by function had been an important component of national forest operations and was historically well established. The better-funded functional programs, such as forest engineering (mainly the construction of roads) and timber management, often helped projects in other, less well-funded resource areas that could be carried out as joint operations with road construction and maintenance or timber management. This was one aspect of multiple-use management. *Coordination by "functional" specialists was the principal tool for integrating multiple uses and their management on the ground.*

The Washington Office was responsible for developing national-level programs, budgets, and policy and for public affairs, while implementing programs and budgets and the management of national forests was the primary and separate role of the regional, national forest, and ranger district managers. The Washington Office dealt with policy; the local field units with the solution to on-the-ground problems. Decentralized decisionmaking became the guiding principle for solving land management problems. Under this principle, *problems were analyzed using local technical and management considerations and did not explicitly delve into policy questions. This worked well as long as problems remained individual local problems and were not widely replicated among the 9 national forest regions and the 155 national forests.*

When the Washington Office finally undertook a national assessment of clearcutting in 1970 and found 30 types of problem situations associated with it, it was too late to manage the clearcutting issue internally and at a local level. *The Forest Service's decentralized management and sharp hierarchical division of responsibilities without central oversight or evaluation seems to have contributed to the pub-*

lic's increasing dissatisfaction with clearcutting and related timber management practices in the 1960's and their emergence as a national issue in the 1970's. The monolithic loyalty and inflexible commitment of national forest managers to the agency's organizational philosophy and discipline as well as its resource mission and program likewise probably contributed importantly to its inability to respond more effectively and quickly to the public's changing values and the issues they raised (Kaufman 1994).

Other aspects of National Forest System operations may have contributed to the clearcutting issue. National forest management was driven incrementally, year by year, by the continuing and growing public demands for all national forest uses. *There was little or no clear information about how these continuing and growing uses and their management would shape and condition the national forests for the future. Nor could anyone explain how the multiple-use management approach worked to find the level and mix of uses that would best meet the American people's needs.* The fact that public preferences and "needs" were evolving rapidly and unpredictably during this period at both the national and local level contributed significantly to this problem. Thus, *the management of the National Forest System depends on the public's trust of its professional resource managers. The emergence of clearcutting as a national issue undermined a great deal of that trust — and as a result, substantial responsibility for providing planning and management guidelines and standards and for the public's participation in establishing goals and direction for such planning, managing, and monitoring shifted to Congress.*

The lack of a comprehensive system for evaluating the performance of multiple-use management probably contributed similarly, but indirectly, to the decline of public trust and the tarnishing of the Forest Service's image. While there was some misuse of clearcutting, there were many successes in fitting multiple uses into National Forest System ecosystems; but they were just not as widely publicized as the problems. Generally, national forests conducted their timber management activities in ways that protected watersheds; permitted the expansion of wilderness designation; encouraged the growth of recreation, wildlife, and fishery uses; and maintained

or improved rangelands. *But there was a lack of national and regional measures for assessing and documenting the performance and success of multiple-use management on the ground.* Management conflicts and problems were surfaced and publicized locally and nationally through complaints and actions of individuals, interest groups, and the media. But there were no measures or assessments of the successes of multiple-use management; they were poorly documented and not effectively communicated to the local and national public.

Wilderness designation, for example, was initiated in the 1920's and steadily expanded through the 1960's and 1970's. Recreation use on national forests, including hunting, fishing, and wildlife observation, grew much more rapidly than the U.S. population, and national forest management accommodated it well during the 1960's and most of the 1970's. Watersheds generally were successful in ameliorating waterflows and maintaining stable soil conditions. Serious damage or major disasters were rare. Domestic livestock numbers on national forest rangelands were reduced, and rangeland conditions were generally maintained or improved. Timber harvesting and management, after rapid acceleration following World War II, remained relatively stable in the 1960's and declined slightly in the 1970's.

Timber use tended to shape national forest management in the sense that it was usually the first use involving management of undeveloped forest areas. Planned harvests were dispersed throughout the National Forest System for three reasons: to provide access for other uses, to provide more effective resource protection and administration, and to leave forest conditions in roaded, but unharvested, areas that were suitable for other uses. The 1969 Douglas-fir supply study, for example, reported that recreation users, including hunters and anglers, promptly took advantage of new roads in previously undeveloped areas.

The University of Montana's report on its evaluation of clearcutting on Montana's Bitterroot looked at the Forest Service's multiple-use philosophy and found it wanting. The Senate Subcommittee's hearing report, however, did not find any general issue with the way the Bitterroot's had implemented the multiple-use

philosophy. It focused only on clearcutting being misused as it related to other resources uses and sensitivities. NFMA addressed the same issue. It strongly affirmed the multiple-use approach to national forest management, provided legislative guidelines and standards to implement it, and monitoring requirements to evaluate its performance. Thus, *the management of multiple uses in the combination that would best meet the needs of the American people remained the basic policy for national forest management policy. But the public perceived a need for more consistency in national forest management.* This need called for more sufficient guidelines and standards that would ensure "equal consideration" for all national forest uses and resources and stronger integration of the sciences and professional disciplines in managing and protecting those resources. It also called for a clear explanation and public understanding of how the management of multiple uses contributed to the "greatest good of the American people."

Even though national forest managers successfully accommodated the rapid growth in recreation, wildlife, and fishery use, some users were not happy with the rapid development of the national forests primarily for timber production in the 1950's and 1960's. As timber harvesting was extended into the remaining unaccessed old-growth timber, year after year, road access and timber harvesting were seen as rapidly reducing the *de facto* wilderness and the decreasing opportunities for designating many areas desirable for wilderness. The issue was aggravated when national forest managers reallocated some forested areas previously set aside as primitive and wilderness candidate areas for designation to timber management. As a result, the Wilderness Act of 1964 withdrew forest managers' authority to define and designate wilderness and placed it with Congress.

Complaints about clearcutting emerged from other national forest users in the early 1960's. These complaints grew and became more widespread during the balance of the decade and the early 1970's. National forest evaluation teams repeatedly reported a need to involve interested national forest users earlier and more effectively in planning timber harvests that involved clearcutting, especially where

there were sensitive soils and others were using the national forests for nontimber purposes.

Users who were concerned with clearcutting and its apparent unacceptable impacts often reported that *national forest managers were less than responsive to their concerns*. These reported shortfalls — where clearcutting and related timber management were inappropriately applied — called for a *more integrated approach to managing multiple uses at the grassroots level and less functional management*. They also indicated the need for some effective public participation and a better two-way dialog between national forest resource managers and all interested public.

NFMA ultimately provided legislative guidelines and standards for planning, managing, and monitoring multiple uses. *The public, interest groups, and the national forest managers can use monitoring results to evaluate the effectiveness of management for multiple uses and sustaining resources*.

Notwithstanding the internal weaknesses in the National Forest System, other factors contributed to those shortfalls. During the 1950's, 1960's, and 1970's, the national priority for meeting post-World War II housing goals in the face of rapid population and economic growth and the need to brake and reverse runaway inflation were powerful driving forces for increasing national forest timber harvests. For several decades, there was a lack of a clear national consensus on allocation of multiple uses, including wilderness use, on national forests.

Finally, there have been some important benefits to the accelerated national forest timber harvest that have not been well presented to the public. After World War II, such harvests tended to stabilize the timber industry and many rural and urban communities in the Pacific Northwest. Nationally, the increased national forest harvests reduced the pressure to harvest sawtimber on the South's heavily cutover and young, mostly private forests for about two decades, giving them time to grow and mature.

Public and interest group demands for more balanced use of national forests and management adjustments for environmental quality purposes

continued to escalate throughout the 1970's, even though forest managers' efforts to respond to growing user demands and public issues intensified and increased. As national forest plans began to be completed in the early 1980's, appeals related to the plans accelerated and the number of court suits grew. Chapter 5 addresses on-the-ground management responses of national forest managers to the growing pressures of the 1970's.

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Policy Issues and Management Conflicts Challenge Multiple-Use Planning and Management During the 1970's

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Chapter 5

Performance of Multiple-Use Management: 1970 to 1979

This chapter describes the national forest on-the-ground response to the growing demands for multiple uses and the rising pressures for greater environmental sensitivity and protection. It presents a fuller view of the setting for and national forest managers' response to the national policy issues of the 1970's and new congressionally enacted policy direction. Overall, national forest managers continued to respond to the expanding national and local national forest use demands but struggled to implement the new policy direction and the environmental and ecosystem emphases that were rapidly evolving from the national debates and public pressures.

The Internal Forest Service Setting: The 1970's

By 1970, many national forest managers and professional staff were deeply concerned about the direction national forest management was taking. Chief Cliff shared these concerns in a memo to all Forest Service employees (Cliff 1971a). He pointedly reported that programs were out of balance with the public's emerging environmental preferences and that criticisms were mounting on all sides. The national forests needed new direction, and the Forest Service was taking steps to achieve such changes. He cited the draft Environmental Program for the Future (EPF) as a leading initiative to shape these changes — through higher and more balanced congressional funding. The Chief stressed the need to heed President Nixon's response to the Softwood Timber and Plywood Task Force findings to intensify management to increase national forest timber supplies while protecting environmental quality. He also reiterated NEPA's strong requirements and the President's direction that Federal agencies carry out full pollution abatement on all Federal projects promptly.

The Chief felt the key to successfully achieving a more balanced resource emphasis and the new NEPA objectives was increased staffing and funding (Cliff 1971a). If such increases were not feasible, then current activities would have to be reprogrammed: timber sales, road construction, and structural improvements would need to be reduced; funding

for wildlife, watershed, recreation, pollution control, and similar activities would need to be increased.

In July 1971, Chief Cliff summarized the public's view and outlook, as he saw them, before a joint meeting of the Western Association of State Game and Fish Commissioners and the Association of Midwest Fish and Game Commissioners in Aspen, Colorado:

The American public is demanding top quality in the management of natural resources and attention to the way things look. We are already involved in a number of lawsuits reflecting public awareness of our activities. The public is increasingly unhappy with us. This will continue until we get balance and quality into our program, as well as public involvement into our decisions. Until we do this, the course of the public entering into our fairly routine decisions through protests, appeals, and court cases will have the effect of reducing our ability to put timber on the market to help meet housing goals (Cliff 1971b).

Earlier, in January 1970, Chief Cliff had told regional foresters and experiment station directors that he was convinced that an ecosystem approach to the management of national forest uses would contribute to a better life for present and future generations. This approach would provide a high-quality environment for recreation opportunities, fish and wildlife, water, forage, and timber in harmony with the needs of lesser organisms. He encouraged his staff to review the current ecology and ecosystem management references and to participate in a national training program on ecosystem approaches to national forest management.

Following the traditional division of policy and management responsibilities between the national and field offices and the decentralized approach to managing multiple uses, the implementation of this approach and related training was left largely to regional foresters and forest supervisors and their professional staffs. Washington Office leadership would not refocus its multiple-use resource-management policy attention to the ecosystem approach explicitly again until the 1990's.

National Forest Managers' Training in Ecosystem Management

Chief Cliff's views for linking the ecosystem approach to managing multiple uses on national forests were translated into a national ecosystem management training program for national forest managers. This program began in 1970 through joint Forest Service sponsorship of an *Ecosystem Management Short Course* with the Department of Range Science at Colorado State University. At that time, it was the first formal ecosystem management course offered at the university level in the United States (Cook 1994).

The Forest Service sponsorship led to substantial course additions and its expansion from 2 to 3 weeks. It was initially offered three times per year — later reduced to two weeks and two sessions per year — with a minimum of 35 students per session. Forest Service sponsorship continued into the early 1980's, when the program was superseded by the national training program for National Forest Management Planning. In the 12 or so years that it was offered, nearly 1,000 national forest managers and staff experts from the Chief's level down to the ranger district participated in it. Over the years, Forest Service participants made up more than 80 percent of the total enrollees (Cook 1994).

Many Ecosystem Management Short Course graduates became trainees in the national forest management planning training program in the 1980's. Such enrollees provided a bridge for linking ecosystem management principles with national forest planning.

The range management background of many of the course instructors and the Department of Range Science influenced the general context of the course — forested and open rangelands — but it also addressed wildlife, timber, water, recreation opportunities, and related uses. The teaching focused on ecological principles and theory, with a strong emphasis on ecosystem

structure and functions. The course's objective was to provide a generalized understanding of how ecosystems responded to different natural and anthropocentric influences and the importance of maintaining the integrity of ecosystem structure and functions. Instructors often supplemented this training with case studies and field observations. (Bartlett 1994; Cook 1994; Colorado State University undated).

The Washington Office did not furnish any central guidance for applying the ecosystem approach to managing national forest resources during the 1970's. Ecosystem principles were implemented by the trainees who took what they had learned about ecosystem functions and structures and applied it as they saw fit in their daily management work on the national forests. Ecosystem approaches to national forest resource management developed most strongly in connection with range and wildlife. But this emphasis naturally influenced the management of other resources — particularly timber. Early applications of an ecosystem approach within the National Forest System were quite uneven. They were hampered because managers saw uncertainties and risks with such applications, especially the

barriers of the Forest Service's detailed manuals and management guides. Where ecosystem-oriented efforts deviated from manual guidelines and led to unacceptable results, or where supervisors saw aberrations from established guidelines, the ecosystem approach carried career risks for young foresters, resource specialists, and managers (Hartgraves 1994).

Even though the ecosystem approach was not formally adopted, there were many efforts and initiatives to incorporate its principles into managing national forest uses (Hartgraves 1994). One of the most important initiatives established a common framework for classifying National Forest System lands and resources by



C. Wayne Cook, Professor Emeritus of Range Science, Colorado State University, and the driving force in the introduction and development of the Ecosystem Management short course in the late 1960's.



Ecosystem Management short course participants received field instruction and experience to better understand the concept of ecosystem management. Field trips examined both rangeland and forested ecosystems.

ecosystem characteristics. An ecosystem approach to national forest management needed to stratify forest and rangeland ecosystems as they lay on the land.

Classifying National Forest Lands and Resources

In the early 1970's, when national forest unit planning was getting underway, the Intermountain Region's regional forester initiated a project to provide a common framework for classifying heterogeneous lands and resources on the region's national forests. At that time, each functional staff had its own particular approach to land and resource classification and each forest developed its own classification system to fit its specific conditions. Such classifications were influenced by the particular background, training, and experience of the resource staff developing them. The goal of the Intermountain Region's project was to develop a common classification framework that would consistently predict management responses, distinguish ecosystem productivity differences, and be useful for timber, wildlife, fish, watershed, range, recreation planning and management, and the integration of multiple uses across the region (Sirmon 1994).

Robert Bailey, the Intermountain Region's ecological geographer, led the project. He mapped ecoregions (extensive geographical zones over which the macroclimate is sufficiently uniform to permit the development of similar ecosystems on sites with similar properties). Within the same ecoregion, such broad-scale landforms as mountains and valleys, extensive water bodies, swamps, or broad plains modified the "local" climate and led to secondary differences in the ecoregion structure and components. Ecoregion substratifications due to landform were called "landscapes." Due to

different geographic patterns, an ecoregion could contain many landscapes. With this understanding of the relationship between climate and landforms, national forest resource people could consistently delineate and differentiate ecosystem units at several different scales depending on their needs and purposes and upon which questions decisionmakers at various levels would be asking. The variously sized ecosystem units provided a base for consistent estimates of ecosystem productivity, probable responses to management practices, and the interaction effects of such management among ecosystem units (Bailey 1983; 1987a). Because ecoregions and ecosystems units did not follow National Forest System boundaries, Bailey's approach was broadened to cover all ownerships.

In 1976, the Forest Service published the first map titled "Ecoregions of the United States" for the Department of the Interior's Fish and Wildlife Service, a cooperator in the project, to help compile its National Wetlands Inventory. The same map was used in the RARE II process to assess which ecoregions and lower level ecosystem components were not already represented in designated wildernesses.

Bailey's map was later used to identify and locate ecosystems not represented or underrepresented in the National Wilderness Preservation System. The Intermountain Region used Bailey's process in unit area planning and eventually in national forest land and resource management planning. Other regions also used the map, but in the absence of any central consistent direction within the National Forest System, each region applied different or additional criteria for its particular purposes.

National direction for implementing an ecosystem approach to managing multiple uses was to come almost two decades later in 1992, with the further development and refinement of the ecoregion framework and the technology for mapping lower level ecosystem units. In November 1993, David Unger, the Associate Chief of the Forest Service, issued a directive, "effective immediately," to begin using the National Hierarchical Framework of Ecological Units in land management planning, research programs, and cooperative efforts with other agencies and partners (Unger 1993; USDA Forest Service 1993a). This framework has been adopted by several Federal and State resource agencies, including the USDA Natural Resource Conservation Service (formerly the Soil Conservation Service), the BLM, the Fish and Wildlife Service, the Department of Commerce's National Oceanic and Atmospheric Administration, and the Minnesota and Michigan Departments of Natural Resources (Bailey 1987b; USDA Forest Service 1993a). Much of the basic work was developed during the 1970's. Bailey's ecosystem classification approach to meet the needs of the Intermountain Region was national in scope from the very beginning.

Timber Management

As the 1970's began, national forest managers became increasingly aware of needed changes in national forest timber harvesting and management to meet wilderness and recreation uses, environmental objectives, and timber harvest targets. Such needs called for the fuller use of timber and better land management. They included constructing minimum-impact roads that were better fitted to forest uses and environmental needs; using new and advanced logging methods in environmentally sensitive areas; expanding investment in intensive forest practices;

using more successful and effective regeneration methods; planning and designing timber harvest units more carefully to meet landscape objectives; using downed timber more fully, and reducing slash; using environmentally sensitive slash disposal methods; and much more (Roth and Williams 1986a).

The findings of the Monongahela, Bitterroot, and Wyoming clearcutting studies, and the Forest Service's national evaluation of *National Forest Management in a Quality Environment: Timber Productivity* highlighted this need for change. Subsequent congressional hearings on clearcutting and court suits challenging clearcutting reinforced it. Further evidence surfaced in many other studies undertaken by national forest managers at all levels on clearcutting, regeneration success, timberland suitability, the adequacy of timber harvesting systems, logging methods, and road layouts and designs to meet nontimber forest uses and environmental protection needs; determining allowable cut levels; writing and revising timber sale contracts to increase environmental protection; and other aspects of timber harvesting and management.

Three National Forest System-wide actions were undertaken in 1972 and 1975 to improve timber harvesting and management on the ground: implementation of *The Action Plan for National Forests in a Quality Environment*, stratification of the commercial forest land (CFL) base, and shifting the planning approach to unit planning. The first action gave forest-wide direction for applying recommended on-the-ground solutions to the 30 problem situations outlined in the "National Forest Management in a Quality Environment" report. The second action implemented the findings from the study on "Stratification of Forest Land for Timber Management Planning on the Western National Forests" (Wikstrom 1971).

Stratification of the Commercial Forest Land Base

The 1971 stratification study was directed by the Intermountain Forest and Range Experiment Station and conducted by staff foresters from the six western regions. It evaluated the suitability and availability of the CFL base for growing tree crops on six national forests — one in each region. Taking careful account of soil and slope conditions, land productivity, and

land use, major factors influencing suitability and availability, the study reduced the 4.2 million-acre CFL base by 22 percent to 3.2 million acres. An additional 13 percent of the remaining CFL was reported economically or technologically unavailable due to high operating costs, low product values, or terrain that was subject to high risks of erosion or environmental damage with current conventional logging methods (Wilkinson and Anderson 1985).

The stratification study concluded that the traditional differentiation of commercial and noncommercial national forest land had been oversimplified and inadequate for national forest planning — especially for timber management planning. The study recommended stratifying CFL into subclasses, including a “marginal utility” subclass for forestlands with problems of erosion, regeneration, or restocking on unstocked lands or that were otherwise economically and technologically unavailable. It also proposed that such areas be excluded from current cutting budgets to avoid overcutting the commercial timber growing base (Wilkinson and Anderson 1985). A May 1972 amendment to the Forest Service manual on timber management plans established a new classification system requiring CFL to be stratified into four components: standard, special, marginal, and unregulated and the use of the same calculation procedure to determine potential yields and allowable cuts for each.

The CFL *standard* component, the largest one, involved few or no adjustments to the calculated harvest for multiple-use objectives. The *special* component encompassed lands that had been zoned to protect waterways, riparian areas, travel ways, aesthetic areas, recreation areas, and other resources. Land within this component usually required specialized silvicultural prescriptions and modified harvesting methods. Light partial cuts, longer rotations, fewer or no thinnings, no cutting along streambanks, and other special practices usually reduced its programmed harvests. In some cases where special practices could be applied to meet multiple use objectives and environmental constraints, full yields could be realized (Newport 1973a).

In the *marginal* component, very little timber was sold or harvested. For example, in 1973 eight forests in the Northern, Southwest, and Pacific Northwest Regions with new timber plans had programmed an allowable cut of 51 million board feet per year for their marginal lands compared to a potential yield of 156 million board feet. Six of the eight forests had an allowable cut of zero for their marginal components compared to a potential yield of 92 million board feet per year (Newport 1973b; Wilkinson and Anderson 1985). The fourth, or *unregulated*, component included harvests from experimental forests, administrative sites, recreation sites, and tracts isolated from markets. Such areas were very limited.

The new classification system generally reduced the estimated allowable cut on the national forests. For the eight forests with new timber plans, the new allowable cut calculated for 1973 averaged 9 percent below that for January 1, 1972 (Newport 1973b). The reductions were almost entirely from lands withdrawn from CFL. Withdrawals were attributed to special component (multiple-use coordination) and marginal component (critical soil or slope, economic, and environmental problems). By 1977, national forest managers had classed more than a third of the CFL timber base as special or marginal (Wilkinson and Anderson 1985).

The Shift to the Unit Planning System

The third major action modifying timber management planning was the shift from multiple-use plans to unit plans. Each forest had up to 20 planning units, each made up of one or more drainage basins. In 1972, the planning objective for each national forest over the next 10 years became the preparation of an intensive land use plan for each of its units. Units where critical management decisions were to be made were given planning priority. This new system required timber management planners to follow the land allocations of the individual unit plans. In this approach, the areas that unit plans zoned for recreation, scenic landscape, travel influence, water influence, streamside, or critical soil also had to be classified as special or marginal in each forest’s timber management plan. Unit plan allocations also reflected national and regional timber production goals — the first time that national forest planning

policy required timber management planning and implementation to be explicitly coordinated with other multiple uses.

A May 1972 Forest Service manual amendment made another important revision for timber management plans — the whole national forest was to be the area base for allowable cut determinations rather than individual working circles. However, in most regions, regional office timber staffs continued to make the potential yield and allowable cut calculations. The forest timber staff provided data and information, advised on various aspects of allowable cut calculations, and wrote the final timber management plan (Newport 1973a).

The Nondeclining-Flow Policy and Its Measure: Potential Yield

With the help of computer technology and the Douglas-fir supply study in 1969 (USDA Forest Service 1969), national forest managers, for the first time, were able to simulate timber harvests, management, and growth, decade by decade, for several decades beyond the first rotation. Unexpectedly, the study results revealed that, under the existing management intensity, current national forest harvest levels could not be sustained after the old-growth inventories had been harvested in the Douglas-fir region of Washington, Oregon, and California. The study projected that, using existing management intensity, harvests would be reduced 45 percent after the first 100 years. The current harvest level could be sustained only if forests were more intensively managed (Wilkinson and Anderson 1985; Roth and Williams 1986b).

The findings shattered the traditional basis for determining sustainable harvest levels in western old-growth forests — estimating the annual allowable cut by dividing the total old-growth inventory by rotation age and adding the net annual growth of immature timber to it. As a result, national forests shifted the determination of allowable cuts to a nondeclining-flow policy based on the potential yields (or harvests) that second-growth forests could produce using existing timber management intensity. The western timber industry took strong exception, because this policy would immediately reduce the timber supply from western forests. The industry argued that such a

policy would waste the old-growth timber inventories, which greatly exceeded the stocking levels for managed forests (Wilkinson and Anderson 1985).

Ultimately, a compromise based on intensified timber management avoided timber harvest reductions. This solution required the Administration and Congress to make a commitment to increase the second rotation's potential timber harvest volume by increasing the funding for current reforestation, thinning, timber stand improvement, and other intensive practices to accelerate the growth of young timber.

The influence of the expected increases in future timber growth and inventories (due to more intensive stand management) on the current allowable cuts was initially referred to as the "allowable cut effect" (ACE). It has since been renamed the "earned harvest effect" (EHE). However, there was no assurance that Congress and the Administration would sustain higher funding for more intensive timber management over time. Lack of this guarantee made the Forest Service cautious and reluctant to raise allowable cuts based on the EHE.

Nevertheless, the regional forester of the Pacific Northwest Region wanted to evaluate how the Douglas-fir Supply Study findings and methodology and the underlying implications of new computer technology and projection methods would influence planning and management activities and decisions in the region. He wanted to know the impacts on data, information, and skill requirements for planning allowable cut levels; on timber management practices and intensities for individual forests; and on potential second rotation yield calculations. He wanted to know what implications different mixes and levels of timber management practices or improvements in timber utilization standards would have on allowable cut decisions and future timber program planning and funding.

In the early 1970's, Washington State's Gifford Pinchot National Forest was chosen to pilot this evaluation. It had just updated its timber inventory, its 10-year timber management plan was due to be updated, and it was representative of other productive Douglas-fir forests in the Pacific Northwest. As

the Washington Office became involved with the study and the questions it addressed, the study became a national pilot for responding to the Pacific Northwest Region's concerns.

The Gifford Pinchot study found that allowable cut determinations could no longer be made without related decisions about investments to intensify timber management and about the types and amounts of timber management practices that would produce the growth and inventories to sustain current harvest levels into the next rotation (Roth and Williams 1986a). In 1975, the Gifford Pinchot National Forest became the first national forest permitted to reflect the EHE in its allowable annual cut determinations. This action was based on Congress' commitment to provide annual funding needed to support the intensified management over the new timber plan's 10-year life (Wilkinson and Anderson 1985).

On the basis of anticipated funding and backed up by monitored annual performance, this new approach was extended to the entire National Forest System in the late 1970's. Timber management plans documented the acres and types of silvicultural treatments needed to sustain the selected allowable cut level. Annual monitoring of actual treatments and acres treated showed whether such treatments satisfied the 10-year timber management plans' planned treatment schedule. Where actual performance fell short, individual forests reduced their allowable cuts accordingly. If the performance followed the plan, the allowable cuts could be maintained. The Gifford Pinchot fulfilled its scheduled silvicultural treatments during the balance of the 1970's and to the end of its 10-year plan in 1984 (Roth and Williams 1986a).

In line with the Church Guidelines, the Forest Service recommended that the EHE be determined by relying on reforestation, thinnings, and stand improvements for which growth responses had been reasonably documented. Forest planners were discouraged from relying on other intensive practices, such as fertilization and irrigation, whose growth benefits were poorly documented or largely speculative for large parts of the country (Wilkinson and Anderson 1985). Funding for silvicultural examinations, reforestation, and timber stand improvement

practices increased almost three times, from \$50 million in 1968 to \$147 million in 1979 (USDA Forest Service 1992a).

Silvicultural Practices

For silviculturists, the late 1960's and 1970's were a time of growing recognition of the need for more intensive silvicultural examination and management of the national forest timberlands. This was particularly true in the West, where timber management had focused heavily on protection, access development, harvest area dispersal, and natural regeneration. Often the key foresters in the western regions were the timber sale planners and supervisors who carried the principal production workload and produced the major revenues within the National Forest System. Generally, the less-experienced foresters and forestry technicians at the district level were assigned the regeneration and related silvicultural responsibilities (Roth and Williams 1986b). In the East, where national forests were made up largely of heavily cutover timberlands, timber management had focused more heavily on rehabilitating cutover stands, improving their growth and growing conditions, regenerating unstocked lands, and rebuilding growing stocks. This naturally called for more attention to silvicultural examinations, their diagnoses, and the development of silvicultural prescriptions to guide actual management practices.

Both in the East and in the West, national forest managers increasingly recognized the need for more effective silvicultural treatments, including coordination with other multiple uses. This was well evidenced during the Church hearings in 1971. But each region did much more to evaluate its own stand conditions and management needs. In 1974, for example, an evaluation of the timber situation in the Rocky Mountain national forests found that only a third of the harvested land was regenerating successfully. The research bulletin that reported this study characterized the reforestation failures as "galloping devastation" (USDA Forest Service 1974a).

An analysis of the performance of sanitation silvicultural practices in the old-growth ponderosa pine stands in eastern Washington and Oregon revealed that sanitation was not developing any young stands. Sanitation harvests removed old-growth ponderosa

pine trees that were being attacked or were highly susceptible to attacks by bark beetles. Sanitation harvests usually removed about 40 percent of the stand volume, leaving 60 percent to grow. They were seen by the average person as selection cutting. But sanitation harvests were not providing the regeneration needed for the next rotation. The heavy emphasis on sanitation-salvage cutting often left residual stands inadequately stocked and frequently with decreased, damaged, and poorer quality regeneration (Burke 1985). The new silviculture called for complete harvesting of the sanitized stands to start new stands (Roth and Williams 1986a). The Pacific Southwest Region made similar discoveries in California.

In the Pacific Northwest, the most basic finding was that its national forests were not regenerating within 5 years after timber harvest — an NFMA requirement. The record "was not good." Part of the solution was retraining key forest staff. Many foresters returned to universities for a semester or more of retraining to bring them up to speed in silviculture (Roth and Williams 1986a).

Following Chief's Office direction, the first national forest program for training and certifying silviculturists was established in 1973 in the Northern Region, where the Bitterroot National Forest had been a focal point of the Church hearings. It was entitled Continuing Education in Forest Ecology and Silviculture (CEFES). The program recognized the larger context of ecosystems, but due to the narrow understanding and limited ecological science and knowledge at the time, its primary focus was largely on the stand and individual tree interactions and processes with the local environment. Several aspects of other resource interactions were included in the curriculum but not fully integrated into a broader ecosystem context.

Other regions followed with programs of their own over the next 5 years. Each regional program was approximately equivalent to a masters degree and constituted one requirement for silvicultural certification. The other requirements usually included 3 years of silvicultural field work and the successful defense of a silvicultural prescription before a panel of experts. The continuing education programs in

forest ecology and silviculture were strongly coordinated with university programs and faculty and other resource management agencies. In the Northern Region, 461 natural resource professionals participated in the CEFES program. Half of that number were Northern Region foresters or resource experts.

As silvicultural and forest ecology training programs were getting underway in 1973, national forest managers also began to intensify on-the-ground silvicultural examinations and evaluations. Qualified certified silviculturists became responsible for determining stand conditions and the need for cultural treatments. The level of effort for such examinations rose from 101 FTE's in 1968 to 188 person-years in 1975, when each person was examining about 25,000 acres per year. By 1979, FTE's rose to 836 person-years, with one person examining an average of 11,000 acres per year.

Congressional emphasis on eliminating the reforestation backlog gave a big boost to silvicultural examinations. In 1976 and earlier years, less than 5 million acres were examined. This quickly rose to nearly 9 million acres per year by 1979. The goal of the silvicultural examination and diagnosis program was to provide site-specific silvicultural prescriptions prepared or approved by certified silviculturists for all forested lands needing treatment. Each stand was to be reexamined every 10 years to update its silvicultural prescriptions and to keep pace with changing forest conditions and management needs and new technology (USDA Forest Service 1979, 1980, 1992a).

During the same period, almost every region developed automated stand recordkeeping systems to maintain long-term stand condition and management records — making reporting silvicultural accomplishments easier and more reliable.

Most timber activities, including reforestation, timber stand improvement, and timber sale preparation were based on silvicultural prescriptions derived from stand examinations. In areas planned for timber harvests, such examinations and diagnoses reviewed stand conditions throughout the entire sale area, identifying stands that would benefit most from

planned harvest and those that would benefit from such treatments as thinning (Murphy 1994). Silvicultural examinations also produced the data and prescriptions needed for the intensified unit planning process that emerged in the 1970's (USDA Forest Service 1980).

During 1978 and 1979, the silvicultural examination effort completed an NFMA-required inventory of all national forest lands in need of reforestation or thinning. This inventory included an estimate of the acres of treatment and the funds needed to eliminate the accumulated reforestation and timber stand improvement (TSI) backlog and to provide follow-up treatments on stands that would be harvested during the 8 years Congress had given the Forest Service to eliminate the backlog. As of October 1979, national forest lands needing of reforestation totaled 1.6 million acres; 882,000 were the result of timber harvest, fire, insects, disease, wind, and storms or failure of seeding, planting, or natural regeneration before 1975. The balance, 757,000 acres, was acreage that accrued after 1975. For TSI, generally precommercial thinning, the backlog was 2.2 million acres. Precommercial thinnings were needed to reduce the number of trees per acre and thereby increase overall stand health and individual tree growth. Thinning improved the health of stands by strengthening their resistance to drought, insects, disease, and other threats and increased the quality and value of their future growth. More than 400,000 acres of reforestation and 350,000 acres of TSI per year would be needed to eliminate the backlog (USDA Forest Service 1980).

The total acres reforested annually during the 1970's rose about 40 percent, from 313,000 acres in 1970 to 446,000 in 1979. Eighty percent were planted or seeded, while the remaining 20 percent were regenerated naturally. Twenty percent of the increase in regeneration treatments occurred between 1970 and 1977. The balance, 80 percent, was achieved in 1978 and 1979 in response to the newly developed inventory of backlog reforestation needs (USDA Forest Service 1972-1980).

TSI treatments during the 1970's rose almost 60 percent, from 303,000 acres in 1970 to 477,000 in 1979. TSI practices included thinnings and various

other stand improvement measures such as fertilization, which was introduced in the early 1970's, and rose to more than 20,000 acres per year by 1976 (USDA Forest Service 1972-1980).

National forests continued to develop seed orchards and production areas to produce genetically improved for tree nurseries. The capacity of national forest seed extractories was increased as the production and collection of seeds increased. In 1970, for example, national forest seed extractories processed 22,000 pounds of seed. By 1979, they were processing 81,000 pounds. In 1976, the Forest Service initiated a major study of national forest nurseries to find out whether their existing capacity was capable of meeting the reforestation backlog of seedling needs and the needs resulting from new NFMA requirements. As a result of this study, two nurseries were added — one in the Southwest Region and the other in the Pacific Northwest.

Nursery tree production at the 13 national forest nurseries rose from 97 million trees in 1970 to 127 million in 1979. To increase planting stock survival rates on difficult reforestation sites, the nurseries also began producing containerized nursery stock. In 1979, they were providing more than 6 million containerized seedlings (USDA Forest Service 1972-1980).

The Forest Service developed standard methods for evaluating and certifying the effectiveness of silvicultural treatments in 1977 and implemented them in 1978. Regeneration could be certified successful after the third year for plantings and seedings and after the fifth year for natural regeneration. Failures, due primarily to insufficient tree survival, were recorded. Failures that needed further reforestation became a part of the reforestation backlog. TSI was certified in the first and third years after treatment. In 1979, national forests reported certified successful regeneration on 308,000 acres and certified success on 350,000 of TSI (USDA Forest Service 1978-1980).

In the 1970's, the intensification of silvicultural examinations increased the number and quality of silvicultural practices applied on the ground, improved tree and stand growth, and offset some of the impact of the nondeclining-flow policy on allow-

able cuts. The intensified silvicultural approach also reduced clearcutting, which had reached a peak of 564,000 acres in 1970 when timber was harvested from more than 1.5 million acres (Cliff 1971b). In 1978, as the timber harvest area rose to more than 2.6 million acres, the actual area clearcut was reduced to 310,000 acres — a 45-percent reduction in clearcut acres in 8 years (Forest Service 1992b).

Coordination of silvicultural examinations, planning, and treatments with other resource specialists likewise improved. But much of the coordination tended to be consultative and multidisciplinary rather than truly interdisciplinary. Although the NEPA environmental coordination precepts were available, national forests as a whole did not fully and mutually integrate resource specialists into the dominant timber management and harvesting tasks, which largely remained in the hands of the traditional timber staff. Thus, during the 1970's, a true, mutually interdisciplinary approach to timber and general resource planning and decisionmaking evolved slowly and in relatively few places (Roth and Williams 1986c).

Timber Harvests, Logging Systems, and Landscape Management

During the 1970's, the annual amount of national forest timber sold and harvested averaged about 11 bbf — about the same as for the 1960's (fig. 15). The average annual harvests, however, dropped from 11.4 bbf in the first half of the 1970's to 10.6 bbf in the second half. This reflected the decline of national housing and timber demands after the early 1970's (see fig. 10, chapter 4). The average annual volume of timber sold in this period was 0.5 bbf below the average annual volume sold and harvested in the last half of the 1960's (see fig. 6, chapter 3). This reduction largely reflected the influence of growing environmental pressures and the increased designation of wilderness.

During this period, the full annual harvests were concentrated on about two-thirds of the timber land base that was accessible and available for harvesting. This was due to the withholding of RARE I and RARE II roadless areas from harvesting in the absence of a final EIS evaluation of their suitability for wilderness. Because the Forest Service believed that RARE I, then

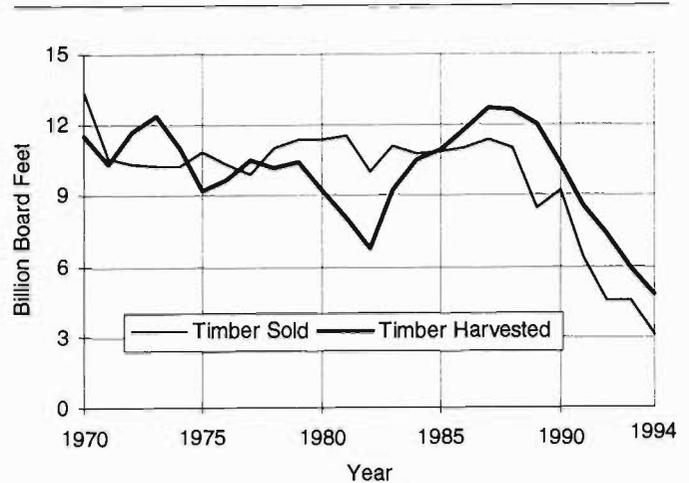


Figure 15. National forest timber sold and harvested, 1970–1994

Source: USDA Forest Service.

RARE II, would resolve the wilderness/roadless area issue in a few years, it kept the timber inventory in roadless areas in the CFL timber base and continued to sell and harvest the full allowable cut. From this viewpoint, it did not seem reasonable to cut back the annual allowable cut, close local mills, and cause unemployment for a relative short-term period. As a result, timber harvesting in already roaded areas was greatly accelerated throughout the 1970's, and this exacerbated environmental issues and concerns related to clearcutting.

This concentration of harvests began to cumulate pressures on related resources of forested rangeland, landscapes, and wildlife cover. Soil movement and stream sedimentation risks increased as larger-than-planned harvest areas had to be roaded and regenerated in the same watersheds. Mitigation efforts increased logging costs as more expensive logging methods and land treatments were required to protect other resources. The harvest concentration also contributed more to the public concern over national forest management than would have been experienced under the normally more dispersed timber harvest program (Roth and Williams 1986d). Throughout the 1970's, appeals and court actions became costly major obstacles to achieving the congressionally established and funded timber targets (USDA Forest Service 1979).

Logging Equipment: Methods and Systems

During the late 1960's, the need to improve logging equipment and systems to respond to the expanding environmental policies and standards and growing public concerns became increasingly clear throughout the National Forest System. Special harvesting methods without the environmental damage associated with ground yarding and road construction were needed to sustain national forest timber supplies (Newport 1973a).

The timber industry and loggers would require considerable persuasion and training to adopt new equipment and methods for felling and yarding timber. They had no independent incentive to make such changes unless such stipulations were built into the timber sale contracts. The timber industry and the loggers generally had only two basic logging systems: tractor yarding and high-lead (yarding with one end of the log on the ground). The high-lead system was largely used on national forests in western Washington and Oregon and northern California — an area where half of the total annual national forest timber harvest was concentrated. The Forest Service conducted special training programs for industrial, Federal, and State forestry personnel in California, Oregon, Washington, Idaho, and Montana to promote advanced cable and tractor logging systems that national forest managers, engineers, and resource specialists had determined would reduce timber harvesting's adverse impacts on soil and water (Roth and Williams 1986a; USDA Forest Service 1972).

The Pacific Northwest Region was the leader and innovator in new logging equipment and systems and fuller utilization of the timber sold, but this was also shared by other regions. It introduced the yarding of unutilized material (YUM yarding), which cleaned up many sale areas, made them easier to reforest, and added to timber supplies. During the 1970's and earlier, logging residues were generally considered cull material. They were widely scattered over each cutting unit or piled and usually burned. YUM yarding concentrated this material at a central landing point. The small material was difficult to sell, but, periodically, when the pulp market was strong or pulp mills experienced a wood shortage, many of the YUM piles were sold for pulp production. Others

were taken for domestic fuelwood (Roth and Williams 1986a).

Other practices applied in the Pacific Northwest Region and elsewhere included requiring loggers to remove lower diameter materials from the sale area. As an incentive for purchasers, the smaller, less merchantable timber sale components were offered at a fixed lump-sum contract price per acre (Roth and Williams 1986a). Salvage logging was introduced to increase timber supplies and to reduce the loss of such timber to decay and insects. In 1977, Congress established a revolving timber salvage sale fund. By 1979, such sales added a billion board feet annually to national forest sale volumes. During the 1970's, the amount salvaged grew as timber markets and prices became stronger and receded in years when markets were weaker. The trend in the use of small timber materials followed a similar pattern (USDA Forest Service 1980; USDA Forest Service 1992a). National forests also instituted a free use-permit system so that people could cut dead timber for fuelwood. Before 1970, the use of national forest timber for home-heating fuelwood was nominal. By 1979, however, some 700,000 families were collecting a total of 3.2 million cords per year of national forest fuelwood — a trend that continues today (USDA Forest Service 1980). Directional felling of old-growth was introduced by the Pacific Northwest Region as a contract requirement to reduce tree breakage, improve tree utilization, and reduce erosion damage on steep slopes with shallow soils (Roth and Williams 1986a).

Perhaps the Pacific Northwest Region's most significant accomplishment toward better land management was the development, improvement, and diversification of entire logging systems and fitting them to the site-specific needs of individual harvest areas. The Pacific Northwest Region initiated a program for testing and demonstrating various forms of skyline logging (a system that lifts both ends of logs off the ground during yarding). Helicopter and balloon logging methods were also tested. Helicopter yarding proved to be very costly (\$1,300 per hour of flight time) and ultimately was limited to areas where other logging systems could not be used on the timber sale and the environmental benefits and road-cost savings justified the costs.

Most logging improvement focused on skyline logging systems that could operate on concave slopes and reach out laterally for 800- to 5,000-foot yarding distances. A Pacific Northwest Region survey of lands requiring such systems estimated that they contained a 40-bbf timber inventory — equivalent to an annual allowable cut of 0.4 to 0.5 bbf over 100 years (Roth and Williams 1986a; Newport 1973b).

The skyline logging development program offered several practical challenges. National forest engineers were basically trained as civil, not logging, engineers. Forestry schools' logging engineering programs had been greatly retrenched or eliminated. Thus, there was a major challenge to recruit and/or train logging engineers who could test, evaluate, and demonstrate advanced logging systems. These logging systems needed to be evaluated on both environmental and economic criteria to ensure that they would be successfully adopted on national forests by the timber industry. A third challenge was to develop and provide training programs for technicians on how to use the advanced logging systems and for line and staff officers on how to design timber contract specifications for using these advanced logging systems. During the 1970's and later, the Forest Engineering Institute (FEI) at Oregon State University met these challenges. It provided a month-long course for technicians and a 1- or 2-year training program for professional foresters and engineers. A research and development program to improve existing and develop advanced logging systems called FALCON (Forestry, Advanced Logging, and Conservation) was proposed and funded from existing national forest appropriations for a 5-year period. FALCON's second component was to study the compatibility of different logging systems with various

resources and their impact on those resources.

A third component established a demonstration area in the Pansy Creek drainage on Oregon's Mount Hood National Forest where a person could observe all the different logging systems and their impacts on the resources of a harvested area and its surrounding sites (Roth and Williams 1986a).

Road Design and Construction

The Pacific Northwest Region modified road designs and construction to reduce their impact on soil and water resources — particularly where roads served individual harvest settings and otherwise carried light traffic volumes. Civil engineers managed the national forest road program and set road design standards. The Forest Service began to use civil engineers in the early 1950's when national forest logging and road construction began to expand rapidly. Prior to that time, forest engineers were primarily forestry school logging engineering graduates.

Civil engineers were trained primarily to meet urban and highway engineering standards and the roads that they designed for lower class forest roads often



The typical logging road on Alaska's Tongass National Forest is also used for recreational fishing and hunting.

exceeded the standards needed or required for forest use and management. These roads were generally too wide and were built to too high a standard. They involved larger volumes of sidecast rocks and soils than necessary to maintain their grades and widths. Excess material was often pushed over roadsides, where it became an erosion and sedimentation problem.

This problem was familiar to and a concern of national forest managers throughout the system, but it took Regional Forester Rex Ressler's leadership to bring this situation to a head in Washington and Oregon. A region-wide forest supervisor's meeting — an historic first for such meetings — was held on a timber sale road where alternative road standards could be thoroughly reviewed and discussed in relation to actual ground conditions and environmental needs. The meeting's outcome was clear direction from the regional forester to design and build what came to be known as "minimum-impact roads." Minimum-impact roads were narrower, had less sidecast material, and required less end hauling. They required no special surfacing material and less rock. Compared to the impact of the previous higher standard road designs, they substantially reduced the scarring of hillside landscapes. Minimum-impact roads were increasingly used in the Pacific Northwest Region during the 1970's, and their use continues today. Similar road design and construction improvements were made in other regions (Roth and Williams 1986a).

During the 1970's, almost 75,000 net miles were added to the national forest road system (fig. 16). Road construction and reconstruction (rebuilding existing roads that had been degraded or did not meet existing design standards or reopening closed roads) averaged 9,494 miles per year for the decade. (USDA Forest Service 1972–1980). Most of the reconstruction was concentrated in the regions with the largest timber harvest volumes. In the Pacific Northwest Region, for example, which harvested more than 42 percent of the total national forest timber cut during the 1970's, reconstruction constituted almost half of the total road construction (Coghlan 1995). Reconstruction of existing roads to current requirements and standards did not count as net additional road mileage. Roads actually construc-

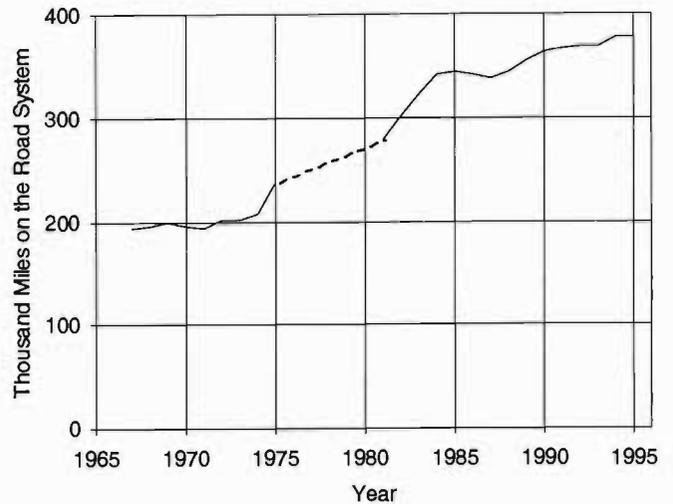


Figure 16. Total road mileage in the National Forest System, 1967–1995

Source: USDA Forest Service 1996. Data provided by Washington Office Engineering.

ted and reconstructed in the 1970's totaled 94,944 miles, more than the net increase in the total miles of national forest roads. Only 6.4 percent, or 6,013 miles, of these roads were funded by direct congressional appropriations. The vast majority were built by timber operators and funded by timber sale proceeds (purchaser credit). Purchaser-built roads were primarily logging spur roads and some secondary or collector roads. Mainline access roads were usually funded with appropriated funds and often included standards necessary to meet recreation traffic requirements as well as mainline road needs for loggers to reach public highways.

Landscape Management

In the late 1960's, national forest managers recognized that sustaining timber harvests would require blending the location and design of timber harvest areas and roads with the general landscape in ways that protected visual quality. This need led to a new landscape management approach that provided a harvest layout design that responded to the public's interest in landscape views and vistas while achieving timber harvest objectives (USDA Forest Service 1972, 1974).



Moon Pass Road, Idaho Panhandle National Forest, where it passes cedar swamp snags and forest regrowth from the 1910 fire. This gravel-surfaced road is cooperatively maintained by the Forest Service and Shoshone County, mainly for recreation in the summer and snowmobiling in the winter.

While the first efforts to integrate harvest locations and boundaries with the natural landscape emerged in California, systematic visual resource management guidelines emerged in Oregon and Washington. At the Chief's request, a silviculturist and landscape architect combined their skills to prepare a regional guide as the first component of a national manual released in 1974 under the title *National Forest Landscape Management* (USDA Forest Service 1974b; Roth and Williams 1986a). This manual identified visual landscape characteristics and provided guidelines to analyze the visual effects of different timber harvest alternatives. Its main purpose was to help national forest managers coordinate timber harvest designs and plans with maintaining acceptable vistas. Such landscape management involved both the location and shaping of timber harvest units. During the 1970's, national forest managers recruited the Nation's, and perhaps the world's, largest staff of landscape and environmental experts to plan timber harvest area landscapes. Such specialists became skilled in harmonizing national

forest installations such as roads, log landings, ski lifts, and other signs of land management with nature's woods and natural beauty.

Chapters on range and roads were added to the *National Forest Landscape Management* series in 1977. These handbooks provided vocabulary, planning guidelines, and an objective-setting process. The range chapter offered ideas on acceptable manipulation of forage vegetation and the installation of range improvement structures. The roads chapter provided methods to reduce the visual impact of roads so that they "lay lightly upon the land" (USDA Forest Service 1978).

A supplemental report, "Land Use Planning Simulation," described how the visual impacts of proposed timber sale areas, power lines, surface mining, and other land uses and installations could be evaluated by projecting visual impacts on a screen. This became a useful tool in providing large groups of people the opportunity to see and react to the visual effects of various timber harvest alternatives. In 1978 and 1979, additional chapters on timber and wildlife were prepared. They illustrated methods for combining visual resource management with silvicultural and wildlife habitat practices to achieve attractive as well as productive landscapes.

The use of the *National Forest Landscape Management Handbook* broadened beyond national forests as demands for the publication and its concepts from universities, other Government agencies, and the public grew throughout the 1970's (USDA Forest Service 1978-80). To reflect the substantial advances in research and technology since 1974 and respond to a significant increase in the demand for high-quality scenery, the 1974 handbook was revised and

updated and released in August 1996 under the new title *Landscape Aesthetics: A Handbook for Scenery Management*.

By 1979, all national forest regions had completed analysis and mapping of that 40 percent of National Forest System lands where visual quality objectives needed to be integrated with forest management activities. This helped to ensure that the scenic aspects of such land areas would be taken into account as growing national forest land use and management shaped their future direction.

Wilderness Management and Use

Much of the wilderness management effort in the 1970's was devoted to wilderness planning for RARE I and RARE II and evaluating the 5.5 million acres in 34 national forest primitive areas that Congress had assigned for further study in the Wilderness Act of 1964. National forest primitive area evaluations were completed on schedule. By September 1974, all 34 areas had been recommended to Congress for designation and had actually been designated as wilderness. In the same year, the national forests celebrated the 50th anniversary of the designation of the first administrative wilderness in the Nation — the Gila Wilderness — with commemorative ceremonies held in Silver City, New Mexico. The celebration was held within sight of that first wilderness established on national forest lands.

The expanding number, area, and use of national forest wildernesses increased the wilderness management challenge in every dimension in the 1970's. Their number rose by 80 percent, from 61 to 110. Their area increased from 9.9 million acres to 15.3 million (55 percent). Their dispersion among the States rose from 13 in 1970 — 10 in the Far West plus Minnesota, New Hampshire, and North Carolina — to 26 States in 1979. Twelve of the new States were in the East, a reflection of the eastern wilderness legislation: Alabama, Arkansas, Florida, Georgia, Kentucky, Missouri, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin. Utah was the thirteenth. But, even with this wider dispersion of wilderness areas, some 92 percent of the total designated wilderness remained concentrated in the eight Rocky Mountain States and

the three Pacific Coast States (USDI/USDA 1970–1980).

The growing number and expanse of designated wilderness areas multiplied the need for wilderness management plans. By 1979, management plans had been completed and implemented for 46 areas. Planning was under way for another 38 and pending for most of the 24 units added in 1978. No areas were added in 1979. The new national forest land and resource management planning guidelines issued in 1979 fully integrated designated wilderness management direction into the new forest plans.

A 1970 study, prepared by the Department of the Interior in consultation with national forest mining specialists updating the 1961 and 1964 reports to Congress on wilderness mining activities, reported 18,000 unpatented mining claims and 1,500 patented claims in designated wilderness and primitive areas. In the 1964 Wilderness Act, Congress had directed that these mineralized areas, located on 34 national forests, be evaluated and that recommendations be made on their suitability for wilderness. The mineral reviews for these areas were completed and published in 1973 by the U.S. Geological Survey and Bureau of Mines (USDI/USDA 1970–1980).

The most demanding challenge facing national forest wilderness managers in 1970 was the preservation of the wilderness resource and its pristine conditions in the face of rapidly rising use, which in that year exceeded 5 million RVD's. The management experience to 1970 also clearly demonstrated a rising trend of wilderness use violations; these exceeded 200 per year and involved 173 prosecutions. Many violations were unintentional, where violators generally failed to comply with Forest Service regulations. Many users were either unaware that they had entered wilderness areas or were uninformed about wilderness restrictions — indicating a priority for wilderness user education and clearly marked wilderness boundaries (USDI/USDA 1970–1980).

National forest managers were participating and assisting wilderness search and rescue operations, which were likewise increasing. In 1971, for example, there were 84. A rising number of fatalities were

also being reported each year. In 1971, there were 16 — four lives were lost in airplane accidents and 12 fatalities occurred as people were testing their skills against the wilderness. Many more people suffered serious injuries during their wilderness activities. Such instances were expected to occur more often as the number of wildernesses and users continued to grow.

A more systematic problem was occurring at the most popular lakes, streams, and other scenic or attractive spots in the wildernesses, particularly those near highly populated urban areas or in areas that were otherwise readily accessible. Many groups and individuals visiting such attractions were not seeking, or often did not have the skills to meet, the challenges wilderness offered. The intensity of use around many such spots was rising to the point that it was threatening the quality of the wilderness resource. Thus, in the early 1970's, the following wilderness management priorities emerged: preparing and distributing educational information on wilderness restrictions, ethics, and safety to users; posting wilderness boundaries; establishing proper people-carrying capacities for wilderness and managing use accordingly; cleaning up human debris and waste; providing sanitation controls; removing nonconforming structures and developments; and administering grazing and mineral exploration activities as permitted by the Wilderness Act.

To serve the preferences of national forest visitors seeking primitive-type offroad activities without the need to do so in a formally designated wilderness, national forest managers expanded complementary space and sites outside the wilderness for back-country hiking, camping, hunting, fishing, and other roadless recreation activities.

During the 1970's, the number of wilderness visitor days rose by 85 percent. This compares with a 27-percent increase in the total acreage of national forest wilderness and primitive areas available for wilderness experience and activity (fig. 17). The available area rose from 14.3 million acres in 1968 to 18.1 million in 1979. Thus, the intensity of use of wilderness opportunities nearly doubled in the 1970's. This rapid growth in wilderness use contrasts with a 35-percent increase in total outdoor RVD use on national forests during the same period.

On a State-wide basis, California, with 13 percent of total available national forest wilderness and primitive area in 1979, continued to receive the most RVD use — about 20 percent of the total. The Boundary Waters Canoe Area in Minnesota, with 5 percent of the available wilderness and primitive area, however, was the single most intensively used wilderness. It provided 12 percent of the total national forest wilderness visitor day use. Together, the California wildernesses and Boundary Waters Canoe Area

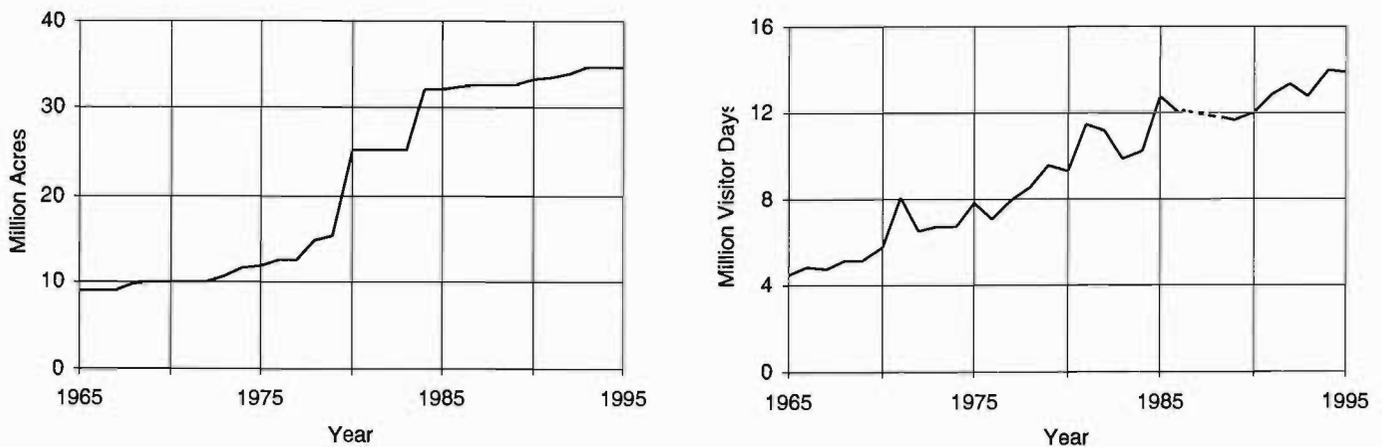
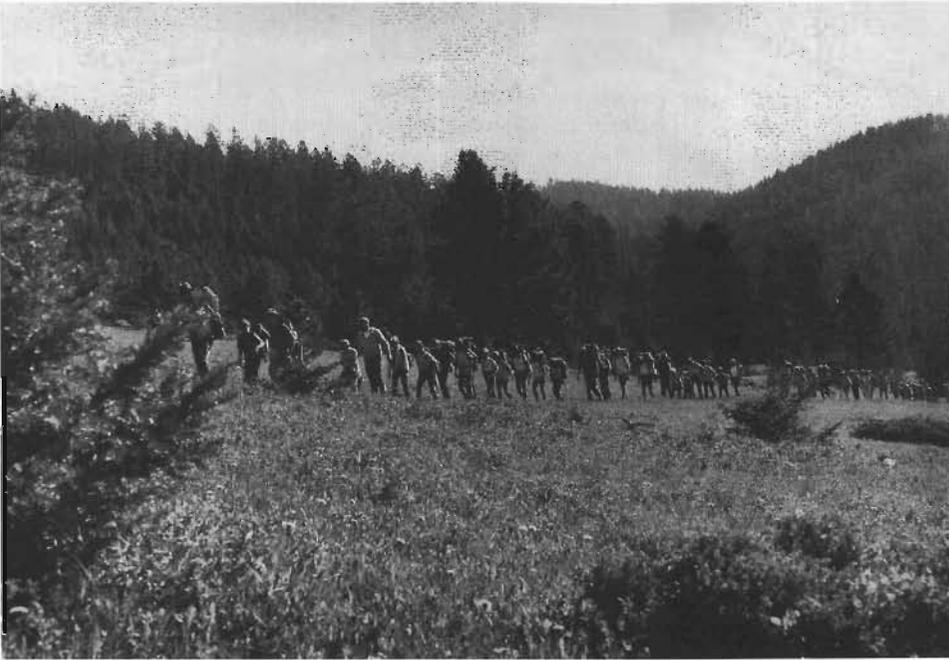


Figure 17. National forest wilderness area and visitor use, 1965–1994.

Source: USDA Forest Service.



Fifty-four wilderness hikers crossing Bear Prairie on the annual "Gates of the Mountains" wilderness hike, Helena National Forest, Montana, 1970.

accounted for almost a third of national forest wilderness use.

To manage wilderness use consistent with its capacity and capability, national forest managers introduced a wilderness permit system in the early 1970's. They expanded its use wherever it would help to ensure that wilderness resources would be properly and safely used and would help to control human debris and waste. By 1979, 50 percent of wildernesses and primitive areas, including all California wildernesses and the Boundary Waters Canoe Area, were under the permit system. Where it was implemented, the permit system generally worked satisfactorily and improved wilderness management effectiveness. Permit issuance, either by a staff person or volunteer at a wilderness trailhead or at the local ranger district office, gave national forest employees the opportunity to communicate directly with wilderness users and inform them about wilderness care and use. Wilderness users appreciated and responded to this information. Where permits were used, national forest managers reported less litter and reduced ecological impacts (USDI/USDA 1970-1980). Individuals, groups, and organizations who were interested in maintaining a high-quality national forest

wilderness system increasingly volunteered work on projects. They communicated with visitors, performed searches and rescues, maintained signs and trails, cleaned up campsites, removed debris, and performed various other supporting functions.

The dominant recreation activities among wilderness users in the 1970's were hiking; horseback riding with pack stock and backpacking, usually with guide services; camping; hunting; fishing; and mountain climbing. In the late 1970's, winter wilderness activities were becoming more popular in

some places and were seen as likely to increase the need for search and rescue operations, which were ranging between 265 and 310 per year. In the late 1970's, fatalities averaged more than 40 per year. Many could have been prevented with better understanding about how to meet nature on its terms, how to effectively prepare for emergencies, and how to develop skills in wilderness activities and conditions.

Trespass and violations increased during the 1970's despite the improved intensity of wilderness information, supervision, and management. In 1976, they reached a peak of 794 and remained a continuing problem for the balance of the decade. Wilderness violations involved various forms of motorized equipment, occupying and using wilderness without a permit, not complying with a wilderness permit, and violating special wilderness restrictions. In 1978, two incidents of armed robbery and one murder required coordination with local law enforcement authorities (USDA/USDI 1970-1980).

Although wilderness interests were successful in getting Congress to endorse lower than pristine standards for wilderness candidate areas and wilderness designation, the management of national forest

wilderness continued to be guided by pristine standards. Wilderness interests did not oppose them — although some users complained about permitted livestock grazing and horse use, legitimate mining activities, thefts, low-flying aircraft, and, in some places, the permit system.

Outdoor Recreation Use and Management

RVD use for a wide variety of recreation activities grew throughout the decade, despite rising concerns and issues among various resource interest groups and some users about wilderness preservation, timber harvest levels and related road construction, and clearcutting, all of which probably contributed to the culmination of the wilderness preservation, timber harvesting, and clearcutting issues during the 1970's. National forest management of multiple uses, on the other hand, encouraged and helped make this growth possible.

Growth in Total Visitor Use

National forest outdoor recreation use in the 1970's increased from 163 million RVD's in 1969 to 220 million in 1979 (see fig. 8, chapter 3). While annual RVD use on other Federal lands, mainly national parks, declined after 1976 by nearly 30 million RVD's, outdoor recreation use on national forests continued to rise by more than 20 million RVD's. Fitting these expanding demands for outdoor recreation opportunities with other uses on national forests became and remained a major management challenge for national forest managers throughout the decade (USDA Forest Service 1970–1980).

Visitor use and growth were concentrated in the western national forests. The seven western national forest regions accounted for 78 percent of the RVD use and more than 80 percent of the RVD growth during the 1970's. The western regions included the Pacific Coast and Rocky Mountain States plus Alaska, North and South Dakota, Nebraska, and Kansas. They made up barely 20 percent of the U.S. population, but had more than 90 percent of the national forest area. Visitor use was largely local or regional and averaged 3.5 RVD's for each western person each year. The intensity of use varied by State from 2 to 3 RVD's per person per year in South Dakota and the most populous States of California and Washington to 10 to 12 RVD's per person per

year in less populous States such as Idaho, Montana, and Wyoming. In North Dakota, Nebraska, and Kansas, where national forest acreage was minimal, national forest use averaged barely a tenth of a visitor day per capita per year (Poudel 1986).

RVD use on national forests in the East totaled 36 million in 1969 and was about equally divided between the Southern Region and the Lake States and North-eastern Regions (combined and called the Eastern Region in mid-1970's). By 1979, it had risen by 32 percent, to 48 million. Almost 85 percent of the increase had occurred in the Southern Region. Because the population in the East is very dense and highly urbanized, average per capita use per State among the Eastern States was very low. Although national forest acreage in the East was small, and constituted less than 12 percent of the area of the National Forest System, it was used twice as intensively as that in the West (Poudel 1986).

Camping accounted for more than 23 percent of the increase in RVD use on all national forests. It rose by 13 million RVD's between 1969 and 1979. Motorized travel through and within national forests for general viewing and accessing specific recreation sites and opportunities accounted for 20 percent of the RVD increase, rising by 17 million during the decade to 50 million. Safe, drivable roads became important during the 1970's, not only for viewing the forest and its mountain scenes and environment, but also for accessing the wide variety of recreation resources — streams, lakes, mountainsides, and trails and the developed sites for camping, boating, swimming, skiing, and other activities (Poudel 1986).

Outdoor recreation visitors to national forests typically devoted about 38 percent of their RVD's to activities in developed sites such as campgrounds and picnic areas; winter sports sites; water developed for boating and swimming; observation sites; various interpretive, informational, and documentary facilities; fishing areas and trailheads; playgrounds, parks, and sports fields; recreation residences; and hotels, lodges, resorts, and concessions. Visitors devoted about 42 percent of their RVD's to dispersed recreation activities throughout the national forests and an additional 20 percent to motorized travel on forest roads (Poudel 1986).

Staffing for Recreation Management

National forest staffing for recreation planning and management and operations and maintenance generally followed the upward trend in RVD use. Professional and support services rose by 35 percent between 1973 and 1979, from 4,300 FTE person-years to 5,900 FTE's (USDA 1992a). Almost 95 percent of the staffing was directed to general recreation and served both developed and dispersed recreation sites, opportunities, and uses. This included landscape planning, which was a growing component of the recreation function during the 1970's and worked closely with timber sale planners and road engineers. The remaining 5 percent of the staffing was directed to cultural resources and wilderness management.

National forest managers also graciously and generously used human-resource programs and volunteers to accomplish a large part of their expanding operational, maintenance, and construction work needed to support rapidly growing recreation use and activities on national forests. The programs (shown with their dates of initiation on national forests) include the Job Corps (1965); the Youth Conservation Corps (1971); Volunteers in the National Forest (1973); the Senior Community Service Employment Program (1974); the Young Adult Conservation Corps (1977) and various hosted programs (1960's–1970's) of other agencies, States, and the private sector, such as College Work Study, the Work Incentive Program, Vocational Work Study, and programs authorized under the Comprehensive Employment and Training Act of 1973 (CETA).

These programs provided conservation education through natural resource activities on national forests, skills training, employment, and national service opportunities for the unemployed, underemployed, minorities, disadvantaged, youth, elderly, retired people, and persons with disabilities. Through conservation work projects, participants made valuable, increasing contributions to visitor information services, recreation site and facility maintenance, camp unit construction, trail maintenance and construction, and clerical support throughout the 1970's. The total work provided by human resource programs and volunteers rose from less than 4,000 person-years in 1970 to more than 6,000 person-years in 1975, and more than 16,100 person-

years in 1979. The great growth after 1975 was largely due to the initiation of the Young Adult Conservation Corps in 1977 and expansion of the Youth Conservation Corps and Senior Community Service Employment programs during the 1970's. The number of volunteers continued to expand rapidly after 1975 (USDA Forest Service 1972–1980).

In 1979, 93 percent of the total services available to the Forest Service from human-resource programs were used on national forests. Recreation resources and users received a major share. Other resources benefitting from these services were timber stands and wildlife habitats. The total estimated value of all human-resource services provided to the Forest Service in 1979 was \$164 million and compared with \$28 million in 1975 and about \$13 million in 1970, measured in constant 1979 dollars (USDA Forest Service 1972–1980).

Capacity and Use at Developed Sites

In addition to upgrading the sanitary facilities at developed recreation sites, the annual recreation investment on national forests in the 1970's rehabilitated many deteriorating sites and constructed some new ones. Between 1970 and 1979, Federal and private investments increased the capacity of national forest developed recreation sites for visitor use occupancy by 12.6 percent. Use at developed sites rose by 21.0 percent during this same period, to 81.9 million RVD's — more than the capacity of developed sites could accommodate (fig. 18). Forty percent of this increased use was accommodated by more effective and intensive use of existing sites during the recreation season. Recreation visitors were encouraged to use available existing sites on weekdays rather than weekends. To achieve fuller use of the available developed sites, new sites or those replacing abandoned sites were located in areas of stronger recreation demand and greater user access (Poudel 1986).

National forests operated 53 percent of the total occupancy potential at developed sites. The balance was privately operated, usually with privately constructed facilities, under the national forest special use permit system. The privately operated facilities included all recreation residences and public concession sites; most of the hotels, lodges, and resorts;

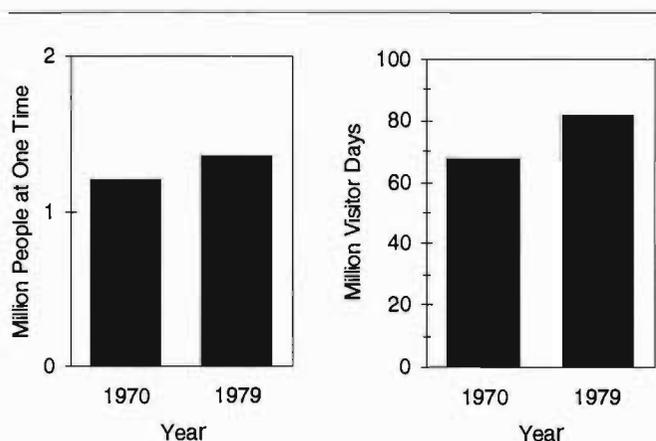


Figure 18. Developed outdoor recreation site capacity and use, 1970 and 1979

Source: USDA Forest Service.

some winter sports sites and boat marinas; and organizational camps administered by youth organizations and other groups. Privately operated developed-site occupancy capacity increased by 15 percent during the 1970's; national forest occupancy capacity increased by almost 10 percent (Poudel 1986).

The largest occupancy capacity increase occurred at winter sports sites, which grew by 43 percent during the 1970's. RVD use of winter sports sites, mainly ski areas and other facilities, increased by 6.4 million, or 98 percent. The next largest increase in RVD use occurred in campgrounds. It grew by 4.1 million RVD's, or 10 percent, and was accommodated primarily by more intensive use of existing sites. The use, however, shifted among campground sizes and types of camp units. Over the decade, a third of the campgrounds with 25 or less units were shut down and their capacity replaced by expansion of larger existing campgrounds and by constructing new, larger ones. Between them, campgrounds and winter sports sites accounted for 75 percent of the increased use at developed sites between 1970 and 1979. Boating sites and interpretive sites each accounted for an increase of 1.1 million RVD's of use and about 15 percent of the total increase. Occupancy capacity for each rose between 50 and 60 percent.

Visitor use of hotels, lodges, resorts, and public service concessions increased by 800,000 RVD's, or 17 percent, and was accommodated largely through increased use of existing facilities. On the other hand, recreational residence use declined by 900,000 RVD's as national forest managers reduced the number of recreation residence permits. Beginning in the late 1960's, national forest policy called for a shift in the use of isolated individual private recreation residence sites to public purposes. Where public values exceeded those for continued private use, existing permits for some of the more isolated residence sites would be canceled and no new permits would be issued for establishing any additional private recreational residences. Permits for recreation residences that were located in established residential tracts were not subject to cancellation (USDA Forest Service 1969, 1978-1980).

Other uses, such as swimming, picnicking, and scenic observation, also grew, between 400,000 and 450,000 RVD's, and were accommodated primarily through more effective use of existing sites. The number and capacity of picnic areas and scenic observation sites were reduced. Visitor use at existing playgrounds, parks, and sports sites quadrupled from 1970 to 1976 and led to expanding existing sites and building new sites that doubled occupancy capacity during that period. A further doubling of capacity by 1979, however, proved excessive and was not fully utilized until well into the 1980's (Poudel 1986).

Finding ways to more fully use existing developed site facilities, providing supervision and information, and meeting the higher maintenance needs of more intensive use were major management achievements in the 1970's. Human-resource and volunteer programs contributed importantly to these achievements. The effectiveness of this effort is reflected in the maintenance of fully 74 percent of the forest-operated developed sites at the "full service" level for visitor use and enjoyment in 1978, primarily at the more intensively used sites. Only 26 percent received a "reduced level" of maintenance and service for visitor use. In 1979, however, the developed sites receiving full-service maintenance fell to 69 percent as the fast-growing use continued to strain available, but limited, national forest resources for recreational

facility management and maintenance. Congressional funding for recreation management was escalated in 1978 and 1979 to help meet the need for higher maintenance and, in some instances, rehabilitation of deteriorating sites (Poudel 1986).

National Forest Trails

The national forests fully maintained 98,000 miles of trails in the 1970's (Poudel 1986; USDA Forest Service 1992a). In 20 States — Arizona, Colorado, New Mexico, Nebraska, Wyoming, North and South Carolina, Georgia, Florida, Mississippi, Louisiana, Texas, Oklahoma, Arkansas, Tennessee, Pennsylvania, Indiana, Missouri, Wisconsin, and Minnesota — and Puerto Rico, trail use increased an average of 4.2 times, from a million RVD's to 4.2 million RVD's, between 1969 and in 1979. As trail use by recreation visitors continued to escalate rapidly, the total miles of trail constructed and reconstructed with Federal funds rose from an average of 283 miles per year from 1970 to 1976 to 1,052 miles per year between 1977 and 1979. Human-resource and volunteer programs also rebuilt existing trails or built new ones. In 1970, volunteers built only 50 miles of trail; in 1978 they built 1,236 miles, and in 1979, 878 miles, approximately equaling the trail miles constructed with Federal funds in the late 1970's (USDA Forest Service 1972–1980; USDA Forest Service 1992a).

Trails generally provided recreation opportunities for hiking and horseback riding with pack animals. But, some were designed for bicycling, snowmobiling or other offroad vehicles (ORV's), and cross-country skiing. Trails also provided access to the backcountry, including wilderness, as well as pathways to reach undeveloped recreation areas such as mountain climbing sites, lakes, streams, and mountaintops.

Congress designated both the Appalachian Trail and the Pacific Crest Trail as national scenic trails in 1968. During the 1970's, national forests constructed or reconstructed more than 90 percent of the 840-mile Appalachian National Scenic Trail and 76 percent of the 2,600-mile Pacific Crest National Scenic Trail (USDA Forest Service 1980). By 1977, national forest managers had evaluated and designated 14 additional national recreation trails. However, President Carter, in his environmental message for FY 1979, expanded the goal to designating 244

national recreation trails on national forests by 1980. This goal was exceeded. At the end of 1978 there were 69 national recreation trails, and by the end of 1979 there were 256, totaling 2,986 miles. Many trails were located near large population concentrations. Much like the regular national forest trails, they were designed mainly for foot travel, but some provided for bicycles, horses, snowmobiles and other ORV's, and others were designed for cross-country skiing. Other national recreation trails were built for wheelchairs and still others had Braille markers for natural wonders that could be touched, smelled, or heard by the blind. Such trails varied in length from a quarter mile to 200 miles and were located in 36 States.

Visitor Information Services and Centers

By 1971, Visitor Information Services had established more than 300 national forest information stations, including ranger stations, where information services were available to visitors. Other information areas, services, and facilities in 1970 included 973 interpretive signs, 291 slide talks, 256 interpretive trails, 255 scenic overlooks, 209 interpretive brochures, and 60 auto tours. In 1970, visitors devoted 2 million RVD's to using these information facilities, talks, walks, slide shows, and tours (USDA Forest Service 1972). Use of these services and facilities and those added during the 1970's grew to more than 4 million RVD's by 1979. Information stations increased to 584.

Beginning in the 1970's, national forest managers increasingly used cooperative agreements with private interpretive associations to staff and operate visitor information facilities. In 1971, five such associations, comprised of local citizens, were providing national forest visitors with information on natural and human history, forestry, and fire prevention at visitor information facilities — and negotiations were underway for agreements to recruit five more. By 1979, the growth in interpretive association services led to the establishment of an Interagency Task Force on Interpretation — a task force that met monthly to interchange ideas among Federal agencies, professional interpretive association representatives, and the Smithsonian Institution. The task force is known today as the Federal Interagency Council on Interpretive Services.

Recreation Special Use Permits

National forest managers worked cooperatively with permittees to administer more than 20,000 recreation special use permits each year during the 1970's for the private use of national forest land by individuals and families for recreation residences; by youth, religious, and civic groups for organizational camps and group-oriented recreation activities; and by commercial concessionaires to provide recreation services for a fee to national forest visitors. The largest number of special use permits were issued to construct private recreation residences on national forest sites. In 1969, there were 19,000 such sites, but by 1979 their number was reduced to 17,220. Permits were also issued to youth, religious, and civic groups to construct and maintain organizational camps. In 1979, national forest managers provided for 542 such camps — a decline of 23 since 1969 (USDA Forest Service 1970, 1979–1980). In 1979, commercial concessionaire permits numbered nearly 3,000 (table 2).

National forest managers worked with permittees to protect the forest environment and the health, safety, and welfare of national forest visitors and resource users. They made periodic inspections of permittees' activities to ensure that they conformed to permit standards and other provisions. For example, in 1970, as the number of skiers continued to grow and the use of snowmobiles steadily increased, national forest managers recognized that public exposure to avalanche hazards was increasing at winter sports sites and in cross-country travel. In 1971, working with permittees, users, and other interests, the Forest

Table 2. Number of recreation special use permits issued to commercial concessionaires, 1979

Services	No. of Permittees
Stores and Restaurants	160
Ski areas and Winter Sports	218
Hotels, Lodges and Integrated Resorts	363
Marinas	930
Outfitters and Guide Services	1,310
Total	2,981

Source: USDA Forest Service 1980.

Service initiated a program to develop a National Avalanche School in Reno, Nevada (USDA Forest Service 1972). The National Avalanche School has been conducted regularly every other year since 1972, with an average of 200 enrollees from the National Forest System, ski area operators and employees, members of the National Ski Patrol, and employees of county, State, and other Federal agencies (Kurman 1996; Barr 1996).

In 1979, special use permittees paid \$8 million in fees for their permits. Concessionaire operators paid \$5 million for operating privileges and the use of national forest lands. Recreation residence permittees paid \$3 million — an average of \$170 per site per year.

Offroad Vehicle Use and Management

As ORV use became a highly popular and more widespread recreation pastime on Federal lands in



Gallatin National Forest, Montana, snow ranger and ski patrolman fire a 75-mm recoilless rifle to reduce avalanche hazards by triggering planned avalanches, Bridger Bowl area, 1970.

the 1960's and early 1970's, conflicts began to arise with other uses and interests. In 1972, President Nixon's Executive Order 11644, addressing four-wheel-drives, motor scooters, motorcycles, all-terrain vehicles, dune buggies, and snowmobiles, called for regulations to control indiscriminate ORV use on Federal lands. The Executive Order required that national forest managers complete ORV use plans and designate areas where ORV use would be permitted, prohibited, or to various degrees restricted by January 1, 1977 (USDA Forest Service 1974b).



Dirt bike riders on Naches Pass Trail, Wenatchee National Forest, Washington, 1976.

ORV plans for all national forests were completed before that deadline. By the end of 1978, they were operational on 181.5 million acres, or 97 percent of total national forest lands. Implementation was pending on portions of 6.3 million acres on three forests, awaiting resolution of ORV plan appeals or the incorporation of the ORV plans into forest land management plans (USDA Forest Service 1979). In 1979, ORV plans were operating on 98 percent of national forest lands. Management and use guidelines designated 122.9 million acres, 66 percent of the total national forest land base, as available for ORV use, but this included areas totaling 64.5 million acres that were classed as unusable for ORV operation due to topography, vegetation, or other natural barriers. An additional 24.5 million acres, or 13 percent, were available for restricted use to specific vehicle types or seasons of use. A total of 40.5 million acres, or 21 percent, including 18 million acres of wilderness, were closed to all ORV use (USDA Forest Service 1979–1980).

Cultural Resource Management

Cultural resource management was introduced in the 1960's, and it expanded and matured in the 1970's. It was designed to implement the requirements of the

National Historic Preservation Act (NHPA), NEPA, Executive Order 11593, and USDA regulations for identifying, evaluating, and protecting historical and cultural artifacts of past human activity on national forests.

Cultural resource management was closely integrated with timber management, road development, land exchanges, range management, and other land-disturbing activities at their earliest stages. Early cultural assessments and proper planning of such activities were essential to avoid or mitigate the adverse effects of ground-disturbing activities on significant cultural resources. Cultural resource surveys became an important tool for locating prehistoric and historic properties on national forest lands. By 1979, archaeologists had identified 6,480 historic and prehistoric sites as possible candidates for inclusion in the National Register of Historic Places.

In 1970, this function was being carried out by 70 professional and support staff. This number rose to 105 FTE's by 1979 and included 72 full-time archaeologists and some historians operating at the regional and national forest levels. In addition, a full-time

cultural resource management specialist position was established and filled in the Washington Office in 1979 to provide leadership and give national direction to nearly 100 field-level specialists.

National Recreation Areas and Wild and Scenic Rivers

Two national forest national recreation areas were opened in 1972 to help meet the Nation's growing need for more recreation near larger population centers. In Oregon, the 32,000-acre Oregon Dunes National Recreation Area was dedicated on the Siuslaw National Forest. In Idaho, the Sawtooth National Recreation Area dedicated 754,000 acres of some of the most beautiful forest and mountain settings on the Boise, Challis, and Sawtooth National Forests for public recreation use.

In 1974, Cascade Head, a 4,787-acre coastal scenic area on Oregon's Siuslaw National Forest, was designated as a natural scenic research area. Two additional national recreation areas were established in the late 1970's: Hells Canyon National Recreation Area (1975), totaling 625,488 acres on Oregon's Wallowa-Whitman National Forest and Idaho's Nez Perce National Forest, and the Arapaho National Recreation Area (1978) on Colorado's Arapaho-Roosevelt National Forest. In 1976, Congress also set aside the Alpine Lakes area, 547,155 acres on Washington State's Mt. Baker and Snoqualmie National Forests, for special national management emphasis.

During the 1970's, Congress increased the number of national forest rivers to be studied for inclusion in the National Wild and Scenic River System from 9 to 17. It also designated eight additional wild or scenic rivers, bringing the total national forest wild, scenic, or recreational rivers to 14. Located on 16 different national forests in 13 States, five of which were in the East, they totaled 1,143 miles in length and encompassed 238,000 acres. In 1979, recreation use of these wild and scenic rivers totaled 1.2 million RVD's, 11.8 percent of the total RVD use of national forest rivers and streams (USDA Forest Service 1972-1980, 1993c).

Minerals Management

The heightened public awareness of national pollution problems and rising concern for environmental

quality sharpened conservation issues between environmentalists and miners. It also increased the sensitivity of national forest managers to the need for further oversight and more careful management of surface resources on mining leases and claims. For example, national forest managers issued orders in 1970 and 1971 restricting the use of tracked vehicles and earth-moving equipment on the Mount Moriah area in Nevada's Humboldt National Forest and the White Clouds area on Idaho's Challis and Sawtooth National Forests, where mineral-rich lands were also highly scenic, fragile, and susceptible to aesthetic damage. Permits were withheld from mineral claim holders who proposed to use mechanical equipment to prospect in the Boundary Waters Canoe Area, pending resolution of a lawsuit by a conservation group challenging the validity of the mineral rights that covered nearly a third of the wilderness canoe area. On West Virginia's Monongahela National Forest, a conservation group filed suit to enjoin the forest supervisor from issuing a right-of-way and use permit to a coal operator planning to prospect on the forest. The coal was owned by the operator; the surface was national forest land (USDA Forest Service 1972).

On Montana's Custer and Gallatin National Forests, where six mining companies had conducted extensive explorations for copper-nickel deposits, poorly designed and located roads, bulldozed discovery pits (required by State law), and inadequate erosion control had caused stream siltation and considerable damage to a fragile alpine environment. Although national forest managers were working cooperatively with the companies in 1969 and 1970 to minimize the pollution and rehabilitate damaged areas, the problem raised State-wide concern, and Montana Senator Mike Mansfield, the majority leader of the U.S. Senate, intervened directly. Senator Mansfield expressed alarm over the environmental damage and the asserted powerlessness of national forest managers to control it. He suggested that the Forest Service promulgate regulations under the Multiple-Use Mining Act of 1955 to control mining activities on and under national forests (Wilkinson and Anderson 1985; USDA Forest Service 1972). In the early 1970's, responding to the policy direction of NEPA, national forest managers began to prepare EIS's on mining proposals as they related to surface resources.

The BLM, however, prepared the formal EIS and was the leasing agent for leasable minerals on all Federal lands.

Minerals management was further sensitized and complicated in the 1970's by the emergence of a new American interest in energy and mineral exploration focusing on national forests — the largest remaining expanse of unexplored U.S. lands, except for offshore submerged lands. Although the Forest Service, the mining industry, and military and political leaders had recognized a need to stockpile strategic minerals since World War II, it took the Arab Oil Embargo of 1973 to bring this reality home to every American citizen. The huge increase in oil prices during the 1970's made it economical to search for oil on the ocean bottoms and in the more remote and rugged areas of the United States with methods that had not previously been economical or available. The adverse impact of oil prices on the Nation's economy spurred national interest in developing domestic resources to offset the Nation's dependence on foreign resources. All of a sudden, in the late 1970's, national forests became a major center of the Nation's minerals future and the focus of an unprecedented search for energy sources and minerals (Peterson 1983).

National forest managers were not fully prepared for this explosive development in mineral exploration. Thus, they played catchup during the 1970's — recruiting geologists and mining engineers and experts who understood the socioeconomic impacts of mineral development, surface resource management, and reclamation opportunities and who were qualified to develop effective, cooperative working relations with the mineral, oil, and gas industries (Peterson 1983). Staffing for minerals management in the first half of the 1970's had been reduced to about 140 FTE's, compared with about 325 FTE's during the 1960's. By 1979, however, minerals management staffing was restored to the 1960's level (USDA Forest Service 1992a).

Fortunately, national forest managers had begun to develop regulations in 1971, as Senator Mansfield suggested, to ensure more effective control of the surface resources at mining and prospecting sites (Wilkinson and Anderson 1985). At the same time,

national forest managers, mining interests, and conservationists had also generally recognized the need to improve Forest Service control over mining on national forest and other Federal lands. Political and public support was strong and reinforced by NEPA's goals. Thus, during 1971, the Forest Service was able to complete and share a draft of proposed mining regulations with the American Mining Congress, State mining associations, and conservation groups. The proposed regulations suggested a set of operating rules for mineral development and mining activities on legitimate claims, while providing for roads, timber disposal, and required surface protection. The recipients responded with a flood of comments that prompted hearings by the House Subcommittee on Public Lands. The mining industry was skeptical of the Forest Service's authority to adopt such regulations, but responded with their concerns and proposed changes. Before final regulations were adopted in August 1974, the industry acknowledged the need to protect the environment from destructive mining practices (Wilkinson and Anderson 1985).

At 1971 hearings on the proposed regulations before the House Subcommittee on Public Land, the Forest Service made it clear that it did not know where miners were actually operating their claims. Periodic estimates had indicated there could be as many as 1.3 to 1.5 million claims on national forest lands. However, only a possible 10 percent were active. Holders of the balance of the claims were required to perform only the minimum statutory work of \$100 per year to maintain their claims — but even that small amount sometimes involved several thousand acres of resource disturbance each year. Without a continuing annual survey, the Forest Service lacked a way to pin down where all this activity was occurring. While not all the disturbance necessarily involved unacceptable environmental impacts, there were always some cases of a mountain meadow being ruined, soil erosion that was difficult to correct, and roads placed where they were not needed. Not all miners conducted their operations in this way, but enough did, so there was a need for a way to control them (U.S. Congress 1974).

The Public Lands Subcommittee expressed doubt about the extent of the Forest Service's authority to control mining activities and cautioned that the

agency's regulations be implemented with the greatest discretion to avoid any conflicts with miners' statutory authority under the General Mining Laws (Wilkinson and Anderson 1985). The Forest Service's final regulations, based on the Multiple Use Mining Act of 1955, were promulgated in August 1974. They required mineral operators to file operating plans with national forest managers when any of their proposed activities would cause significant environmental disturbances. An approved plan, including steps for rehabilitation, was required and had to be followed during mining and prospecting operations where a district ranger determined such operations would "likely cause significant disturbance of surface resources" (USDA Forest Service 1975). The Forest Service's authority to adopt regulations to control mining operations was ultimately resolved by a landmark suit in 1981, *U.S. v. Weiss*, in which the Ninth Circuit Court of Appeals found such regulatory authority in the Organic Act of 1897 direction to "regulate" the "occupancy and use" of the national forests (Wilkinson and Anderson 1985).

The implementation of the new mining regulations for hardrock (or locatable) minerals was cautious. National forest guidelines provided that surface resource protection be assured by securing the willing cooperation of prospectors or miners. The Forest Service encouraged face-to-face dialogue with miners. Notices of intent were not required for claim staking, subsurface operations, and work that did not disturb vegetation or use mechanical earth-moving equipment. Where there was disturbance and a local determination of a need for an operating plan, national forest managers generally worked with operators to review and revise plans until they reached a mutually acceptable agreement. Miners and prospectors were specifically required to comply with Federal and State air and water quality and solid-waste treatment and disposal standards; protect scenic values, fisheries, and wildlife habitat; construct and maintain roads with minimum resource damage; and reclaim any damaged surfaces.

In the first 2 years of the mining regulations, miners filed 3,149 notices of intent and 1,567 operating plans; national forest managers approved 1,308 of those plans. A plan described proposed mining methods, access routes, waste disposal arrangements, envi-

ronmental protection measures, and final reclamation activities. Forest managers worked with operators in reviewing and revising these plans, as needed, and also in their actual implementation. Otherwise, operations were managed by the Department of the Interior except where improper use created emergencies that endangered public health or safety, life, or property or were likely to cause irreparable damage to resources (Wilkinson and Anderson 1985). National forest managers reported mining industry cooperation to be excellent and that the regulations appeared to be working well. Only a few cases of significant surface disturbance were reported, and those were in instances where operating plans had not been required or filed (USDA Forest Service 1976, 1977).

The total number of operating plans completed or administered for nonenergy minerals rose to 7,049 by 1979, while those for oil, gas, and coal, the principal energy sources, increased to 8,500, for a total of 15,549 plans. This compared with a total of 12,640 operating plans completed or administered in 1977. The operating plans were widely distributed among all national forest regions (table 3).

Surface Mining Activities and Environmental Protection

As domestic demands for energy sources grew in the early 1970's, leasing and surface mining for coal on national forests and grasslands expanded rapidly,

Table 3. Completed mineral area operating plans by region, 1979

Region	Number of Plans
Northern	2,839
Rocky Mountain	2,158
Southwestern	945
Intermountain	2,418
Pacific Southwest	742
Pacific Northwest	1,838
Southern	2,586
Eastern	1,933
Alaska	90
Total	15,549

Source: USDA Forest Service 1980.

particularly in the northern Great Plains. National forest managers launched a 5-year research, development, and demonstration program called SEAM (Surface Environment and Mining) for miners in Montana, Wyoming, North and South Dakota, and Nebraska in July 1973. It was an on-the-ground problem-solving effort to advance mining and reclamation methods that satisfied both mineral production and environmental needs. It evaluated and showed miners new techniques for the design of surface mining operations, new rehabilitation methods, new mining technologies, and environmental stewardship.

SEAM was expanded to address phosphate mining in Idaho and Florida, coal mining in the Appalachian States, and iron and copper-nickel mining in Minnesota. By 1976, SEAM was operating continuing projects in 12 States, involving 18 universities, 8 Forest Service research units, 6 national forest regions, other Federal and State agencies, and various mining companies. The project developed model demonstration areas, did research on reclamation problems, collected field data, produced plant materials that would grow well on mined areas and mine tailings, developed planning and development techniques, and published the accumulated knowledge (USDA Forest Service 1974–1975).

Environmental Analysis Related to Minerals

Environmental analysis became an increasingly important aspect of minerals management in the 1970's. Resource specialists responsible for minerals management performed a NEPA-required environmental assessment on each proposed claim or lease operating plan to determine whether an EIS was needed (Wilkinson and Anderson 1985). In 1977, for example, national forest managers reported gathering comprehensive resource data and evaluations on seven geothermal areas, and EIS's were completed for six of them. In the same year, a joint Forest Service effort with the Nuclear Regulatory Commission and the U.S. Geological Survey completed EIS's for a major uranium mine and mill on the Thunder Basin National Grasslands in Wyoming (USDA Forest Service 1978–1979).

In 1978, three regional draft EIS's were prepared in proposed coal leasing areas covering parts of Utah's

Manti-LaSal National Forest, Wyoming's Thunder Basin National Grasslands, and Colorado's Grand Mesa, White River, and Gunnison National Forests. Coordination with the Department of the Interior was completed and approved for leasing 17 million tons of coal to be extracted by underground methods on Utah's Manti-LaSal and Fishlake National Forests. In 1978, Montana's Kootenai National Forest completed a comprehensive EIS for approval of a mining and reclamation plan for a major copper and silver project (USDA Forest Service 1979).

Leasable Minerals

The total acres leased for mineral exploration and development increased from 16 million in 1970 to 17.5 million in 1977 and escalated rapidly to 30.9 million acres in 1979, primarily for energy resources: oil, gas, and coal (fig. 19).

In the last half of the 1970's, the Western Overthrust Belt in the Rocky Mountains became a hotspot of rapid exploration and major oil discoveries on national forest lands. This was closely followed by a similar leasing boom on the Eastern Overthrust Belt (Peterson 1983). Between 1977 and 1979, oil production on national forests increased from 8.1 million barrels to 11.0 million barrels. Gas production rose from 210 billion cubic feet to 213 billion cubic

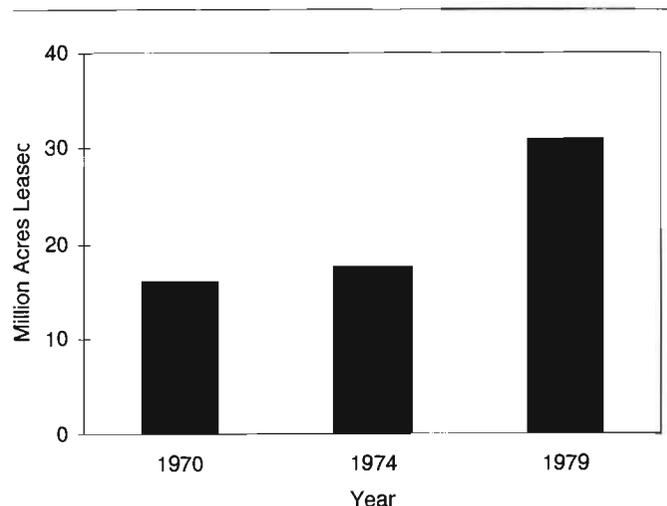


Figure 19. National forest area leased for mineral exploration and development, 1970–1979

Source: USDA Forest Service.

feet, and coal production from 4.2 million tons to 6.2 million tons. The production of locatable (hard-rock) and salable minerals, particularly uranium, likewise increased during the 1970's. At the end of the decade, mining trends on national forests indicated increased future activity in oil, gas, and uranium exploration and extraction in all geographic regions; increased coal production in Colorado, Wyoming, and Utah, and greater geothermal developments in all western regions (USDA Forest Service 1980).

Although the authority for issuing mineral leases on national forest lands was still vested in the Department of the Interior through the BLM, national forest managers had a major role in the environmental analysis and review of all lease applications and proposed operations, and the authority to attach lease stipulations to protect surface resources. In the case of coal or geothermal steam leases, national forest decisions to deny a lease or to attach specific lease stipulations were final, and the Department of the Interior was obligated to accept them in processing the lease application and the proposed operating plan. For other leasable minerals, Interior was required to make independent judgments in issuing leases but, in practice, generally accepted the stipulations national forest managers proposed. National forest use of stipulations increased dramatically in the early 1970's but became tempered in later years as stipulations were incorporated as lease requirements.

Control of Forest Fires and Fuels Management

The average annual area of national forest lands burned during the 1970's rose to 200,000 acres — slightly more than one-tenth of 1 percent of the national forest land base. This was 10 percent more than the average annual burn during the preceding 25 years. The increase can be attributed to the 3 years in the 1970's when fires burned more than 300,000 acres. There were two such years during the 1960's and a total of three for the 25 preceding years (1945 to 1970). Despite the 1970's increase in the average annual burn over that of the previous quarter century, it was still 9 percent below the average annual burn in the 1950's (USDA Forest Service 1972–1980; USDA Forest Service 1970–1979).

The three most extensive burns occurred in 1970 (446,000 acres), 1977 (391,000 acres), and 1979 (328,000 acres). Lightning-caused fires associated with early and widespread summer droughts and high temperatures were a major contributor. Lightning ignited almost 60 percent of the area burned in these years. Many of the severe burns occurred in the Rocky Mountains from north to south, in southern California, and in the Pacific Northwest, where during the 1960's successful forest fire protection began to be recognized as a contributing factor to forest fuel buildups and an increasing fire hazard (USDA Forest Service 1972–1980).

More than 95 percent of the annual area burned by lightning-caused fires occurred in the western national forests. In the years when less than 300,000 acres burned, lightning-caused fires ignited only about 25 percent of the annual burn.

The number of fires controlled annually on national forests during the 1970's averaged somewhat more than the 1960's — 11,000 per year. In the three severe fire years, wildfires numbered 15,000 in 1970, more than 14,000 in 1977, and 10,100 in 1979. More than 90 percent were brought under control at 10 acres or less. The number of fires burning more than 100 acres averaged 150 per year. However, most of the acreage burned during all of the 1970's was attributable to fires that burned 300 acres or more — less than 1 percent of all fires (USDA Forest Service 1972–1980).

National forest fire control effectiveness in the 1970's was comparable to that in the 1960's. But it was a major achievement in the face of the rising fuel hazards and the greater risks of frequent droughts, heavier public use of the national forests, and a greater number of fires. The continuing improvements in the use of aircraft and aerial attacks and their coordination with ground attacks as well as increasing effectiveness of logistics, communications, and coordination among firefighting organizations and forces contributed to the success of fire suppression in the 1970's. Other improvements included fire planning, analysis, and computer modeling to evaluate fire problems.

Better Trained and Equipped Firefighters

Basic fire suppression and safety training for regular and seasonal employees was increased to 40 hours, and the use of fire-resistant clothing and fire shelters was expanded and became mandatory in the late 1970's. All Federal wildland agencies engaged in fire control agreed to adopt and comply with the National Interagency Fire Qualification System for all their employees. Training quality became more uniform as standardized training materials were developed and distributed to all participants. During a year of large fires, 1977, a new concept for mobilizing firefighting suppression forces from various agencies from a wide geographic area and concentrating them quickly where needed was tested and proved successful.

Emergence of Fire as a Management Tool in the West

Although the Southern Region used prescribed fire as a resource management tool in its pine forests, it was not used in the western national forests until the 1960's, and then its use was largely sporadic. Prescribed fire was used to control forest disease, eliminate undesirable forest undergrowth, expose mineral soil for successful seed germination, improve wildlife habitat, and reduce forest fuel accumulations.

Fire's changing role in the National Forest System was first recognized on a national scale in 1974. The shift from fire control alone to fire management, however, had some distressing effects and challenges, especially when the news media implied that Smokey Bear was "laying down his shovel." This, of course, was not true, but it emphasized the Forest Service's need to inform the public about the change in its fire management policy and obtain public acceptance of the new role of fire in fuel management. As a result of the increased emphasis on fire prevention, the number of human-caused forest fires generally declined by 660 ignitions from 1975 to 1980, with the one exception of the conflagration year of 1977, when they rose by 460.

National forest managers tested the concept of wild-fire management in the mountains of Idaho's Selway-Bitterroot Wilderness between 1972 and 1974 to remove the human influence of wildfire suppression in a wilderness area and any upsetting impacts it had

on the natural forest ecosystem. They let natural wilderness fires burn under carefully monitored conditions in a 20-mile-long, 5-mile-wide section of the White Cap drainage. Six fires were allowed to burn under prescription during this period, with close daily monitoring. A total of 1,200 acres was burned in two units. Further tests were done on the other wildernesses, including the Gila Wilderness in New Mexico.

The Designated Controlled Burning System was tested on the Southern Region's Francis Marion and Kisatchie National Forests. Fires caused by lightning or humans and occurring in certain management units before a scheduled prescribed burn was initiated were allowed to burn until they reached pre-designated natural or human-made barriers, such as streams or roads. The test monitored four such fires that burned 275 acres through 1974.

In 1977, the Forest Service established a Fire Management Fund to integrate all presuppression funds. This fund was particularly effective in increasing the forest fuel hazard reduction acres treated each year.

Fire Management Areas

Fire management areas were first established in 1978 to integrate fire management objectives with national forest land and resource management goals and objectives. A fire management area was a land unit having the same or common fire management objectives. National guidelines directed that fire management areas and their objectives for all national forest lands be developed through the forest planning process by 1983 (USDA Forest Service 1978). National forest managers were required to determine fire protection and fire use standards that would ensure the attainment of national forest land and resource management goals, establish measurable standards for maximum individual fire size and tolerable annual and long-term allowable burn acreage for different fire intensities, and identify areas and set a schedule for their treatment by prescribed fires (USDA Forest Service 1974b).

Wildfires were to be managed to meet land and resource management objectives at all times. Fires not meeting such objectives and burning outside a prescription in a fire management area were to be

promptly suppressed. During 1978, national forests implemented 68 fire management areas covering 4.8 million acres on 23 forests in the six western regions. In 1979, fire management area plans were approved for an additional 1.9 million acres on 12 new and two existing areas and on six additional western national forests. During 1979, 150 wildfires occurred in approved fire management areas. Thirty-five percent of these fires were monitored and confirmed to ensure that they did not jump prescribed boundaries. The remaining 65 percent were suppressed within fire management area boundaries.

Fuel Management

Emphasis on fuel management increased throughout the 1970's and became a major fire management objective on national forests. The goal of fuel management was to reduce forest residue hazards from timber management, harvesting, and road-clearing operations and the natural accumulation of forest fuels in unharvested and unroaded areas. Disposing of forest residues after timber harvest was a traditional practice. The new focus was on reducing hazardous forest fuel accumulations to less flammable conditions and constructing fire and fuel breaks on high-hazard areas, often in the unroaded and unharvested forest areas. The goal was to reduce both potential wildfire intensity and the level of wildfire damage to resources or property. Fuel management lowered fire's potential rate of spread and area burned, reduced the size of areas with continuous hazardous fuels, and provided improved firefighter and equipment access. Prescribed burning became the principal fuel management tool during periods of low fire escape risks.

By the mid-1970's, fuel management using prescribed burns to reduce accumulated forest fuel and constructing fuel and fire breaks had risen to about a 100,000 acres per year. With the 1975 RPA program, it became a regularly targeted funding objective. Congress also provided additional funds for fuelbreak construction in the dense chaparral brushfields of southern California and for treatment of old logging slash on the Bull Run Watershed near Portland, Oregon.

Fuel management targets for 1978 and 1979 were 303,000 and 360,000 acres, respectively. Fuel re-

duction actually accomplished was 392,000 acres in 1978 and 375,000 acres in 1979. Favorable weather and moisture conditions during burning periods, increased spring burning, and the use of human-resource program workforces to treat fuels (12,000 acres in 1978 and 36,000 in 1979) contributed to more than achieving these targets.

In the late 1970's, fuel buildups were reduced on more than 1.7 million acres. This included about a million acres with accumulated residues from timber sales and stand improvement work, road construction, and wildlife habitat and range improvement projects. Naturally occurring fuel hazards were reduced on an additional half million acres as a joint product of fire management treatments for purposes other than fuel reduction.

A National Model for Planning National Fire Management Budgets

In 1978, the Congressional Appropriations Subcommittee for Interior and Related Agencies directed the Forest Service to develop a methodology and plan for assessing the benefits and costs of alternative forest-level fire management budgets to determine the best use of national forest fire management funds and their allocations among individual national forests. The Forest Service selected test forests and scheduled assessments to be completed by 1979. In the early 1980's, these test results were used to develop a computer simulation model of expected annual fire behavior and to evaluate the benefits and costs of alternative fire management budgets and budget allocations at the national, regional, and individual forest levels.

Preservation of Research Natural Areas

During the 1970's, the number of research natural areas (RNA's) established increased by 83 percent, to 132, and their aggregate area rose by 61 percent, to 139,965 acres. In all, 60 new areas, totaling 53,330 acres, were added to the national forest RNA network.

The focus of RNA planning and management continued to broaden as an understanding of the variety and vulnerability of natural systems grew. Forest Service Research placed more emphasis on RNA's to protect a variety of forest types and habitats for rare plants and animals and ecosystems, including aquatic

and riparian areas, shrubland, grassland, alpine, and subalpine ecosystems. For example: the Flynn Creek RNA on Oregon's Siuslaw National Forest was added in 1977 to study and demonstrate the decomposition and role of wood in stream ecosystems — the RNA was studied by the National Science Foundation and Oregon State University beginning in 1978. In 1972, the Fern Canyon RNA was established on California's Angeles National Forest to provide basic ecological assessments so natural resource managers and researchers could develop better biological evaluations and management prescriptions for the Angeles National Forest watersheds that were annually subject to intensive recreation use from nearby urban areas. The Goodding RNA was established in 1970 on Arizona's Coronado National Forest to protect a unique assembly of rare and sensitive plant species. The Western Cross Timbers RNA, established in 1977, preserved an especially interesting shrubland area embracing the interface of grand prairie and eastern deciduous forest on the Lyndon B. Johnson National Grasslands in Texas.

The second dimension of the broadening scope of RNA's was to increase the emphasis on replicating ecosystem types already represented in the RNA network to guard against the very real threat that some of these unique natural systems could be permanently lost. *A Directory of Research Natural Areas on Federal Lands of the United States* was published in 1977. It included RNA's established by the Forest Service and by other land managing agencies. The criteria for designating and managing RNA's varied among agencies, but the objectives for establishing them remained the same. In 1978, the nonprofit Natural Areas Association was founded to bring together professionals involved in natural area identification, management, and research. Its objective was to provide support and information to people concerned about the protection and long-term stewardship of such areas.

The RNA network's widening partnership included growing numbers of State agencies, private organizations such as The Nature Conservancy and the Natural Areas Association, universities, and interested individuals who supported the RNA network with activities such as building fences, gathering data, setting up baseline monitoring programs, and

conducting research studies. Thus, by 1980 the RNA network, initiated on national forests in 1927, was making broad and increasing contributions to protecting biodiversity, fostering understanding of natural ecosystem processes, and, of course, providing important baseline knowledge for managing ecosystems for multiple uses as well as for preservation.

Biosphere Reserves

In 1976, 10 key national forest sites were among the first 118 official biosphere reserves established in 40 countries worldwide by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) through its Man and the Biosphere Program. UNESCO established the International Reserve Project to protect representative segments of the world's natural regions as major centers for animal and plant preservation, environmental research, and education. The following national forest areas were selected to participate in this program: Hubbard Brook Experimental Forest on New Hampshire's White Mountain National Forest; Coweeta Experimental Forest on North Carolina's Nantahala National Forest; Fraser Experimental Forest on Colorado's Arapaho National Forest; Coram Experimental Forest on Montana's Flathead National Forest; Desert Experimental Range in Utah; Stanislaus Experimental Forest on California's Stanislaus National Forest; H.J. Andrews Experimental Forest on Oregon's Willamette National Forest; Three Sisters Wilderness on Oregon's Deschutes and Willamette National Forests; Cascade Head Experimental Forest and Scenic-Research Area on Oregon's Siuslaw National Forest; San Joaquin Experimental Range in California; San Dimas Experimental Forest on California's Angeles National Forest; and Luquillo Experimental Forest on Puerto Rico's Caribbean National Forest. The National Park Service and the Forest Service co-coordinate the biosphere reserve project in the United States.

Forest Pest Management

Forest Service pest management in the 1970's continued the post-DDT era emphasis on integrating pest detection and suppression increasingly with forest management practices — an emphasis that included a commitment to apply cultural and biological control measures in every situation where they could be effective in controlling forest insect and disease outbreaks. This new emphasis required that every

effort be made to reduce and eliminate control measures that damaged the environment. Thus, the use of commercially available, nonpersistent chemicals or nonchemical methods in place of persistent pesticides, such as DDT, was required in all situations where research and field tests had demonstrated that they would accomplish forest insect and disease control objectives safely and effectively (USDA Forest Service 1972; Fowler et al. 1986).

Environmental assessments (EA's) that considered the alternative means for suppressing insect or disease outbreaks became a requirement for all potential insect and disease suppression projects. Suppression measures were to be used only when necessary and then only after pest and forest managers determined that the benefits of treatment outweighed the adverse effects of allowing the insect or disease outbreaks to go on unchecked (USDA Forest Service 1980).

The foregoing guidelines embraced the basic concepts of integrated pest management (IPM). IPM advocated the careful consideration of all possible pest control techniques and methods (cultural, biological, chemical, regulatory, and mechanical) and the selection of control methods that were both cost-effective in keeping pest populations below economically injurious levels and at low risk to applicators, to people in the treatment area, and to the environment itself. The application of the IPM concept developed gradually during the 1970's. Managers strived for IPM, but seldom realized it because of the lack of appropriate technology as well as uncertainty about its environmental effects. For example, when national forest managers in the Eastern Region had to make judgments based on whether it was economically justifiable to use biological, chemical, or silvicultural controls, pest management efforts were often curtailed, as "no control" became the prevalent choice.

Pesticide use in Eastern Region national forests dropped drastically between 1960 and 1979 (fig. 20). Pesticide use reached its height in the 5-year period between 1960 and 1964, when a total of 150,000 acres were treated at 64 different sites. With the withdrawal of DDT in 1964, pesticide use in Eastern Region national forests declined rapidly; from 1970

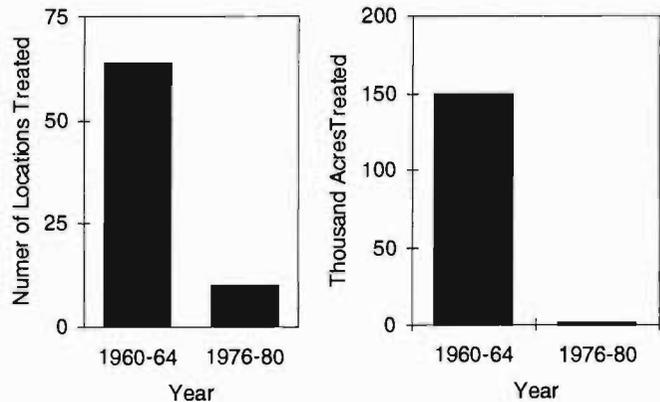


Figure 20. Decline in pesticide treatments in the Eastern Region of National Forest System, 1960–1980

Source: USDA Forest Service.

to 1976, only 1,230 acres were treated with pesticides. After 1976, no pesticides were used (Fowler 1986). In 1986, a report by Daniel R. Kucera, in *Insect and Disease Conditions in the United States 1979–83*, asked the question retrospectively: had national forest managers gone too far, like a pendulum, in not using chemical controls in the 1970's? The spruce budworm outbreaks were again seriously damaging eastern spruce forests. Vast acreage of pine in the Lake States had been killed by the jack pine budworm or deformed by the white pine weevil. Many red pine plantations throughout the Northeast were also being damaged by the Saratoga spittle bug (Fowler 1986).

The Forest Service increased its emphasis on reducing dependence on pesticides in 1978 by reinforcing the use of IPM for preventing insect and disease outbreaks and stronger integration of pest management principles with forest management and silvicultural evaluation and planning. The new emphasis required pest risk assessments as a basis for reducing the risk of serious pest outbreaks and for prioritizing forest stands to receive silvicultural treatment (USDA Forest Service 1980).

Major Insect and Disease Problems

Mild weather in the early 1970's, coupled with other favorable factors, enabled insect and disease populations to expand to record levels on all land owner-

ships throughout most of the regions of the country by 1973 and 1974. The greatest attention was commanded by the southern pine beetle, the mountain pine beetle, the spruce budworm, the gypsy moth, and the Douglas-fir tussock moth (USDA Forest Service 1974b).

Southern pine beetle populations in the South and Southeast were at higher levels than at any time in recorded history. The 1973 outbreak embraced 47 million acres of commercial pine forest, and high infestation levels continued in 1974. National forests, however, represented less than 7 percent of the infested area.

Mountain pine beetle infestations occurred throughout the West, with populations building up in the Black Hills of South Dakota, in Idaho and Wyoming near Yellowstone Park, and along the Front Range in Colorado. A major share of the infestations occurred on national forests and impacted lodgepole and ponderosa pine.

The spruce budworm remained in outbreak status in both spruce and true-fir species and stands across the northern half of the United States throughout the 1970's. In Maine, 2.5 million acres were infested and heavily defoliated. In the Lake States, 1.5 million acres were infested and defoliated, and in the northern Rocky Mountains, 4.6 million acres were similarly infested.

The gypsy moth continued to infest oak stands and other susceptible species in the Northeast. During 1973, 1.4 million acres were defoliated. National forests were a minor part of that year's infestation.

Douglas-fir tussock moth populations increased to epidemic proportions on national forests in Oregon, Washington, and Idaho in 1972 and 1973. They caused approximately a billion board feet of mortality and growth loss valued at \$54.8 million.

Insect Control

Defoliators, such as the spruce budworm and Douglas-fir tussock moth, and the bark beetles, such as the mountain pine bark beetles, caused the most serious and extensive insect control problems on national forests during the 1970's. Due to the lack of

approved pesticides or alternate control methods, the Douglas-fir tussock moth epidemic became the most threatening pest outbreak on national forests. DDT had been an effective control in past years. In 1973, there were no registered chemicals available to use against it. By 1974, Douglas-fir tussock moth had infested more than 400,000 acres of national forest, State, and private lands. In early 1974, the EPA authorized emergency use of DDT to control this infestation. The decision was both difficult and controversial because DDT had been banned for several years as a persistent, environmentally damaging pesticide. The affected States, private landowners, universities, and other Federal agencies were all participants in the decision process. In 1973 and 1974, *Zectran*, *Sevin*, several other nonpersistent pesticides, as well as viral and bacterial pesticide agents were pilot tested along with DDT for their effectiveness against the tussock moth. The DDT control action was elected and undertaken as a cooperative effort by the States, private landowners, and Federal agencies in June and July of 1974 on 426,559 acres that included more than 250,000 acres of national forest lands. The effects of the project were closely studied with some of the closest monitoring ever conducted on an insect control project. The effectiveness of the control effort was dramatic. The tussock moth kill was 98 percent. The tussock moth effort was also the last large project on national forests in which DDT was used.

Late in 1974, the Douglas-fir tussock moth, the southern pine beetle, and the gypsy moth became the targets of a \$47 million long-term cooperative research effort among four USDA agencies, including the Forest Service, to find new weapons to control the three pests and the damage they caused. To ensure maximum effectiveness, this research effort was directly coordinated and administered by Robert Long, the Assistant Secretary of Agriculture for Natural Resources and Environment (USDA Forest Service 1974-1976, 1990).

The western spruce budworm reached outbreak proportions in north central Washington State and on the Warm Springs Indian Reservation in north central Oregon in 1976 and 1977. Cooperative aerial suppression efforts sprayed 360,000 acres, including 155,000 acres of national forest lands, with *Sevin*

and *Malathion* in each of the two years. The outbreaks abated in 1978. But in 1979, a smaller (140,000 acres) outbreak involving national forests and private lands in western Idaho, north of Boise, was sprayed with *Sevin* and *Orthene* in cooperation with the Idaho State Department of Lands, the Boise Cascade Corporation, and other private landowners.

Mountain pine beetle infestations were persistent and widespread throughout the West and involved treatment of many spot infestations on national forests. Overstocked and aging lodgepole pine stands and trees were highly susceptible to beetle attacks. Infestations occurred in the Pacific Northwest, mostly east of the Cascade Mountains. In the 1960's, the mountain pine beetle reached epidemic proportions in northern Utah, western Wyoming, and southern Idaho. In 1970 and 1971, a multimillion dollar program to control the epidemic was evaluated, found to be ineffective, and terminated. The infestation, however, continued to spread northward into Idaho and Montana (Fowler 1993).

The preferred method of controlling mountain pine beetle was to harvest infested stands and scattered trees, which also reduced the fire hazard of dead timber. But this was only feasible where stands and trees were accessible by forest roads. In inaccessible situations, the alternative control methods were to fell, pile, and burn the infested trees or to chemically treat them to prevent emergence of mature beetles that could infest other trees. Preventive sprays became available in the late 1970's but were too expensive to use economically on large infestations. Their use was limited to administrative and recreation areas where the aesthetic value of live, standing lodgepole pine trees was very high.

In the early 1970's, western national forests were treating about 250,000 mountain pine beetle infested trees per year — about half the trees treated in 1969. The buildup of mountain pine beetle outbreaks in 1973 and thereafter increased the level of treatment to about 600,000 infested trees per year through 1977. These treatments and planned harvests of infested stands and trees in roaded areas were effective in slowing population buildups and stemming the spread of the mountain pine beetle. Their populations became relatively static in 1978

and 1979 (USDA Forest Service 1972–1980) until the early 1980's, when major infestations broke out in central and eastern Oregon, then in eastern Washington (USDA Forest Service 1981–1984).

The southern pine beetle was very destructive in the South. It attacked aging old-growth trees and young, overly dense loblolly and shortleaf pine plantations planted on sites where they were not well adapted. Southern pine beetle destroyed the value of saw-timber trees by boring into their heartwood. The principal control was to harvest infested trees before their market value was destroyed. Southern pine beetles were endemic to 47 million acres of loblolly and shortleaf pine timber lands. National forests constituted only 6.7 percent of this area, so they were a small part of the total southern pine beetle control problem in the 1970's. Because of the severe damage southern pine beetles did to mature timber, however, they were important pests to control when their populations threatened to reach epidemic proportions.

Gypsy moths, a growing problem on private and State lands in the Northeast, were a limited problem insofar as national forests were concerned. In 1970, 15 acres were sprayed on New Hampshire's White Mountain National Forest, and in 1972 another 12 acres were sprayed. In the Lake States, 800 acres were sprayed with *Sevin* in 1974 to control an infestation on the Manistee National Forest in West Central Michigan. Insect pest suppression activities for species other than bark beetles and defoliators varied from year to year. The acres treated for other insects varied from 5,440 in 1970 to 470 in 1972, averaging 1,793 acres per year.

Disease Control

Dwarf-mistletoe control occurred in all the western national forest regions. During the 1970's, most infected overstory and understory trees on national forests were removed to check the spread of dwarf-mistletoe and to improve the growth of residual trees. Infested trees that were not marketable in the older stands were felled and logged to remove their potential to infest the remaining healthy trees and understories. In young immature stands, sanitation thinnings were applied to remove infested trees.

White pine blister rust control on national forests in the West and the Lake States was terminated after 1973, when pest and forest managers determined it was ineffective. Experience and evaluations had shown that it was impossible to eradicate *Ribes* (currant family), the intermediate host for the pest, over a large enough area to make it an effective control method, particularly in the West. Western white pine was extremely susceptible to blister rust infection, while the *Ribes* plants were prevalent and widespread. Their spores were carried for very long distances in the mountainous environment. The use of fungicides sprayed on the base of tree boles or aerial sprays on tree foliage were likewise found to be ineffective in controlling the rust (Benedict 1981; Fowler 1993). Acres surveyed for blister rust incidence dropped from 100,000 in 1969, to 30,000 in 1972, and zero thereafter. *Ribes* eradication dropped from 5,000 acres in 1970, to 365 in 1973, and none thereafter.

Herbicide Use

During the 1970's, herbicides were increasingly used to control unwanted vegetation on the national forests and in Forest Service nurseries. During this period, only herbicides registered with EPA as safe and effective were used. Registration, at that time, carried with it the implicit understanding that registered herbicides, when used according to label directions, did not have any significant adverse effects on the environment. Following the enactment of NEPA in 1970, it became national forest policy to conduct environmental analyses to determine the best means of meeting specific resource management objectives where herbicides (or pesticides) were considered one of the alternative means. During the 1970's, these environmental analyses did not include any risk analysis for herbicide use because the EPA said EPA-registered herbicides had no significant adverse effects.

Herbicides were used because analyses and experience had determined they were often more effective and economical than alternative vegetation control methods. Herbicides applied in conjunction with site preparation for reforestation reduced vegetation without extensive soil disturbance. This treatment not only reduced competition for planted seedlings, but made the plantations less attractive to gophers and

avoided the potential erosion problems often associated with mechanical site preparation. Of the acres being reforested, 20 to 25 percent were treated with herbicides. With the use of herbicides, young planted seedlings could usually be released from broadleaf and grass competition in one season. Other available methods often required several treatments or several seasons. Herbicides were likewise used to kill undesirable trees in precommercial thinning operations; to control weeds in nurseries, which contributed to growth of larger, more vigorous seedlings at time of lifting for outplanting; to maintain fuelbreaks to protect national forest resources from wildfire; to improve travelers' vision and reduce fire hazards on road rights-of-way; and to destroy noxious weeds in range applications.

The total area treated with herbicides in 1979 for all purposes, including fire protection, rights-of-way, range improvement, wildlife habitat improvement, general weed control, and timber management, was 184,000 acres. Sixty percent of that amount was for site preparation, release, or thinning. More than 85 percent of the total acreage was treated with just three chemicals, *2,4-D*; *Picloram*; or *Dicamba*. More than 40 other chemical formulations were used on the remaining 15 percent of the treated acreage.

Herbicide spills occurred from time to time, but cleanup procedures generally prevented any major adverse environmental effects. There were intermittent claims of adverse effects on human health, but none of these were verified at the time. The use of herbicides and pesticides on national forests began to be reported annually to Congress in 1977 in terms of acres treated and pounds of individual chemicals used in treatment.

In 1978, in response to a growing public concern, national forest managers worked with the USDA and EPA to sponsor the National Symposium on the Use of Herbicides in Forestry, which resulted in a clearly written national forest policy for using all pesticides. The new policy emphasized the Forest Service's commitment to work closely with the EPA to determine that all pesticides were fully registered for their intended use and that only registered pesticides would be used. The revised policy included no bans on either materials or methods because this type of

action was automatic in response to any EPA suspension or cancellation notices. It emphasized the use of integrated pest management (IPM) techniques for solving the Forest Service's pest management problems. Where pesticide use was necessary, it made it clear that the pesticide would be applied only under very exacting conditions and in a carefully supervised manner. In the case of 2,4,5-T; Silvex; and related herbicides, their use was limited to places where no other environmentally acceptable and economically feasible alternative, chemical or mechanical, was registered or available. Cost-effectiveness was not used as a sole criterion. Forest Service decisions to use pesticides were made subject to review by the Assistant Secretary of Agriculture for Conservation, Research, and Education before implementation. The current practice of using alternative methods such as mechanical and manual brush control was strengthened wherever feasible. A provision for posting treatment areas to inform users that herbicides had been applied was included. Forest Service employees were required to qualify for and have State pesticide licenses to work with pesticides or herbicides. The Forest Service was required to put aerial applications under special scrutiny and use them only where there were significant advantages over the other possible methods in overall effectiveness.

Range Management

In 1970, some 11,000 national forest range allotments, totaling more than 105 million acres, were available for livestock grazing. Almost half of the allotments, 50 million acres, were open, nonforested rangeland and constituted almost a third of the total national forest acreage within the 48 contiguous States. There was no commercial grazing on national forests in Alaska, Hawaii, or Puerto Rico. The balance of the allotments consisted of more than 55 million acres of forested rangelands (USDA Forest Service 1972; Wilkinson and Anderson 1985; Schmautz 1979).

Some 17,872 ranchers and farmers grazed 1.3 million cattle, 1.7 million sheep, and a few thousand horses under paid permits on these range allotments. An additional 200,000 animals were grazed under free use agreements or permits with 80,901 users (USDA Forest Service 1972). More than 95 percent of

national forest grazing use occurred in the 16 western States. The balance, more than 4 percent, was largely on the southern national forests, with less than 1 percent on national forests in the Northeast and Lake States.

Due to the relatively high elevations, grazing on national forests was largely seasonal, except in Arizona and New Mexico, where many yearlong permits were used. In 1970, the average length of the grazing period was 4.8 months for cattle and 2.7 months for sheep. Permits for grazing allotments were also limited to ensure sufficient forage and browse for important wildlife such as antelope, big-horn sheep, deer, elk, moose, and wild horses and burros.

The Wild, Free-Roaming Horses and Burros Act of 1971 established a small number of wild horse and burro territories where feral unclaimed horses and burros existed at the time of the Act's passage. The BLM lands provided rangeland and forage for more than 95 percent of the wild horses and burros on Federal lands yearlong; only a few herds used national forest lands. The national forest forage was managed for the needs of wild horses and burros as well as wildlife and permitted livestock. Prior to the passage of the Act, national forest managers' efforts to control the number of unclaimed feral horses and burros grazing on national forest lands in favor of other land use and management objectives, including wildlife, domestic livestock, and watershed protection, limited the number of horses to 3,000 to 4,000 and a few hundred burros.

Range Analysis, Planning, and Management

By the end of the 1960's, national forest range conservationists had completed the first cycle of systematic range analysis and management plans for all allotments and had implemented management plans on the ground for 4,600 range allotments — more than 40 percent of the total. Ranchers, cooperating with national forest range conservationists, applied intensive range management practices to improve the quality and quantity of the forage on about 45 million acres within their allotments. During the first cycle, the management focus had been on increasing range productivity and the forage produc-

tion levels, while revitalizing deteriorating and depleted ranges (USDA Forest Service 1970, 1972).

The 1970's initiated a second cycle of systematic analysis for range allotment planning, which continued to emphasize short-term range management objectives for improving range productivity and total forest production to benefit rural areas, but with a stronger focus on "arresting and reversing the widespread decline of environmental quality." Range conservationists recognized that "ecomangement," a broadened concept reflecting an ecosystem approach to land resource management, was emerging as a reality for national forest range management planning and practice and was requiring a more positive and aggressive emphasis on integrating multiple uses on the rangelands. They also pursued the development of an improved allotment planning and evaluation process to identify environmental impacts, such as damage to riparian areas or stream quality, so that range conditions not meeting environmental standards could be specifically addressed in updating management plans (USDA Forest Service 1970, 1972).

In 1970 and 1971, national forest managers initiated a program of intensive management practices to improve vegetation quality and quantity on about 5 million acres of range allotments. This effort included improving practices on about a million acres where the vegetative cover was insufficient to protect the soil. On about a quarter of these eroding acres, they mechanically removed the residual brush cover and seeded the areas to accelerate revegetation and soil stabilization (USDA Forest Service 1972).

During the 1970's, national forest managers became increasingly sensitive to environmental objectives and standards and increasingly aware that the mechanical methods for converting brush cover to grass had only short-term benefits and had environmental costs that were often more than their benefits. Brush usually returned in a few years following treatment. Responding to this new understanding, they greatly reduced the use of bulldozers with plows and brush blades and chains to make such conversions to 100,000 to 150,000 acres a year in the late 1970's, about half the average annual level of such conversions during the late 1950's and 1960's. The

use of herbicides for range improvement was limited to those that were EPA-approved and environmentally safe when applied according to directions. Herbicide use declined, and by the late 1970's herbicide treatments for range improvement varied between 3,000 and 20,000 acres per year. Herbicide use for noxious weed control varied between 25,000 and 60,000 acres per year (USDA Forest Service 1972-1980).

Per capita and total beef consumption in the United States continued to rise between 1970 and 1976, and total beef cattle numbers rose from 38 million to a peak of 46 million in 1975. Beef production rose from 22 billion pounds in 1970 to an historic peak of 26 billion pounds in 1976. In 1976, the average American consumed 95 pounds of beef per year, 10 pounds more than in 1970.

In the far western States between 1970 and 1975, beef cattle numbers rose by 1 million, from 7.4 million to 8.4 million. In the six northern and southern Plains States, their numbers rose by 3.8 million, from 13.6 million to 17.4 million (fig. 21). Thus, the demand for western grass pastures and grazing lands for cow and calf production increased by almost 20 percent in a 5-year period (Fedkiw 1985).

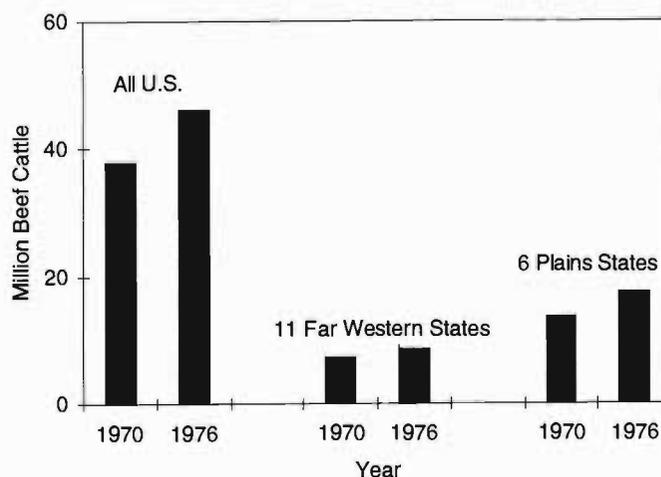


Figure 21. Beef cattle numbers in the United States and its western regions, 1970-1976

Source: USDA Forest Service.

Congress increased direct appropriations for national forest range management activities during the latter 1970's, and Forest Service range staffing rose from 640 FTE's between 1970 and 1976 to 900 FTE's by 1979. The annual levels of range improvement work, such as seeding, water development, and fencing rose to almost 300,000 acres by 1979, almost doubling the early 1970's level of 150,000 acres per year (USDA Forest Service 1992a).

It was under these circumstances, in 1972, that the Forest Service launched a major study of the potential of all range and related forest lands to meet the rising demand for range grazing while responding to the urgency for protecting the natural environment. Several other Federal agencies with rangeland responsibilities, including the BLM, and range researchers from the University of Nebraska became partners in this undertaking, called the Forest-Range Environment Study (FRES).

As a basic requirement for differentiating current conditions, management options, and potentials for environmentally acceptable expanded production, the initial step in FRES stratified all rangelands, nationally, into their separate "ecotypes" and ownerships. Subsequent analysis of each ecotype defined and assessed the different activities that could increase forage to meet projected future beef demands and at the same time protect the environment. Although beset with many data quality problems, FRES found that the Nation's rangelands, with proper range management and technology as well as environmental safeguards, could meet expected future grazing demands without detracting from other resource uses such as wildlife and aesthetics (USDA Forest Service 1974-1976). In 1974, five USDA agencies, including the Forest Service, presented an informational report for the Department of Agriculture's Policy and Program Division on management opportunities to increase domestic "red meat production," mainly beef. The study's second phase, on research and technology options, was completed in 1975.

In 1974, the Forest Service initiated its own planning and research to establish range evaluation and validation areas to test the validity of this management direction nationwide and to make possible adjust-

ments to expand range and grazing production. The validation areas demonstrated alternative grazing systems for a variety of range conditions on dependent private lands as well as the related national forest and other public grazing lands. Unfortunately, these management demonstrations and strategies were never fully implemented and evaluated due to budget reductions in the early 1980's. Although the Forest Service completed limited evaluation on an Oregon validation area, others were discontinued in their early development. Beef demands peaked in 1976 and steadily declined due to consumer health concerns. Cattle inventories also declined with the falling demand, and the incentive to expand national grazing capacity and red meat production faded away after 1976.

Federal Land Policy and Management Act of 1976

The Federal Land Policy and Management Act of 1976 (FLPMA), as amended by the Public Rangeland Improvement Act of 1978 (PRIA), was enacted to regulate the public lands administered by BLM. The range management section of FLPMA, however, was written to apply to the national forest lands in Washington, Oregon, California, Nevada, Arizona, New Mexico, Utah, Idaho, Montana, Wyoming, Colorado, North Dakota, South Dakota, Kansas, Nebraska, and Oklahoma. In doing so, it set the stage for the Forest Service and BLM to continue their efforts for a more consistent approach to managing public rangelands. This Act reaffirmed existing national forest policy for administering and managing livestock grazing on national forests and clearly specified that national forest managers had broad discretionary authority to modify the number of livestock permitted and to set limits on seasonal use of rangelands. It stressed once again that a grazing permit did not convey any rights to the permittee against the Government, but granted the permittee rights against other applicants. The 10-year term grazing permits were reaffirmed. The Act further provided that livestock grazing on national forest lands in the 16 contiguous western States be managed through the development of allotment management plans, which was the established national forest policy and management approach. It directed that the allotment plans be developed only after careful and considered consultation, cooperation, and coordination with permittees; other landowners, including

States having land within the planning area; and others having interests in that area. It further specified that such plans prescribe how and to what extent livestock grazing practices, including range improvements, would be carried out to meet multiple-use sustained-yield objectives. These plans gave precedence to the resource and to meeting the objectives of new NFMA forest plans. Thus, where NFMA called for the removal of livestock grazing, the affected permits were phased out. When this occurred, FLPMA provided that permittees be compensated for range improvements they had installed based on their investment in the lost improvements.

FLPMA and subsequent regulations authorized the establishment of grazing advisory boards made up of grazing permittees elected by their peers. Most national forests had chartered such boards by December 31, 1985 — the date that the legislative authority for such boards expired. All boards were terminated when this legislative authority expired, and none were rechartered.

FLPMA also required that one-half of the grazing fees collected within the 16 contiguous western States be appropriated and made available for on-the-ground range rehabilitation. These monies were routinely appropriated by Congress and averaged approximately \$4 million per year. However, such funds were not additional range funding because direct appropriations for range improvements were reduced by the same amount. National forest regulations earmarked these funds for rangeland betterment — seeding and reseeding, fence construction, weed control, water development, and fish and wildlife habitat improvement. To further the overall direction contained in forest plans, the Forest Service restricted the use of these funds to areas that had approved allotment management plans.

System-Wide Assessment of Range Condition

In 1977, the Forest Service completed a System-wide assessment of the ecological condition of rangelands based on their current vegetative cover and several soil factors. The current range condition (poor, fair, good, or excellent) was compared with what it would or should have been under pristine conditions. The pristine condition was used as the standard because it

was believed to reflect natural conditions most favorable to long-term sustainability of range ecosystems. The ratings were qualitative on a continuum of low to intermediate and high, or of poor, fair, good, and excellent. The current ecological status of the existing plant community considered its composition, cover, and vigor in combination with such nonecological indicators as plant age classes and production. The assessment also evaluated the percent of soil ground cover and current soil erosion (Schmautz 1979).

The assessment found that 68 percent of the national forest rangelands were in satisfactory condition, 24 percent good or better, and 44 percent fair. The remaining 32 percent were classed as unsatisfactory. There were no previously established measures to assess the rangeland condition and trend based on the same criteria. The general judgment, however, based on a broad comparison with long-term historical conditions, was that overall trends were generally upward. Nevertheless, the hard facts remained that almost a third of the rangelands were in unsatisfactory condition, with a downward trend that needed to be halted and reversed to protect basic soil and vegetation resources.

In view of the long-term effort since the mid-1960's to improve range productivity and production, the level of unsatisfactory range conditions was unexpected. Range productivity efforts were out of balance with livestock management and the intensity, duration, and timing of grazing. The remedy to this situation was the improvement of livestock management practices — such actions as adjusting grazing seasons, changing permitted animal numbers, and implementing management practices that would lead to more productive and stable range conditions. In some instances, this meant less livestock and adjustments in elk, but in all cases it meant improved range management.

The Public Rangelands Improvement Act of 1978

The Public Rangelands Improvement Act (PRIA) was a national policy initiative that provided for the improvement of soil quality, wildlife habitat, watersheds, plant communities, and range condition on public rangelands. However, the portions of the Act relating to the national forests were amendments to

FLPMA that required maintaining inventories of range conditions and trends and establishing an experimental stewardship program with incentives or awards for livestock permittees to improve range conditions on their national forest grazing allotments.

National forest managers, in cooperation with BLM, initiated the experimental stewardship programs (ESP's) on three areas in 1979 — one each in Idaho, Montana, and California. The BLM established 13 individual permittee stewardship areas scattered throughout Washington, Oregon, California, Nevada, Arizona, New Mexico, Utah, Idaho, Montana, Wyoming, and Colorado. The ESP purpose was to foster innovation, cooperation, and best range management practices to lead to improved conditions on the public rangelands. The innovative initiatives included cooperative resource management and fee collection distribution approaches, cash investments by permittees, and flexible animal numbers and length of season authorized by grazing permits. The major strength of the ESP was that local people conceived and developed the communications processes at the grassroots level rather than having them dictated by rule or policy from above. The ESP results, however, were never evaluated in terms of range condition improvement.

The Use and Performance of the National Forest Rangelands in the 1970's

The total number of cattle grazed annually on national forest allotments remained stable throughout the 1970's at about 1.3 million. The number of sheep grazed declined from 1.74 million to 1.17 million. The number of horses grazed declined slightly, from more than 175,000 per year to 170,000. Grazing by swine, largely in the South, declined from about 6,000 to negligible numbers as national forest managers increasingly prevented unauthorized use. Total and per animal forage consumption increased somewhat during this period, indicating some continuing weight gains for cattle grazed on national forest lands.

The number of commercial grazing permittees decreased by 13 percent during the 1970's, to a total of 15,518 by 1979. The number of allotments being maintained under intensive management practices increased from 4,600 in 1969 to 5,700 in 1979, a

24-percent improvement. The proportion of such allotments rose from 43 percent to 52 percent out of nearly 11,000 allotments. This trend supports the 1977 professional judgment and estimate that the trend in range condition was upward. However, it also indicated slow progress. Nevertheless, the improvement was notable in the light of the rising beef consumption and continuing pressure to expand grazing during the first seven years of the 1970's.

Soil and Water Resource Management

In response to NEPA requirements and the national goals of the Clean Water Act of 1972, soil and water management efforts greatly intensified during the 1970's. These efforts also responded to concerns emerging from the clearcutting issues and congressional hearings of the early 1970's. Federally approved State water quality standards were now required for all navigable waters on national forests. To ensure that water quality was being protected, national forests installed a water quality monitoring program to measure the effects of land use and management activities on water quality and quantity and the extent to which public water quality and supply goals were being met. At the end of the 1970's, the monitoring program was collecting and analyzing water samples from more than 5,000 locations. In 1978, the Forest Service estimated and reported that about 95 percent of the water produced by national forests was meeting minimum State water quality standards and that by 1985, national water quality goals for swimmable and fishable waters would be met (USDA Forest Service 1978–1980).

National forest resource managers and staff translated local water supply quality standards into performance limits and controls for land management activities such as managing and harvesting timber, managing grazing on rangelands, wildlife and fish habitat improvements, and fire preattack planning. The intensity of management and oversight of soil and water resources grew as the number of development projects receiving priority for soils, geologic, and hydrometric and water resource inventories rose. In 1969, the number of these projects was somewhat more than 500. In 1970, the number had risen to more than 1,000, and in 1971, to 2,000 (USDA Forest Service 1970–1972). Staffing for soil and water management inventories and services rose from less

than 400 to 892 FTE's during the 1970's (USDA Forest Service 1992a).

National forest soil and water staffs conducted soil, geologic, and water resource inventories on 7 million acres in 1970 and 13.2 million acres in 1971 (fig. 22). In 1977, the acreage inventoried had risen to 15.8 million acres, and in 1979 to 18.1 million acres. Such inventories varied in intensity. Resource development projects usually required more detailed inventories, while less detailed inventories were generally suitable for broad land use planning purposes. Soil and geology inventories identified, classified, mapped, and evaluated landform, geology, vegetation, soil types, and climate associated with specific soils. These data helped identify soil and land capabilities for land use planning and project planning. Water resource inventories often covered the same ground. They classified and mapped watersheds and watershed subareas, grouping areas with similar characteristics, and predicted water yield and quality responses to particular uses and management.

Impact surveys conducted on water development projects on and adjacent to national forests and grasslands to provide national and local needs for

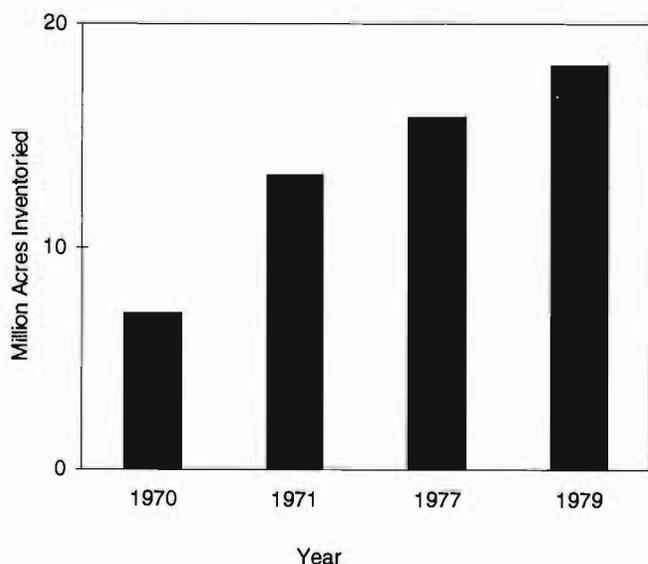


Figure 22. Acres of soil, water, and geologic resources inventoried, selected years 1970–1979

Source: USDA Forest Service.

power, irrigation, flood control, and other purposes reached their peak level (546 projects) in 1970. In 1971, they declined to 476 projects and dropped to even lower levels during the balance of the 1970's, as the rate of reservoir and dam construction declined generally in the United States.

Nevertheless, because public concerns for the environment and water quality were expanding, EA's and EIS's continued to determine the effects of reservoirs and other water resource developments on the protection, administration, and management of National Forest System lands, including the effects on national forest users and permittees, local economies, and the environments of rural communities. Survey reports recommended project plan improvements based on national forest management direction, and national forest managers implemented these improvements through coordination and cooperative liaison with water development agencies — an approach that produced direct environmental, economic, and social dividends. Treatment measures on national forest lands tributary to reservoirs and other water developments increased the quantity and quality of the water inflow to the reservoirs, improved scenic and other public use benefits, and, by reducing siltation, prolonged reservoir life. Other national forest water-related management that contributed to a safer and more attractive environment for reservoir users, and reduced maintenance costs, were sweeping and debris removal, access road and trail maintenance, and fire prevention and protection.

In 1976, FLPMA consolidated all water-related use-permitting authority to USDA and the Forest Service except the administration of permits issued before 1976. Administration of pre-1976 permits remained with the Department of the Interior. This permitting shift considerably increased the Forest Service's multiple-use management authority (Wilkinson and Anderson 1985).

National Forest Water Rights

Water rights issues and challenges escalated during the 1970's as national forest managers sought to ensure adequate water supplies for national forest uses such as recreation, instream flows, municipal needs, timber production, and national forest administration. Concerns over excessive appropriation of

water from national forest water courses rose during the 1960's, as the use of water for irrigation and hydroelectric power generation intensified and began to degrade fish habitat and recreation sites.

The rising concerns led to a 6-year study, completed in 1972, on the long-term water needs for internal uses on western national forests and for local municipal water supplies. As the study was nearing completion, States were advised of national forest water use needs to aid in planning and developing their own water uses and potentially for accommodating national forest needs. The national forest policy since 1936 had been to obtain water rights in the name of the U.S. Government for national forest purposes in accordance with State law. Traditionally, the Congress had also deferred to State water law in water allocation matters. Typically, those rights were for consumptive uses. In the 1970's, however, national forest managers sought to justify water allocations for fish, wildlife, recreation, and aesthetic purposes on the basis of the Doctrine of Federally Reserved Water Rights on national forest lands reserved from the Public Domain. The Doctrine of Federally Reserved Rights was first enunciated in 1908 by the Supreme Court decision in *Winter v. United States*. The Court said that when the Federal Government established Indian reservations there was an implied reservation of water rights needed to achieve the purposes for which such Indian reservations were established. In 1963, the Supreme Court in the *Arizona v. California* decision expanded the "Winter Doctrine" to apply to other Federal reservations, including national forests.

Legal issues arose as to whether the Winter Doctrine actually applied to water rights for specific uses not cited in the Federal law and whether such reserved water rights could retroactively preempt private water rights established in previous decades under State law. In 1978, the Supreme Court narrowed the scope of the Winter Doctrine as it applied to national forest management purposes and uses. In *United States v. New Mexico* (the Rio Mimbres case), the Supreme Court interpreted the doctrine to mean that Congress intended to reserve only that amount of water necessary to meet the primary purposes for which national forests were reserved under the Organic Act of 1897 — to ensure a continuous supply of timber and to secure favorable water flow

conditions. This ruling excluded the consideration of reserved rights for the use of water for purposes not explicitly in the Organic Act of 1897, such as fisheries, aesthetics, recreation, and stock watering (USDA Forest Service 1988). Thus, national forest managers' efforts to control the over appropriation of water by private individuals, industry, and communities by claiming reserved water rights met with only small success. In the main, they were unsuccessful. National forest water resource managers had to direct increased attention and effort to achieving desired and needed national forest water allocations under State laws (Wilkinson and Anderson 1985; USDA Forest Service 1972–1980).

Watershed Improvements

Watershed improvements benefitted water quality and increased water-holding capabilities of watersheds by controlling runoff, restoring soil productivity through the reduction of sheet and gully erosion, stabilizing soils and stream channels, and installing sediment retention structures. During the 1970's, an average of 35,400 acres of damaged watershed areas were treated each year. Actual acres treated annually varied from 16,100 in 1971 to 88,000 in 1978 and 36,000 in 1979. In 1979, the total national forest watershed area with declining watershed conditions and in need of improvement was reported to be 315,000 acres (USDA Forest Service 1972–1980).

Land treatments and watershed practices to prevent or control soil erosion constituted the vast majority of acres treated each year. Other treatments included several hundred miles of gully erosion control and soil stabilization, a few miles of lake shoreline improvement, revegetation and soil stabilization on 1,000 or more miles of abandoned roads and trails, and restoration of a few hundred acres of land disturbed by surface mining and prospecting.

Emergency rehabilitation of land damaged by wild-fires and floods also contributed to watershed protection. The most extensive rehabilitation occurred on 375,000 acres of the total 446,000 acres burned by 25 major wildfires on national forest lands during the 1970's. Timely surveys of newly burned areas prompted such rehabilitation measures as improving road and trail drainage, clearing stream channels to rapidly improve the quality of large volumes of

water, and aerial seeding to quickly establish ground cover on burned areas (USDA Forest Service 1972–1980).

Water yield improvement work on national forests in the early 1970's consisted principally of maintaining previously completed projects. National forests had applied water yield improvement practices on about 165,000 acres before 1970. Similar opportunities were estimated to occur on an additional 12.5 million acres within the national forests. The barometer watershed projects initiated in the 1960's to manage water yields were largely put on hold or retrenched during the 1970's in favor of higher priorities (USDA Forest Service 1972–1980).

Managing Wildlife and Fish Habitats and Use

The 1970's were a period of transformation and accelerating growth for wildlife and fishery management. It moved from what was largely seen as a secondary role in coordinating and adjusting other national forest resource activities and cooperative habitat improvement with States to a primary management function for protecting and improving wildlife and fish habitats, user opportunities, and the total quality of the forest environment. The pace of this transition was modest in the first half of the decade and then accelerated rapidly in the second half. As late as 1975, however, wildlife management was still seen as a distinct secondary, or even an incidental, function on most national forests and was still struggling for independent recognition (Robinson 1975; Wilkinson and Anderson 1985).

Total FTE staffing for wildlife and fisheries activities rose from less than 300 person years, including 100 biologists, in 1970 to 358 person-years in 1975. By 1979, however, total FTE staffing rose to 856 person-years and included several hundred biologists. Total direct Federal funding for wildlife and fisheries management and improvement rose similarly, from \$13 million (constant 1992 dollars) in 1970 to \$17 million in 1975 and then to more than \$43 million in 1979 (USDA Forest Service 1992a).

The expanding role of wildlife and fish habitat management and improvement was primarily driven by new national policy and requirements for the environment and endangered species and related

internal national forest needs for more effective integration of timber management and harvesting, livestock grazing, and mineral exploration and development with wildlife and fish management objectives.

Hunting and fishing use grew modestly from 29.0 million wildlife and fish user days (WFUD's) in 1970 to 32.1 million in 1979 (fig. 23). This was barely a 1-percent average annual increase — a major slowdown from the 3.5 percent per year growth rate in the late 1960's. It was also a much slower rate of increase than total RVD's, which grew at an average annual rate slightly greater than 3 percent during the 1970's. Nonconsumptive or appreciative uses of wildlife increased during the 1970's, but no reliable, consistent documentation was available except an estimate of "several million" WFUD's of total nonconsumptive use cited in the 1978 Annual Report of the Forest Service (USDA Forest Service 1979).

NEPA and the Endangered Species Act of 1973 (ESA) provided much stronger driving factors for intensifying wildlife and fish habitat management. NEPA requirements called for explicit assessment of the impacts of resource use activities on wildlife and fish with open, public participation. The ESA gave absolute precedence to the management of habitat to

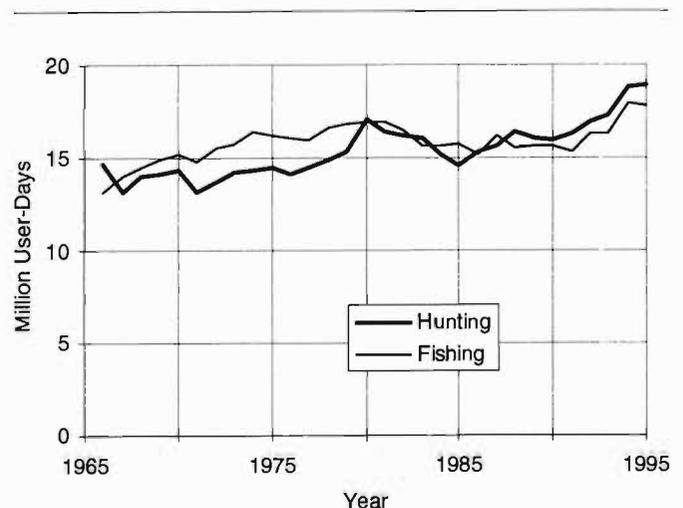


Figure 23. Wildlife and fisheries user days (WFUD's) on national forests, 1966–1995

Source: USDA Forest Service.

maintain or restore the viability of endangered wildlife, fish, and plant populations and indirectly called for action to protect sensitive and threatened species from becoming endangered. These policy objectives and requirements were reinforced by the public's demands and participation in resource planning. Wildlife and fishery public interest groups and individuals sought greater consideration for wildlife and fisheries and more emphasis on nongame species.



Opening day of fishing season at Buffalo Lake Reservoir, Monongahela National Forest, West Virginia, 1971.

The adoption and implementation of the unit planning approach during the 1970's, with its intensified emphasis on zoning subareas to differentiate their multiple-use potentials and requirements, called for increasing consultation and integration of other resource uses with wildlife and fish habitat and use needs. There was no separate zoning for wildlife or fish. Wildlife occupied all zones and fish habitats were included in waterway and riparian zones. The stratification of the commercial forest lands into standard, special, marginal, and unregulated components further intensified the demand for wildlife and fish habitat management constraints and guidelines in planning and designing timber harvests. The maintenance of the general timber harvest level, while reducing clearcutting, expanded the demands for wildlife and fishery consultations and coordination. Less clearcutting meant that more acres had to be entered to harvest the same volume. In the early 1970's, this caused timber harvest entry into a half-million additional acres.

During the 1970's, and in the earlier decades, wildlife habitat management on national forests continued to be strongly linked with timber management. However, by 1970, wildlife managers were no longer

generally accepting the former, widely held simplistic philosophy that "good silviculture also constituted good wildlife management." But it had become increasingly incumbent on wildlife managers to come up with guidelines and adjustments that could be readily applied and be reasonably economical for timber management and, at the same time, be effective in achieving wildlife habitat objectives. Large-scale wildlife management normally called for manipulation of tree cover, but this was usually too expensive to be done solely for wildlife purposes. Because forest management practices undertaken to increase wood production could introduce major changes in wildlife habitat conditions and structure, some wildlife managers began to view timber management as a practical way of achieving wildlife habitat objectives, provided the timber management activities were located, designed, and executed to also achieve them (Thomas 1979).

In the late 1960's, after the passage of the MUSY Act, wildlife managers had evolved two major approaches to wildlife management on national forests: species richness and featured species. Both followed the basic ecological principles developed by Leopold

and other conservationists in the 1930's and focused management strategies and practices on achieving habitat diversity to encourage and maintain species richness for local areas as well as for broader ecosystems (Wilkinson and Anderson 1985).

Species Richness Approach

The species richness approach provided or maintained the habitat requirements for a wide variety of species by using practices ranging from clearcutting to provide big game forage and edge effects to protecting old-growth forests to maintain cover. A specific prescription was required for each land unit that would create and maintain habitat conditions and structures that would sustain wildlife species and populations at a level that would preclude their extirpation (total loss in the areas they occupied). Although wildlife managers sometimes focused on a particular species in applying the species richness approach, they usually did not set standards for any particular species.

Featured Species Approach

The featured species approach was implicit in early efforts to protect endangered species such as the condor in California, the Kirtland's warbler in northern Michigan, and the osprey in central Oregon. This approach was particularly well adapted to address endangered species, but it raised various difficulties when it was applied to other species. Focusing on a particular species involved difficult-to-evaluate tradeoffs with other species, especially where the featured species was not endangered. Timber managers would adjust harvests for endangered species, but were reluctant to do so for a secondary featured species if it involved unduly complicated timber management adjustments beyond those required for a primary featured species (Wilkinson and Anderson 1985).

The featured species approach was first developed as a general approach to wildlife management on the southern national forests. Southern wildlife user interests focused their attention on particular animals, whether for hunting, as in the case of deer and squirrels, or because they were endangered, such as the red-cockaded woodpecker. For this reason, the Southern Region focused its wildlife management approach on developing a handbook for managing

the region's principal species. The *Featured Species Handbook*, published in 1971, was prepared with the collaboration of timber managers, research scientists, and wildlife specialists and became the region's basic reference guide (Roth 1988).

The handbook's primary guideline provided that all silvicultural activities be carried out to promote the featured species and, indirectly, such other species that had the same habitat requirements. Where deer were the featured species, for example, timber would be harvested in broken clearcuts, leaving some early successional tree species on the site. Where squirrels were the featured species, some hardwoods would be left on the sale area. Where management focused on protecting the endangered red-cockaded woodpecker, trees left on the sale area provided for their favored nesting sites — tree hollows in older growth southern pine trees with red heartwood. Biological diversity was achieved by varying the wildlife featured species selection among adjacent management areas, which ranged from 2,000 to 10,000 acres in extent. State wildlife commissions and management agencies participated directly in selecting featured species. In practice, nongame species other than endangered species were usually not featured species, although they were mentioned in the *Featured Species Handbook*. The effects of the featured species management system were far-reaching for both wildlife and timber management (Roth 1988).

Ned Fritz, a Texas attorney and an active critic of national forest timber harvesting, filed suit against the Forest Service over the featured species management system. He charged that it was not based on proven biological principles and that it was detrimental to threatened or endangered species such as the red-cockaded woodpecker. The Federal District Court in Tyler, Texas, in 1976, however, upheld the system's biological soundness. It also found that featured species did not violate the ESA — marking the first time that a Federal agency prevailed in an endangered species test case (Roth 1988).

Managing Wildlife Habitats in Managed Forests: An Integrated System

In 1977, national forest wildlife managers and scientists documented a general methodology for

evaluating the possible influence of various timber management practices on the habitats of the many wildlife species that occupied large managed forested areas (USDA Forest Service 1978). This methodology provided forest managers an insightful, systematic way to integrate timber management with many wildlife species' habitat requirements. It quickly became a widely used tool for preparing land management plans, assessing wildlife habitat impacts for EIS's, and integrating wildlife habitat requirements with timber management on the ground.

This methodology, initially developed for integrating timber management with wildlife requirements in the Blue Mountains of eastern Oregon and southeast Washington, was published in 1979 as USDA Agricultural Handbook No. 553, *Wildlife Habitats in Managed Forests: The Blue Mountains of Oregon and Washington*. The actual project and handbook, respectively, were coordinated and edited by Jack Ward Thomas (1979), when he was the principal research biologist and project leader at the Pacific Northwest Forest and Range Experiment Station in LaGrande, Oregon. Thomas, in late 1993, was to be named the thirteenth Chief of the Forest Service.

The handbook had 16 authors, including Thomas. They included experts in wildlife biology, silviculture, fish and wildlife habitat management, range and plant ecology, landscape management, resources and environmental planning, game management, riparian areas, and forest fuels and fire management. Forty-five other natural resource professionals and scientists contributed substantive materials that were incorporated into the handbook's content. The effort became serendipitous as the authors and contributors multiplied, data and information accumulated, and the systematic relationships and methodology evolved. The final document included 10 chapters on basic relationships and methodology for integrating wildlife habitat requirements for numerous species with timber management and the timber types (mainly ponderosa, lodgepole pine and mixed conifer) in the Blue Mountains, which embraced a total of 5.5 million acres of CFL, 72 percent of which was included in four national forests: the Malheur, the Ochoco, the Umatilla, and the Wallowa-Whitman. In addition, the Blue Mountain Guide, as it became known, included

59 appendixes documenting the available, underlying resource data and relationships and over 400 annotated references.

This monumental work was an immediate success. Other national forest regions quickly adopted its basic approach and used it as a model, with modifications, for systematically integrating wildlife habitat requirements with timber management for their own locally managed forest areas and conditions. The underlying methodology that "good timber management can be good wildlife management if it is done correctly" was a modified version of the old cliché that "good timber management is also good wildlife management." The new methodology essentially embodied a modern ecosystem approach to managing multiple uses and became an important tool for fulfilling the goal of "good wildlife management." It was specifically designed for large-scale wildlife management, where manipulating the tree cover solely for wildlife on large forest areas was either too expensive or too extensive. The new methodology provided an effective tool for wildlife biologists to coordinate with timber managers to provide and maintain habitats for many wildlife species, including selected featured species. Because the new methodology developed for the Blue Mountains forests addressed nongame species requirements, it also became instrumental in shifting the National Forest System's emphasis from its traditional orientation toward game species more strongly toward endangered, threatened, and nongame species (Roth 1988).

The Blue Mountains methodology had its origins in the severe Douglas-fir tussock moth outbreak in Oregon, Washington, and Idaho in 1974. In the winter of 1975, the forest supervisor of Oregon's Umatilla National Forest sought out Jack Ward Thomas for advice about wildlife before he harvested trees killed or injured by the tussock moth (Roth 1988). The forest supervisor made it abundantly clear that he would soon harvest the trees whether he got the advice or not. Working under this indeterminate, but urgent, deadline, Thomas came up with initial guidelines within 3 weeks. Surprised by this prompt response, the supervisor then wanted to know, "if you can do this in 3 weeks, what more can you do?" Thomas, who at that time was national president of the Wildlife Society (which had lobbied for the wild-

life sections of NFMA enacted in October 1976), saw the supervisor's query as the opportunity to implement NFMA's wildlife provisions for nongame species. Although there was no authorization for doing such a project, he undertook it on his own initiative. This was the beginning of the Blue Mountain Guide. It soon had the support of the forest supervisors on the four Blue Mountain national forests, who saw its utility and the need for such a tool and gave direction and encouragement to carry out the task (Thomas 1979). The BLM provided additional financial resources for completing the guide, and the director of the Pacific Northwest Forest and Range Experiment Station encouraged its completion and publication so that others could use this fully developed wildlife evaluation system.

The Blue Mountains methodology grouped 378 species of amphibians, reptiles, birds, and mammals into 16 lifeforms based on the similarity and closely related habitat requirements of each group. The basic objective in evaluating alternative timber management strategies and practices became the maintenance of habitat diversity. The evaluation model was based on the relationship between lifeform feeding and reproduction habitat requirements and the plant community or vegetative type (meadow, sagebrush, juniper, aspen, ponderosa pine, or subalpine fir) and the successional stage of the plant community (grass-forb, shrub-seedling, sapling-pole, young, mature, or old-growth). These relationships were also developed for individual wildlife species. The methodology analyzed and summarized available biological data and bibliographies on the habitat relationships of each species and evaluated the critical role of special habitats such as riparian zones, edges, snags, and logs and unique habitats in geomorphic formations such as cliffs, caves, and talus. The underlying management and decisionmaking principle was that maintaining habitat diversity was the key to restoring the variety of wildlife species to the Blue Mountains ecosystem.

The initial highly specific guidelines prepared for wildlife habitat protection in a timber salvage program planned for the Blue Mountains national forests evolved into a generalized methodology for evaluating the impact of timber management alternatives on wildlife. The general guidelines emerged

as a direct consequence of critiques by national forest managers who began to use the initial specific guidelines. They were adamant about one point — the specific guidelines were too rigid. In order to apply them to local situations, the guidelines needed to be more flexible. Using the more generalized guidelines, national forest managers could evaluate alternatives, make appropriate tradeoffs, and account for those decisions.

Support for and Coordination With Other Resource Activities

Based on staffing and funding levels during the 1970's, support and coordination activities, including management for threatened and endangered species, constituted about two-thirds of the wildlife and fish habitat management effort and tripled between 1969 and 1979. In 1969, about 180 FTE person-years were devoted to support and coordination activities. Most of the huge increase came after 1975, when FTE person-years were only 235 compared to 530 in 1979 (USDA Forest Service 1992a).

ESA's enactment in 1973, the Sikes Act Extension in 1974, and NFMA in 1976, together with major funding increases that came in 1978 — a direct result of goals and funding levels proposed by the 1975 RPA program — all contributed to the expansion of the wildlife and fish habitat support and coordination function. The Sikes Act Extension exercised its influence through its mandate that the Secretaries of Agriculture and the Interior "work in concert with the States to develop comprehensive plans ... for the conservation and rehabilitation of wildlife, fish, and game." Roth (1988) cited the Sikes Act Extension and NFMA as "the cornerstones" of modern wildlife management on national forests.

In the late 1960's, wildlife biologists began to advocate retention of some "snags" and dead trees which, at that time, were routinely felled to reduce the potential hazards they posed to loggers and as wildfire ignition. These efforts, however, remained largely unsuccessful until the late 1970's when leaving snags and dead trees for birds and providing other wildlife-related treatments became more general practices (Roth 1988). The number and sizes of snags needed, as well as patch sizes or the need for individual, well-spaced snags, became hot topics for

wildlife biologists, timber planners, and managers and were complicated by the Department of Labor Occupational Safety and Health Administration (OSHA) standards which essentially required that dead snags be cut for worker safety.

In the Pacific Northwest, before the 1970's, there was little coordination of grazing and riparian area protection for wildlife purposes. As research in the middle 1970's showed that fish populations decreased approximately 50 percent if livestock were grazed next to streams, range conservationists began to increase their efforts in the late 1970's to keep livestock away from streams and to expand the use of alternative stock watering systems (Roth 1988).

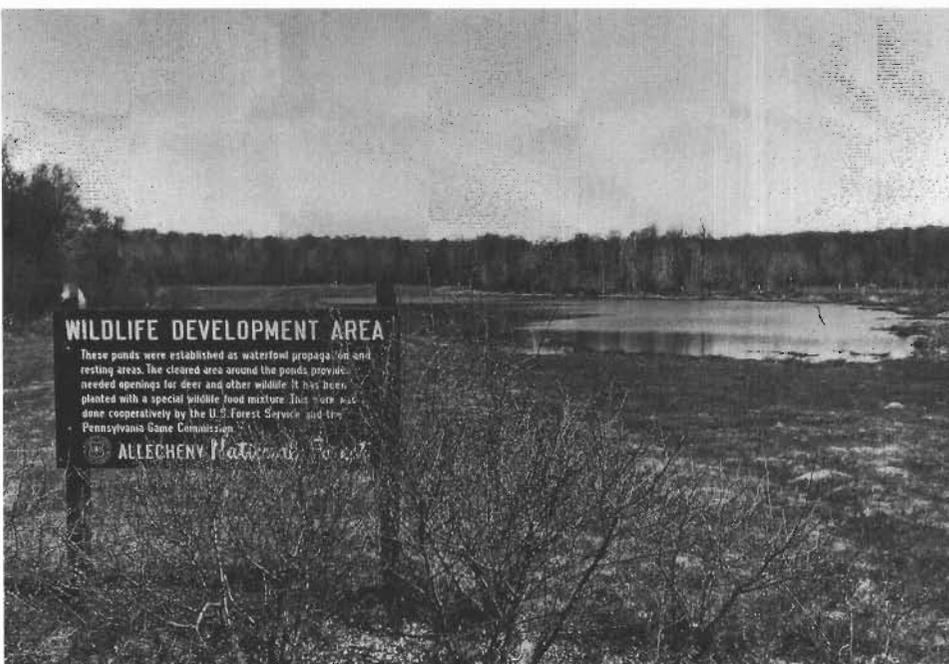
Following NFMA's passage in 1976 and the availability of the Blue Mountains Guide for integrating habitat requirements of all wildlife and fish species with timber management, the habitat requirements of nongame wildlife became more important. Coordination included modifying timber sales to protect the nests of hawks, owls, and other raptors and installing direct habitat improvements such as

nest structures for songbirds, hawks, and geese. NFMA also expanded the Forest Service's authority to use KV funds (a percentage of timber harvest receipts retained for resource management) for wildlife and fish habitat management. This authorization provided an increased opportunity to improve big game habitat productivity, fisheries potentials, and other wildlife habitats on national forests (USDA Forest Service 1978).

A Case in Point: Coordinating Timber Management and Elk

In 1970, the elk and timber management issue in Montana's Little Belt Mountains led directly to a cooperative agreement for conducting research on the effects of logging and roads on Rocky Mountain elk. The cooperators initially included the National Forest System's Northern Region; the Intermountain Forest and Range Experiment Station; the Montana Department of Fish, Wildlife, and Parks; and the University of Montana's School of Forestry. The BLM joined the agreement in 1971. The Plum Creek Timber Co., Inc., a major timber landowner of the former Northern Pacific railroad grant lands, became a participant, but not a cooperator, in 1974. It had a representative at all research committee meetings and, after 1980, provided financial support. The study objectives were to determine certain ecological requirements of elk and the effects of logging, roads, and access on elk populations in order to develop guidelines that would ensure maximum compatibility between timber harvest practices and elk management.

The research was initially planned for 5 years, but it was extended twice, each time for an additional 5 years. Eight major study areas were established in the first half of the 1970's to



Area clearcut around pond and planted with special mixture of plants to improve habitat and food for deer and other wildlife, Allegheny National Forest, Pennsylvania. Pond was established as waterfowl propagation and resting area.

represent the various cover types on five national forests in Montana (the Lolo, the Bitterroot, the Beaverhead, the Flathead, and the Lewis and Clark) and the BLM Garnet Resource Area (throughout western and central Montana) to conduct the various intensive and extensive studies. Eighty-seven clearcuts of various ages were selected throughout the heavy timber stands and the open timber types of western and central Montana to study elk use of various-aged clearcuts on summer ranges. In addition, in 1980 and 1981, eight evaluation areas in Montana and three in northern Idaho, averaging 25 miles square and divided into 3 or 4 subunits, were selected to analyze cover, forage, and road density relationships that influenced elks' use of their habitat. Beginning in 1974, the research produced a series of recommendations for designing and conducting timber sales to minimize their adverse effects on elk. These recommendations were implemented as they emerged. As the research advanced for another decade, feedback from the results obtained in the early actual management applications often modified and clarified the initial recommendations.

South Fork Salmon River Strategy

In 1964 and 1965, on Idaho's Payette and Boise National Forests, heavy rain on snow resulted in massive sedimentation of the South Fork of the Salmon River. A logging moratorium and erosion control efforts began immediately to contain any further erosion and sedimentation and encourage stream flushing. The 1970's rehabilitation effort focused on reducing the landslide potential of logging roads on steep slopes. Logging-road closures continued. Revegetation and drainage system improvements on main roads also continued. By 1975, erosion control measures and the natural stream flushing action had greatly reduced the amount of sediment in the South Fork and its tributaries. In 1974, hatchery summer Chinook smolt were released by Idaho's Fish and Game Department, and by the end of the 1970's adult summer Chinook were being trapped to spawn for hatchery operations.

In 1977, the improving trend in salmon habitat conditions led to the resumption of timber harvesting on the upper South Fork drainage. The management plan for the area identified anadromous fish as its most valuable resource. It also made all land-

disturbing activities conditional upon the continued improvement of fish habitat. The Chief of the Forest Service established a group of scientists known as the South Fork Salmon River Monitoring Committee to ensure annual independent reviews of sediment management results. Several years later, in 1983, these reviews found that sedimentation had not declined and that fish habitats had not improved since timber harvesting had resumed in 1977. These findings resulted in a new moratorium on timber sales in the Upper South Fork drainage. The South Fork salmon habitat rehabilitation efforts have been continued to the present. In the 1990's, they became a part of the Columbia River Basin Salmon Management Project to restore the populations and habitats of several salmon species whose populations have been seriously depleted and where habitats have been degraded by a number of different influences ranging from the overharvesting of fish and water power developments to sedimentation and severe drought.

Endangered Species Management

A 1972 survey, entitled "Present Status and Needs of Habitat Maintenance and Improvement for Rare and Endangered Species on Forest Service Administered Land," found that 39 of 109 listed endangered species in the United States were on or near national forest lands. Some were already the subject of management efforts to improve their habitats in ways that would halt further deterioration of their populations and help their recovery. In 1974, to comply with ESA, the Forest Service developed a comprehensive 5-year program to address the needs of all 39 of the listed species. Sixteen additional domestic species that were rare or otherwise considered sensitive were also included in the program (USDA Forest Service 1974, 1975).

The early efforts emphasized inventories and surveys essential to locating endangered and threatened species. In 1975, for example, special efforts were made to locate bald eagle nesting sites, mainly in Florida, Arizona, California, Wisconsin, and Alaska. Several new research units were set up to assist in conserving endangered and threatened wildlife. One unit, working in cooperation with South Carolina's Clemson University, began studying the red-cockaded woodpecker and Backman's warbler.

Research on other selected endangered species was initiated in Arizona and Hawaii (USDA Forest Service 1976).

In 1977, habitat improvement efforts and management guidelines were in effect for the California condor, southern bald eagle, red-cockaded woodpecker, Mississippi sandhill crane, American peregrine falcon, and blunt-nosed leopard lizard, and for other species. Comprehensive management efforts were evolving in cooperation and consultation with the U.S. Fish and Wildlife Service and the States. For example, studies to determine the habitat requirements for, distribution of, and future management direction for grizzly bear populations were expanded in Montana and Wyoming. Study results were expected to directly benefit the estimated 800 surviving bears and provide the needed management direction to ensure the perpetuation of the species and its populations (USDA Forest Service 1978–1979). Continuing surveys broadened the species base for the endangered and threatened species management effort. By 1977, the surveys reported that more than 60 threatened species had been found and identified on national forest lands (USDA Forest Service 1978).

Habitat Improvement Activities

The installation of wildlife food and cover improvements expanded greatly during the 1970's, from 186,000 acres in 1970 to about 250,000 acres in 1974. Thereafter, actual land treatment for wildlife food and cover benefits accelerated to 950,000 acres per year by 1979 (fig. 24). Acreage treated accelerated even more than the funding and staffing, reflecting the growing integration of wildlife practices with other land treatments for silvicultural, fuel management, and wildfire control purposes, and greater coordination efforts among managers and staff experts in all resource areas. Such integration was most extensive where prescribed burning was the basic tool, whether it was used primarily for silvicultural, fuel management, fire control, or wildlife purposes. Similar integration occurred on reforestation projects where wildlife food planting was integrated with reforestation.

In the early 1970's, before 1975, seeding, planting, and release of forage plants, the predominant land

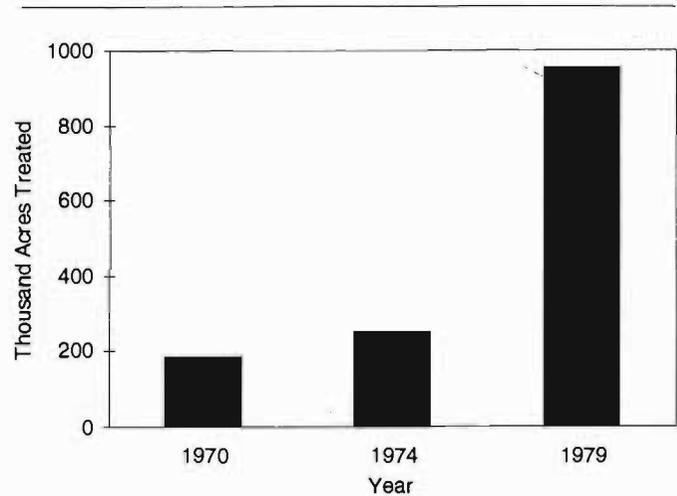


Figure 24. National forest area treated to provide wildlife food and cover benefits in 1970, 1974, and 1979.

Source: USDA Forest Service.

management treatments for wildlife, averaged about 120,000 acres per year. Prescribed burning for wildlife habitat improvement remained below 100,000 acres per year. Treatments to protect key wildlife areas varied between 3,000 acres and 12,000 acres per year. Treatments to improve the wetland habitat for waterfowl, for example, varied between 3,000 and 7,000 acres per year. All of these practices increased significantly during the last half of the 1970's, with the largest expansion coming in the use of prescribed burning specifically for wildlife habitat improvement.

The foregoing wildlife treatment acreage data related only to the actual acres treated directly for wildlife. However, the total acreage of wildlife habitat benefitting from such treatments was four or five times greater. Total benefitting acreage in 1970 would have been about a million acres compared to approximately 4 million acres in 1979. Prescribed burning was the treatment making the greatest contribution to this multiplication of benefits. Small water developments such as ponds, troughs, guzzlers, and other wildlife water supply improvements were regularly installed at the rate of about 1,000 a year. Wildlife habitat acres benefitting per improvement averaged about 180 acres per installation.

Direct habitat improvements for stream and lake fisheries were far less extensive than those for wildlife. This was largely a function of the relatively small acreage of national forest lands occupied by fishable waters. Their management was equally important for protecting and maintaining environmental and water quality on the national forests and for ensuring more satisfying recreational and commercial fishing opportunities where they were practicable. The total visitor use of fishing opportunities on national forests in the 1970's exceeded those for hunting, indicating far more intensive use of the more limited fisheries habitats and opportunities. In 1978, anadromous fish produced annually from national forests provided for an annual catch of 28 million salmon weighing 118 million pounds and valued at an estimated \$100 million (USDA Forest Service 1979).

Not included in the foregoing fish habitat treatments and improvements were the land management and treatment activities designed to protect watersheds and riparian areas and remedy soil and water resource problems when they occurred as a result of either management activities or natural phenomenon. These efforts likewise contributed to the protection and maintenance of water flows and water quality as well as to fish habitats. They are difficult to summarize here and are covered in the discussions of other resource activities.

Fish stream and lake improvements were measured regularly from 1975 to 1979 in terms of acres benefiting from various treatments. Total waters bene-



Wildlife habitat improvement, Ocala National Forest, Florida. Instructor and Florida YCC campers installing a wood-duck nesting box on a tree beside the St. Johns River, 1971.

fitted in those years were 87,100 acres, with an average annual level of 12,400 acres. Actual annual benefitting waters varied from 4,700 acres in 1977 to a record level of 24,000 acres in 1979. Stream improvements included channel structures and stabilization treatments, stream barrier removals, spawning bed improvements, and the establishment of new fishing reservoirs and lakes. Fish population control consisted mainly of the removal of rough and undesirable fish from both streams and lakes.

State Cooperation

State cooperation with national forests was a major component of the wildlife and fish habitat support and coordination function, and States continued to finance about half of the direct habitat improvement work as part of their continuing cooperative projects. State priorities, which had leaned heavily toward



Tongass National forest, Alaska, biological technician using electroshocker to survey feeder stream for salmon, which often rear in the upper reaches of drainages. The electric shock immobilizes fish long enough to identify them and make notes.

game and sportfish during the previous decades, largely continued to govern management of wildlife and fish habitats. National forest managers continued to heed the traditional policy view that the States had the jurisdiction and responsibility for managing wildlife and fish populations as well as setting hunting or fishing regulations on the national forests. National forest managers, however, had the clear responsibility for managing the forest and range vegetation and habitats for multiple-use purposes, including wildlife and fishery habitats.

In 1970, the Public Land Law Review Commission (PLLRC) recommended that formal cooperative agreements be used to coordinate Federal and State wildlife programs (Wilkinson and Anderson 1985). This recommendation was enacted into the Sikes Act Extension of 1974 mandating the preparation of "comprehensive" plans in cooperation with the States for the conservation and rehabilitation of wildlife, fish, and game. Such jointly developed comprehensive national forest fish and wildlife plans were prepared cooperatively in 35 States during the late 1970's (USDA Forest Service 1978). These plans

included provisions for range rehabilitation, ORV control, endangered or threatened species protection, and other terms and conditions that national forest managers and State officials deemed "necessary and appropriate" (Wilkinson and Anderson 1985).

NFMA reinforced the Sikes Act Extension by mandating State and Federal coordination on national forest land management planning. NFMA regulations required such coordination with State fish and wildlife agency biologists. NFMA and the Sikes Act Extension also required, "where appropriate," that national forests adopt State-identified threatened or endangered species as "indicator species" for wildlife and fisheries (Wilkinson and Anderson 1985). In 1978, the cooperative efforts between national forest managers and State fish and wildlife agencies led to the development of the first general guidelines to protect habitats for such nongame species as woodpeckers and the northern spotted owl. In the 1980's, the northern spotted owl would become the object of major Federal court suits and policy issues relating to the national forest's management of endangered species and old-growth forests. In the 1970's, the spotted owl had not been federally listed as an endangered species, nor had the State of Washington classified the owl as "sensitive," nor had the State of Oregon listed it as "threatened." These actions were still to come in the 1980's (Wilkinson and Anderson 1985).

Wildlife Management Institute Study

In 1978, about the time that fish and wildlife management was beginning its major expansion on national forests, the Forest Service contracted the Wildlife Management Institute (WMI) to study the national forest fish and wildlife program. WMI researchers interviewed some 900 Forest Service employees in the Intermountain, Pacific Northwest, and Southern Regions. Since many of the interviewees had worked in other regions, the study leaders felt their results were reasonably applicable to the entire National Forest System. The WMI researchers found that there were managed forests with well-conceived wildlife plans, but that there was a general lack of firm and consistent direction from the Forest Service's Washington Office. They saw a need for national objectives to strengthen "the position of administrators interested in wildlife and fish, and place require-

ments on those who are not so inclined" (Roth 1988). They also reported that many of the national forest comprehensive fish and wildlife plans provided under the Sikes Act Extension of 1974 were deficient in inventory data and did not identify research needs, and that a majority of the interviewees lacked any awareness of or had not read the Sikes Act plan for their particular forests (Roth 1988).

Wildlife and Fish Population Status and Trends

Summary data on national forest wildlife and fish population trends were very limited, except for big game. Generally, however, the shift of national forest wildlife and fish management away from the dominant focus on big game toward maintaining species richness clearly pointed to stronger efforts to sustain habitat diversity and improve the viability of fish and wildlife populations. A new threatened and endangered species policy provided for management actions to reinforce and restore the viability of species populations that were endangered. During the 1970's, no species losses were identified or reported for national forest lands.

Big game populations were generally maintained or increased during the 1970's (see fig. 9, chapter 3). The principal exceptions were deer and mountain goats. Mule and black-tailed deer populations were at peak levels on national forests in 1970, numbering about 2.8 million. However, mule deer population collapses in the Pacific Northwest, together with State and national forest efforts elsewhere during the 1960's to reduce deer herds to manageable sizes, contributed to a major decline, to about 1.9 million deer, by 1980. White-tailed deer populations at a peak level of 900,000 in 1960 had declined during the 1960's and continued to decline to less than 800,000 by 1980. Total deer legally harvested on the national forests declined from 493,000 in 1970 to a low of 312,000 in 1976 and then rose to 360,000, or 13 percent of their total population, by the end of the decade. Elk numbers continued to increase steadily during the 1970's, from 360,000 in 1970 to 470,000 in 1980, compared to 300,000 in 1960. The number harvested in each year during the 1970's averaged about 75,000, or 18 percent of the total.

Other big game populations — pronghorn, black bear, moose, caribou, bighorn sheep, turkey, and

mountain lion — increased during 1970's. Dall sheep remained stable. Only mountain goats decreased, from 31,000 to 23,000. Thus, big game generally appeared to have fared fairly well under the cooperative management arrangements worked out between national forest wildlife managers and State game officials.

No data are available on fish populations. However, national forests in the Pacific Northwest and Alaska, which had more than 10,000 miles of streams that constituted "nursing waters" for the Pacific salmon, estimated that they produced an annual catch of 28 million salmon, weighing 118 million pounds (USDA Forest Service 1972, 1978-79).

Population trends for small game — rabbits, hares, squirrels, quail, pheasant, forest grouse, prairie grouse, doves, and woodcocks — are not available for national forests. However, the national forest share of small game hunting tags indicates that national forests provided from less than 5 percent to 15 percent of all small game hunting days in each national forest region. In some regions for individual species it ranged from 20 to 70 percent — for example: 40 to 70 percent for forest grouse in the Southern, Rocky Mountain and Pacific Coast Regions; 25 percent for waterfowl in the interior West; and for squirrels, 40 percent in the Rocky Mountains and 20 percent in the South (USDA Forest Service 1982).

National Forest Land and Resource Management Performance in the 1970's

For national forest managers, the 1970's were marked by a continuous effort to upgrade the integrated management of multiple uses on national forest lands everywhere in ways that improved both total resource productivity and the quality of the forest environment. These challenges were all the greater as the demands for timber and range resources remained at high levels and national forest resource use and the American public's interest in recreation, wildlife and fisheries, wilderness, minerals, and water expanded significantly.

The record of national forest planning and on-the-ground management activities reveals a growing effort and commitment to integrating the manage-

ment of multiple uses more effectively on the land — a trend generally consistent with improving ecosystem viability and integrity and the quality of the environment while satisfying timber, range, mineral, and energy resource production objectives. The trend also seems to have responded to the ecosystem management training efforts initiated in the early 1970's and continued through the decade. Nevertheless, at the end of the 1970's, much more remained to be done.

Changes in resource allocation, management, and on-the-ground conditions came perceptibly, but slowly, during the 1970's for several good reasons. Only a very small percentage of the total forest lands could be treated through management activities in any one year. This was a function of both the funding and the long-term nature of forest resource production, use, and management.

The science and technology for change were limited, and new management approaches, as they emerged, took time to introduce into the huge national forest management system and its organization. Thousands of professionals needed to be trained in the new approaches or needed to update their skills and capabilities to meet new goals and objectives. Often, the prime need to bring about desired management changes called for new data and knowledge and new technology. Thus, research frequently became the principal route to finding new management approaches. Scientific studies to develop the new data, knowledge, and technology to successfully implement new approaches often involved several years to a decade or longer.

Change was also hampered by national policy objectives and programs for benefitting the Nation's economy, national housing goals, mineral and energy supplies, and Federal rangeland use. Production and management demands competed for the time needed by national forest managers and experts for training and updating technology. On the other hand, new national policy and program initiatives for the environment, wilderness, wildlife, fisheries, recreation, water quality, and cultural resources became driving forces that brought desirable improvements to national forest management. Often, the Forest Service was among the supporters of and,

in some instances, a leading advocate for such improvements.

Implications for the 1980's and 1990's

Jack Ward Thomas's basic methodology for integrating wildlife and fisheries objectives with timber salvage among the various ecosystems of the Blue Mountains laid the basis for a more universal approach to integrating biodiversity and sustainability objectives more effectively into the management of multiple uses within ecosystems. Because the generalized Blue Mountains model avoided rigid or specific guidelines and focused on evaluating management alternatives for multiple uses within ecosystem capabilities on a sustainable basis, it found prompt and wide acceptance among national forest managers as an appropriate tool for resource planning and management decisionmaking.

Thomas's model, however, also revealed that while it was possible to evaluate alternatives for managing multiple uses with the many ecosystem variations, there were enormous data shortcomings and knowledge gaps about resource relationships and ecosystem responses to management. Decisionmaking called for considerable reliance on judgment, experience, and expert advice and often left substantial uncertainty about the ultimate long-term outcome of management. These limitations led to identifying priorities for gathering new data, conducting new research on resource relationships, and monitoring ecosystem responses to management decisions.

National forest management performance during the 1970's clearly revealed that the Forest Service professional staff and scientific researchers had both the understanding and commitment to manage national forest resources, uses, and ecosystems in response to established policy goals and program objectives. The basic grounding and experience in resource management principles and ecosystem management theory existed within the National Forest System and Forest Service Research to do so in ways that benefitted environmental quality and ecosystem sustainability; however, many of those skills and capabilities varied from district to district, forest to forest, and among regions. Nevertheless, the decade of the 1970's also demonstrated that it was difficult to marshal these skills and capabilities rapidly, uniformly, and

effectively within the huge National Forest System. With its decentralized operational organization and stratified hierarchical leadership in a period of major shifts of public interests and policy priorities, the Forest Service needed strong, clear national policy guidance from the Executive Branch and the Congress to address the new goals and objectives along with consistent changes in program targets and supporting budgets.

While national forest managers could participate and sometimes play a leading role in policy issues and the development of new policy goals, programs, and budgets, their primary role was to implement the specific policy and programs provided by the Nation's policymakers. However, implementing such policy goals and programs and budgets often became a hapless, if not hopeless, dilemma in many management situations increasingly burdened by oversight of public interest groups and their recourse to appeals and court suits to achieve their policy preferences and the letter of the law for their management expectations. These interventions became increasingly strong driving forces for change within the National Forest System, especially during the 1980's. National forest management on the ground generally moved toward greater environmental sensitivity, more effective integration of multiple uses, a broader ecosystem approach to planning and management of multiple uses and a stronger balance of amenity uses with commodity uses, however unevenly that management came among the ranger districts, national forests, and regions of the National Forest System.

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Chapter 5

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Chapter 6

National Forest Management for Multiple Uses: 1980 to 1995

The General Setting

The new approach to national forest planning, the economic and policy highlights of the 1980 to 1995 period, the expanding role of public participation, and growing public confrontation are briefly described in this introductory section to provide an overview of the challenging environment for national forest planning and management during the 1980's and early 1990's. These topics are then developed in more detail in subsequent sections.

A New Approach to Forest Planning

NFMA's final implementing regulations, issued in 1979, initiated a new emphasis on integrated land and resource planning for multiple uses on national forests. The implementation of NFMA was as much a new learning experience as a new planning experience on each national forest, and during the 1980's it continually evolved and improved on each forest.

This new approach was linked with nationally determined long-term RPA goals and called for the integrated planning for all resource uses — recreation, fish and wildlife, water, timber, range, and wilderness — on a forest-wide basis for the next 50 years. This approach superseded and integrated the previous unit planning system, which had required 1,200 "unit" land use plans on 123 national forests, and the functional planning for individual resources that involved the periodic updating of 48 separate major resource plans on each forest. NFMA planning replaced these plans with regional planning guidelines for each of the nine national forest regions and forest-wide integrated land use and resource plans for each of the 123 national forests.

NFMA did not require regional guidelines, but they were considered a useful step for linking the national RPA program with individual forest plans. Regional guides allocated the long-term RPA goals among the forests and were intended and designed to ensure comprehensive and consistent national and regional management direction for all national forest resource uses (USDA Forest Service 1982a).

The goal of NFMA planning was to reinforce a more holistic approach to national forest resource planning, use, and management on a forest-by-forest

basis. It was intended that all multiple uses receive equal consideration as long-term planning allocated them to national forest lands for future implementation and that multiple-use planning reflect both the needs and demands of the American people and the capability of national forest lands and resources to serve them. Guidelines for managing the multiple uses would be adequate to sustain the uses and maintain the productivity of the land and the soil. National forest planning under NFMA called for a more evenhanded balancing of resource uses with each other and with national forest land and resource capabilities — forcing greater attention to the interdependent and interactive relationships among the uses and the resources on a forest-wide scale (Cawley 1990). NFMA planning in this way was another step toward an ecosystem approach to planning and managing multiple uses on national forests.

The Forest Service formally considered a fully holistic or ecosystem approach to NFMA planning as it evolved strategies for implementing NFMA planning, but did not adopt the approach for several reasons. Federal policy attention within the Administration and in Congress throughout the 1970's had been strongly focused on increasing timber supplies to achieve housing goals and dampening timber product prices and general inflation. The Forest Service and key Federal policy officials were optimistic that national forest timber supplies could be further increased through greater investments in timber and other resources and appropriate management measures to avoid or mitigate any adverse environmental impacts. Some managers felt that they could adapt their watershed planning and range and wildlife management models to a holistic ecosystem approach for managing multiple uses. But these models and their databases were geared to answer timber suitability questions rather than questions about ecosystem management.

The data supporting timber planning were by far the best developed, with watershed next. The available data for other resources was piecemeal and generally insufficient. Such databases did not generally lend themselves to, and were not readily adaptable for, an ecosystem approach to planning. The models available for ecosystem planning, on the other hand, would have fragmented the timber database and

reduced its effectiveness for timber resource planning and for resolving pressing timber supply questions. This was not acceptable. Addressing the timber supply issue was a high priority and required a traditional timber-oriented planning model — one that could readily evaluate the economic efficiency of timber management alternatives. This choice reflected the Forest Service's strong belief that once the timber supply issue was resolved, provisions for other resource uses would fall in line with NFMA resource and environmental standards and guidelines.

The Forest Service was anxious to respond promptly to the NFMA and NEPA planning guidelines. In 1979, for example, final forest plans and EIS's for all but two of the 123 national forests were tentatively scheduled for completion by the end of FY 1983 (USDA Forest Service 1980b). There was a lack of passion and readiness to try to transform the planning process on 123 national forests to a fully holistic ecosystem approach — although the concept did have appeal and was considered at the time. As it turned out, even with NFMA's limited shift toward an ecosystem approach, most of the plans were not finalized until after 1983, and a few not until the 1990's.

In 1982, USDA policy officials under the Reagan Administration undertook the revision of the 1979 NFMA regulations to better balance economic efficiency with environmental protection. They strengthened the role of economic criteria for NFMA planning and decisionmaking and rewrote proposed environmental guidelines to reflect the broader and more general direction of the NFMA legislation itself. Although the action was viewed in some circles as an effort "intended by the Reagan Administration to weaken NFMA as a statement of environmental policy," the final NFMA regulations of 1982 added language that "substantially strengthened" environmental protection for some resources (Caldwell et al. 1994). The most significant case in point was the new language added to elaborate the 1979 NFMA regulatory guideline "to maintain viable populations of all existing native vertebrate species in the planning area." The new language provided that:

A viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed ... to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others.

This strengthened language was to play a major role in the resolution of the spotted owl controversy that was emerging in the 1980's on national forest lands in the Pacific Northwest and California (Caldwell et al. 1994).

Economic and Policy Highlights

Double-digit inflation and interest rates emerged in 1979 and 1980 and were accompanied by high rates of unemployment. In response to these conditions, the housing market in the early 1980's dropped sharply over the decade to about 1.7 million units per year, and then to an even lower level in the early 1990's. However, average annual softwood lumber and plywood use during the 1980's and early 1990's rose by more than 10 percent above the peak average annual use of the 1970's, due largely to increased remodeling and repair of existing housing.

Administration and congressional priorities for increasing timber supplies from national forests remained strong throughout the 1980's. In the early 1990's, however, this policy pressure abated as housing construction fell to an average of 1.4 million units and court suits were instrumental in reducing national forest timber harvests in the Pacific Northwest. Despite strong softwood lumber and plywood demands between 1980 and 1995, their relative prices remained substantially below the record price levels of the 1970's. This was largely due to an increase in timber supply — a 60-percent increase in softwood lumber imports from Canada and a 40-percent expansion in softwood lumber and plywood production from the southern pine forests (Ulrich 1990; U.S. Bureau of the Census 1993a, 1993b; Warren 1995; Council of Economic Advisors 1994).

The high inflation and high interest rates in 1979 and 1980 also brought severe pressures to reduce Federal spending and budgets. In 1982, under the Reagan Administration, general inflation and interest rates were controlled and reduced, but Federal budget deficits expanded dramatically during the balance of the 1980's and early 1990's — continuing the pressure to control and reduce Federal spending. In this financial climate, national forest budgets were reduced by 24 percent, from \$2.8 billion in 1980 to \$2.1 billion (constant 1994 dollars) in 1986, and remained at reduced levels, an average of \$2.4 billion, through 1994. National forest staffing was similarly reduced, by 26 percent, from 41,700 FTE's in 1980 to 30,900 in 1988. Staffing recovered somewhat in 1989 and reached an average of 34,500 FTE's between 1992 and 1994 (USDA Forest Service 1994f).

Despite funding and staffing reductions, national forests continued to balance staffing among the resource disciplines and improve their capabilities for managing multiple uses on the land in a more integrated manner. For example, staffing for timber programs, including timber sales, silvicultural examinations, resource planning, and all reforestation, timber stand improvement, and brush disposal activities, declined by 18 percent, from about 12,900 FTE's in 1980 to 10,500 in 1994. Much of this reduction reflected the sharp drop in timber sales during the early 1990's. On the other hand, staffing for soil and water programs increased by 40 percent, from 1,170 FTE's in 1980 to 1,640 FTE's in 1994. Wildlife and fish FTE's increased by 114 percent, from 1,040 to 2,230. Recreation program staffing rose by 49 percent, from 3,420 FTE's to 5,100 FTE's. Road and facility engineering staffing, as with staffing for timber programs, also declined, by 64 percent, from 5,220 FTE's to 1,860. Staffing for minerals management, however, increased from 230 to 400 FTE's, or by 66 percent. Range management staffing declined from 1,090 FTE's to 920, or by 16 percent (USDA Forest Service 1994f).

The rapid growth of national forest use abated between 1980 and 1995. Timber sale offerings and volumes sold during the 1980's averaged 11.5 and 10.7 bbf, respectively, about the same as the 1970's decade, then both dropped sharply during the early

1990's to less than 4.0 bbf by 1994. The decline was concentrated in the Pacific Southwest and Pacific Northwest Regions, but all regions except the Eastern Region experienced a decline in timber sale levels. In the early 1990's, timber sales in the Eastern Region, a predominantly hardwood region, averaged 710 million board feet — 17 percent above the 1980 level. Permitted grazing capacity remained more or less stable at 9.8 million AUM's per year, but actual range use declined from 8.7 million AUM's in 1992 to 8.1 million AUM's in 1994.

Recreation visitor day (RVD) use, including wildlife, fishery, and wilderness use, actually experienced a 4 percent decline by 1987, and then began to increase again at 3.4 percent per year to 1994 — substantially faster than the 1 percent population growth rate. The overall average rate of increase for the 15-year period from 1979 to 1994 was 2.2 percent.

NEPA and NFMA regulations and court injunctions increased the need for more intensive oversight of mining plans and operations. Mineral management activities responded with more thorough environmental assessments and protection standards. The number of producing gas, oil, coal, and geothermal leases increased during this period, while the acreage under lease for exploration and production decreased.

This general respite from the dramatic increases in national forest use of the previous three decades, however, did not bring any slackening of the public controversy associated with national forest land and resource planning and management or the public's interest in participating in that planning and management (USDA Forest Service 1981b, 1994e, 1994f).

The Role of Public Participation and Growing Confrontation

The passage of NEPA, RPA, and NFMA legislation during the 1970's greatly broadened the opportunities for a wide range of people and organizations with highly diverse expectations and sharply differing values, preferences, and viewpoints to become involved in national forest planning, decision-making, and project implementation. These opportunities rose to new heights between 1980 and 1995

as NFMA planning, framed by NEPA's requirements for environmental impact analysis, got under way. Public participation in national forest planning activities literally exploded. NFMA planning for the 123 national forests, as reported in 25 draft and 97 final forest planning environmental documents, involved more than 72,000 public input events (table 4) (Russell et al. 1990).

Many more thousands of citizens participated in meetings, in preparing brochures and newsletters, in direct contacts and consultations with national forest managers, and in review and comment on draft EIS documents. About 90,000 copies of NFMA plans and supporting EIS documents were distributed to public policy officials, public agencies, private organizations, and individuals for review and comment.

NEPA, RPA, and NFMA intended that the public's views and ideas on national forest planning and decisions be solicited and taken into account during the development of both draft and final plans and decisions. Legislators and the Forest Service hoped that a wide range of the public would be interested in forest planning and that such interest would lead to fewer appeals and court suits on final national forest plans, EIS's, and decisions. But the public's expectations were very diverse and strongly held. Environmental groups believed NFMA mandated national forest management reform — reform that would involve a change from what such groups viewed as a dominant commodity production focus to a focus on increased protection and enhancement of noncommodity uses, especially the expansion of wilderness areas. Timber industry groups looked for forest plans to achieve the high RPA-set timber production targets more effectively to meet the national demand for wood products. Other groups identified success in terms of their own particular expectations (Larsen et al. 1990).

Growing Public Confrontation

As NFMA plans and resource management projects were developed, completed, and implemented during the 1980's, public participation grew, and debates about the appropriate use and management of the national forests increased and intensified. Growth in public participation led to an increasing

Table 4. Number of public input events by type of event

Type of Event	Number
Meetings Held	1,216
Brochures and Newsletters Produced	650
Contacts and Consultations Made	6,651
Letters of Response Received	63,607
Total	72,124

Source: Russell et al. 1990.

number of challenges as individuals and groups turned to the press, demonstrations, the Forest Service administrative appeals process, court suits, and legislative actions to pursue their goals. By the end of the 1980's, the number of new appeals, for example, had risen to more than 1,000 per year. Such challenges focused primarily on timber harvest and management, but every resource area was affected by them.

Plan and project appeals were directed to the deciding officials and, therefore, were predominantly local — 56 percent went to regional foresters and 33 percent to forest supervisors. Only 11 percent were directed to the Chief of the Forest Service or the Secretary of Agriculture.

Environmental interest groups increasingly turned toward appeals, national public opinion, and interventions by judges and sympathetic congressional authorizing committees to achieve their national forest management goals. Between 1980 and 1995, these groups became increasingly sophisticated and successful in pursuing their goals through court suits, political campaigns, and legislative action — a success that was epitomized by the resolution of the northern spotted owl issue in the Pacific Northwest (Hoberg 1993). A 1993 court injunction and the Northwest Forest Plan adopted in 1994 for the management of the northern spotted owl habitat led to a reduction of several billion board feet in old-growth timber harvests on Pacific Northwest national forests in favor of maintaining a more extensive old-growth environment to protect the viability of the threatened northern spotted owl populations and other old-growth-dependent species.

Thus, while public participation brought significant increases in public input to national forest planning between 1980 and 1995, it also increased and intensified issues and debates between national forest managers and the public about the appropriate use and management of national forests. Chief Robertson, addressing the Lands Committee of the Rocky Mountain Oil and Gas Association in 1988, characterized the environmental community as "extremely vigilant" and "watching every step we make on national forests and standing ready to challenge any decision that has a weak spot" (Robertson 1988).

The National Forest Planning Process and Its Performance

Initially, many national forest managers were hopeful that the NFMA planning process would be largely scientific and produce scientific solutions that would avoid political entanglements — an assumption that tended to shape the public participation process. Lofty expectations accompanied this approach. Its goal was to inform and involve the public — to give the public information and to receive public input — as opposed to problem resolution through two-way communication, negotiation, and shared decision-making. The new forest plans were expected to be more balanced in terms of resource coordination and integrated management for the multiple uses and better understood by the public, thereby earning more public support and producing fewer appeals and litigation. National forest managers hoped, as expressed by Senator Hubert Humphrey, that "forest managers could practice forestry in the forest and not in the courts." The public had similar high hopes. Neither the public nor national forest managers anticipated the influence that the changing values emerging among public interest groups and the maturing of the environmental movement would have on the process. NFMA planning quickly became much more confrontational and political than ever expected. As a result, the planning process became increasingly complex and demanded and consumed more time (Larsen et al. 1990a).

The Public Issue and Management Concern

The NFMA planning process was designed to respond to the 1980 RPA national program goals at the local forest level. RPA projected modest increases in all national forest resource uses by 1995 and major increases in outdoor recreation uses, including wildlife, fisheries, and wilderness; timber harvests; and mineral and energy operating plans, by the year 2030. These projections largely reflected past national forest resource use and demand trends, including a strong response to the newly established demand for substantial expansion of national forest wilderness. This raised both public interest and public concerns.

The planning process provided a forum for addressing and resolving national forest resource use issues and management concerns that emerged from the public's very diverse and conflicting interests. In practical terms, the purpose of the forest plans was to provide answers to three questions: What is a forest good for (its ecological potential)? What do people want from the forest? and How do we meet today's needs, while preserving future options? (Shands et al. 1990).

One of the initial steps in the planning process established each forest's baseline or potential for each of the major resource uses. These capacity limits defined the outer boundaries of the forest planning process. The second step was the identification of issues and opportunities by the public and planning and management concerns by national forest managers. Public issues basically defined the alternatives to be considered. Also, they often reflected and defined longstanding conflicts among competing national forest uses and user interests. In a way, they represented highly politicized public policy questions. Forest planning, however, tended to respond to these issues as management problems and addressed them through the largely scientific and technical planning process (Shands et al. 1990). The commitment of the forest planning process to the 1980 RPA's long-term output goals and objectives tended to orient the planning process toward traditional multiple-use planning and management. Such a technical planning approach did not respond well to the social and political content of the public issues

and did not provide an arena for public interest groups to confront each other and work with policy officials toward mutually acceptable solutions. As a consequence, external pressure on national forest planning mounted. The 1980's were marked by an increased number of appeals and litigation that focused heavily on limiting or reducing the commercial uses of national forests, particularly timber harvesting.

The Role of Planning Alternatives and Management Direction

The public issue process revealed the public's wide scope of expectations for national forest use and management. Thus, there was a corresponding variety of alternative ways national forests could be managed. Taken collectively, these reflected the full diversity of the public's expectations, RPA program goals, and existing management plans and goals. The preferred management alternative was determined and selected by comparing the net public benefits (the discounted market value of all future uses less management costs) of the alternatives and how they responded to the various public issues.

National forest planning alternatives typically included the existing forest plan or plans as the NEPA-required "no action" alternative, and a specific alternative that responded to the RPA goals. Other alternatives could include high, moderate, and low commodity-output options and a similar set of amenity alternatives. Still others might focus on wilderness, wildlife and fisheries, or recreation, or address a particular public issue. A few forests included an alternative that was defined collectively by conservation interests or other interest groups.

Because of their long-term nature, forest plans were goal-oriented and did not specify actual year-by-year on-the-ground implementation. In other words, forest plans were not project- or site-specific. This became quite a problem for many interest groups who expected forest plans to make site-specific decisions. Their expectations led to many forest plan and project appeals. Each year, national forests made decisions on about 40,000 resource management projects — an average of 325 per national forest per year. Over the 10- to 15-year expected life of a forest plan, the inclusion of such projects in the forest

planning process would have entailed advance planning and decisions for 3,250 to 4,875 site-specific projects per forest (Gippert and White 1990).

Management Direction for Implementing Alternatives

The management direction for each alternative was determined by its long-term goals for resource use. It also reflected the direction given in the laws and regulations and the influence of scientific knowledge, technology, and experience, but did not assign any specific forest management activities. Such management direction likewise provided for the protection of soil productivity and environmental quality. In addition, there were environmental guidelines and standards, referred to as "management constraints" (management requirements) to ensure viable wildlife and fish populations, meet State water quality standards, and protect endangered species. Each alternative mapped national forest lands into management areas (land use "zones") reflecting different resource conditions and potentials for use — each area uniform enough to have its own management direction for expected uses, environmental protection, and mitigation. Most forests had about 20 management areas. The planned resource goals and uses among these management areas varied with each alternative, and the management direction likewise varied accordingly.

Many forests were able to design management direction in ways that mitigated or resolved certain public issues. The most successful forests were able to distill their public issues into problem statements. The management direction for each management area then served to resolve such issues. This approach appeared to help the public visualize what would take place on the forest in better detail and tended to increase the public's acceptance of planning decisions (Bosworth et al. 1990).

Principal Guidelines for Planning Multiple Uses

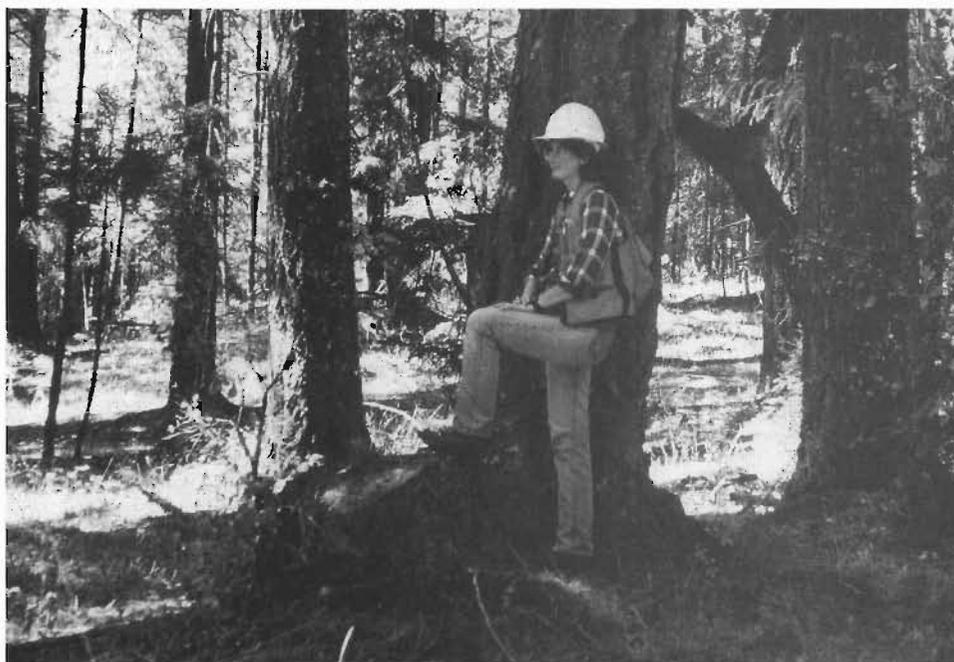
NFMA affirmed the management of national forests for multiple uses. It defined many constraints that explicitly provided for the protection of soil, water, and especially wildlife and fisheries. It also provided strong guidelines for implementing the interdisciplinary approach.

NFMA guidelines and regulations also focused strongly on the timber resource. Timber harvesting would be limited to forested lands where the soil, slope, and other watershed conditions would not be irreversibly damaged and where there was an assurance that the land could be successfully restocked with trees within 5 years following timber harvest. Streams, lakes, shorelines, and other wetlands would be protected from detrimental changes associated with timber harvesting. Clearcutting would be limited to conditions where it was determined to be the best-suited or optimum method to meet land management objectives and not necessarily the one that produced the greatest dollar return or timber volume. Clearcut size would be restricted.

NFMA guidelines and regulations also permitted increased harvest levels based on intensified management, but only if such management was consistent with the MUSY Act of 1960 and successfully implemented. Timber harvesting, except for salvage sales or sales needed to protect other multiple-use values, was precluded on lands classed as not suited for timber production.

Each forest's harvestable volume was limited to the amount that could be removed annually, in perpetuity, on a long-term sustained-yield basis. A forest plan could depart from such a nondeclining flow level, but only where the increased volume provided by the departure helped to achieve one or more other multiple-use management objectives, determined with public participation, in the forest plan.

NFMA also provided for maintaining the diversity of plant and animal communities on each national forest. Its regulations required that fish and wildlife



Forester examining silvicultural practices on Douglas-fir, Siskiyou National Forest, Oregon,

habitats be managed to maintain viable populations of existing native and desired nonnative vertebrate species in the planning area to ensure that such species did not become threatened or endangered. Forest plans were also to protect and restore habitats of any endangered species that existed in the planning area to sustain their populations. This direction responded to ESA's policy objectives and direction.

NFMA called for integrating economic analysis with biological considerations. This was achieved by defining alternative forest resource management practices that would satisfy NFMA's and NEPA's biological and environmental constraints and by selecting the practices that would achieve the resource output goals most efficiently based on their expected rate of return on investment costs. This procedure was most useful in planning the management direction and timberland area needed to achieve the timber management goal.

The plan's EIS was to discuss the environmental impacts for each forest plan alternative. It was also to address social, economic, and community impacts as well as the biological and physical resource effects. Although NFMA itself was vague

about the need to assess community impacts, national forest managers needed to be responsive to community concerns and the impacts that plan alternatives had on a community's stability and viability. Generally, this meant planning national forest management in a way that would avoid radical or abrupt changes in a community's economic and social structure.

The Interdisciplinary Process

NFMA required that each national forest use an interdisciplinary team to develop its forest plan. The role of the interdisciplinary team was to ensure that forest planning would fully consider the physical, biological, economic, social, and other sciences in the long-term planning and management direction for multiple uses — a requirement that was intended to replace the strong role of the traditional multidisciplinary "planning by individual resource function" approach to national forest management. The interdisciplinary team requirement broadened the professional skills available on each forest. The hiring of new and more "ologists" over time contributed to a more evenhanded interdisciplinary approach in developing forest use plans and management direction for each of the multiple uses in each management area (Office of Technology Assessment 1992).

In 1990, a Forest Service retrospective evaluation of the interdisciplinary process, based on comments and responses from 178 key local people in all national forest regions, found that the public had very favorable views about the process. They generally believed that the interdisciplinary process allowed all resources to be appropriately considered and, in this way, helped to achieve more sound management decisions. The interdisciplinary approach also enabled more environmental issues and impacts to be assessed than previous planning approaches. Both the responding public and national forest professional staff believed that the interdisciplinary process produced far better multiple-use coordination than earlier multidisciplinary planning methods had (O'Neal et al. 1990).

The Plan Decision Process: Plan Approval, Appeals, and Litigation

The draft EIS displayed the environmental analysis process and its results and provided initial informa-

tion for evaluating plan alternatives and identifying a preferred alternative. All alternatives were designed to meet environmental protection objectives and resource management constraints. Alternatives were compared by estimating the net public benefits of each alternative, various indicators of each alternative's response to public issues, and the RPA goals for individual resources.

The Preferred Alternative

The selection of a final alternative was based on the public's review of and response to the forest plan's draft EIS and its preferred alternative. Frequently, the public feedback led to adjustments and modifications in the preferred alternative or the selection of another alternative. The regional forester for each region selected the final alternative, issued a final EIS, and documented the decision in a record of decision. Such a decision could be appealed to the Chief of the Forest Service.

Once plans were approved, they became the legal guide for developing annual program and budget proposals. Management direction provided the starting point for implementing the management of multiple uses and their planned annual outputs on the ground. The actual implementation of forest plans, however, was controlled by congressional budget allocations to national forests, which influenced the scheduling and timing of resource outputs and management practices to be used and also the general resource management emphasis (Bosworth et al. 1990).

Forest Plan Appeals

The number of forest plans completed each year is displayed in table 5, together with information on the number of new appeals, resolved appeals, pending appeals, and forest plans free of appeals (USDA Forest Service 1981–1995, 1995e).

As more plans were completed and final EIS's issued, plan appeals escalated to a peak level in 1988 and then declined. Forest plan appeals through 1995 totaled 1,245. The number of appeals per plan or forest varied from a low of 5 to a high of 25. In 1995, there were still 184 appeals outstanding — about four appeals per plan. Table 6 summarizes the resolution of forest plan appeals (USDA Forest Service 1995e).

Table 5. Appeals of completed forest plans by number, status, and year

Years	Forest Plans with EIS filed with EPA	New Appeals	Appeals Resolved	Appeals Outstanding	Forests Free of Appeals
1983	4	-	-	-	-
1984	5	24	22	2	-
1985	14	31	23	10	5
1986	42	230	41	199	12
1987	17	151	117	233	24
1988	8	317	184	366	39
1989	7	84	155	295	49
1990	17	182	128	349	62
1991	1	123	117	355	NA
1992	4	57	122	290	78
1993	0 ^a	40	99	231	79
1994	NA	3	29	205	NA
1995	NA	3	24	184	NA
Total	123	1245	1061	184	-

^a Final EIS delayed on four California national forests due to need to revise previously completed draft plans in response to the listing of the spotted owl as a threatened species.

Source: USDA Forest Service 1981–1995, 1995e.

The record of appeal resolutions suggests that appellants' actions were not very effective for their purposes, which belies the actual case. The contents of all appealed plans received careful evaluation in the Chief's Office. In order to be prepared to provide effective responses to a Chief's Office appeal evaluation, most forests reviewed their plans critically. As a result, many appeals were withdrawn through negotiated agreements for revisions and amendments with national forest planning officials below the Chief's level. The dismissals generally reflected untimely appeal submissions, appeals for remedies not legally available to national forest managers, or issues that were outside the scope of the planning effort. The appeals on procedure (nonsubstantive appeals) were concentrated on just two national forest locations — the Los Padres National Forest in California and those involved in the northern spotted owl issue in the Pacific Northwest — and were essentially dismissed. More than 90 percent of the decisions on substantive appeals affirmed the final EIS and its selected final forest plan.

Only 44 of the substantive appeals were remanded to the forests for further review and consideration of the appeal issue and forest-level revision or amendment. Most of the remanded appeals (37) occurred with the

earlier completed plans and appeals made before 1990.

Although almost all of the planning appeals resulted in affirmed plans or were dismissed or withdrawn, they raised issues that led to improvements in the planning process, the quality of the disclosure of the environmental impacts in the final forest plan, and the management direction published in the final EIS

Table 6. Resolution of forest land and resource management plan appeals

Resolution of Appeal	1984-1989	1990-1995	Total Number
Appeals on Plans Remanded to Forest	37	7	44
Appeals on Plans Affirmed	132	329	461
Appeals Nonsubstantive	70	62	132
Appeals Dismissed	179	41	220
Appeals Withdrawn	127	77	204
Totals	545	516	1061

Source: USDA Forest Service 1995e.

documents. These improvements appear to be reflected in the relatively fewer number of remands between 1990 and 1995 — 5.1 percent of 136 substantive appeals that were not dismissed or withdrawn compared to 21.9 percent of the substantive appeals not dismissed or withdrawn between 1985 and 1989. In addition, the number of appeals that were dismissed or withdrawn declined substantially after 1989 (table 6). However, relatively more appeals were referred to the Chief for affirmation or remand. This trend indicated more effective presentation of appeals by appellants and relatively fewer negotiated settlements of appeals at the forest level.

NEPA and NFMA Forest Planning Litigation

Some public interest groups and individuals pursued their dissatisfaction with approved forest plans through court suits and adjudication. The number of such suits, however, was much less than the number of forest plan appeals. The first forest plan to be challenged in litigation was the Rio Grande (Colorado) National Forest plan. Between that initial court challenge in 1987 and 1995, a total of 49 court suits relating to national forest plans were adjudicated. This compares with the resolution of 1,061 out of 1,245

forest plan appeals without court suits during the same period. In 39 of the 49 suits (80 percent of the time), the courts upheld the forest plans. In addition to the approval of the forest plan itself, most of the suits involved timber harvest or management issues or biological diversity, endangered species, and wildlife or fisheries management issues. Other suits addressed issues related to range, recreation, roadless area evaluation, water rights, public involvement, watershed effects, old growth, minerals, road development, or, in a few instances, regional guidelines, but at a lower frequency than timber and wildlife issues.

The 10 court suits adjudicated in favor of the plaintiffs generally involved either timber management or endangered species issues or both, including the

spotted owl and the salmon species issues in the Pacific Northwest. All but one of these suits related to forest plans in the Pacific Northwest or the northern Rocky Mountains.

Project-Level Appeals and Litigation

As national forest plans were increasingly affirmed through the appeals process and court litigation, public interest groups and individuals increasingly turned to challenging the implementation of site-specific projects to pursue their particular concerns about national forest management. The number of project appeals awaiting decisions rose rapidly, from 163 at the beginning of 1986 to 1,626 at the end of 1992 (table 7).

New appeals in 1986 numbered 1,081, compared with 1,659 in 1992, and totaled 9,983 for the 1986 to 1993 period (includes 1,144 forest plan appeals).

Table 7. Summary of project appeal activity, 1986–1992

Appeal Status	1986	1987	1988	1989	1990	1991	1992
	Number of Appeals						
Pending January 1	163	563	628	1,044	1,045	1,249	1,453
New Appeals	1,081	874	1,609	1,291	1,991	1,386	1,659
Decisions Rendered	681	809	1,193	1,290	1,787	1,182	1,486
Pending December 31	563	628	1,044	1,045	1,249	1,453	1,626

Source: USDA Forest Service 1992a.

Appeals resolved in the same period rose similarly, from 681 to 1,486, but this increase was not great enough to catch up with the growing workload of pending and new appeals.

The appeals focused most heavily on timber sales and management issues (table 8). For 1991 and 1992, such appeals constituted 52.6 percent of the new appeals, while recreation, range, land management planning, minerals and geothermal management, and lands administration each constituted between 6 and 11 percent. Most appeals related to resource management projects; only 201 related to land management planning.

Many of the project-level appeals were filed by interest groups and individuals pursuing issues that

Table 8. Distribution of administrative appeals related to national forest management for 1991 and 1992

Resource or Management Activity	Number of Appeals	Percent of Total
Timber	1,530	52.6
Recreation	320	11.0
Land Planning	201	6.9
Minerals	220	7.6
Range	182	6.3
Lands	189	6.5
Wildlife/Fish	126	4.3
Engineering	62	2.1
Pest Management	13	<1
Water/Air	8	<1
Other	60	2.1
Total	2,991	99.4

Source: USDA Forest Service 1992a.

they felt had not been fully responded to or resolved in approved forest plans and EIS's or actions on plan appeals. The appeals were widely distributed throughout the National Forest System. The greatest concentration, almost 73 percent of all the appeals in 1991 and 1992, were in the major timber-producing regions: Pacific Northwest (Region 6), Northern (Region 1), Southern (Region 8), and Pacific Southwest (Region 5). Thus, public issues and appeals did not abate as national forest plans were approved for implementation and as forest plan appeals were increasingly resolved. The focal point for appeals merely moved from forest plans to site-specific projects.

After 1988, litigation accelerated. The number of NEPA cases litigated rose from 50 between 1970 and 1988 to 79 for between 1989 and 1995. However, the Forest Service success ratio on NEPA court suits rose from 20 out of 47 cases (43 percent) between 1970 and 1978 to 63 out of 79 cases (80 percent) between 1988 and 1995 — a fact that was largely attributed to the Forest Service's commitment, beginning in 1979, to provide Service-wide intensive training and preventive law advice on NEPA's legal requirements, its related decision documents, and its effective implementation in an effort to help meet the growing challenge of NEPA compliance (Bremen

1995). This initiative contributed importantly to more effective responses to NEPA standards and requirements, as well as to better written NEPA and decision documents.

National Action Plan To Improve NEPA Compliance

In 1988, the escalating number of project appeals and the high level of adverse NEPA court suits led the Forest Service to establish a national task force to determine the underlying causes of this performance. There was a growing concern within the Forest Service that the trend of increasing litigation and appeals would significantly change the balance of management activities on national forests and disrupt timber sales and oil and gas leasing, particularly in unroaded areas and old-growth timber. The task force reported three basic problems requiring correction to achieve more effective NEPA compliance and minimize future litigation and appeals: an often insufficient understanding of NEPA requirements among national forest managers and staff; widespread reluctance within the Forest Service to prepare EIS's; and confusion about when specific planning, management, and NEPA-related decisions were made (USDA Forest Service 1989a). Citizens participating in the NFMA planning process also shared the last concern.

This evaluation resulted in *A National Action Plan: Improving Compliance with the National Environmental Policy Act in Project Decisionmaking* (Leonard 1989). The action plan involved formal participation of Forest Service leadership from the Chief down to the district ranger and all professional staff involved in preparing environmental analyses. It focused on removing the obstacles national forest managers and staff faced in trying to comply with NEPA and NFMA when analyzing, designing, and deciding on resource management projects. Such obstacles included pressures brought on by heavy, time-consuming workloads and a tendency to cut corners to meet planned program and budget targets — particularly, but not exclusively, for timber harvests; unclear signals on priorities; lack of clear, accessible direction on NEPA compliance; changing interpretation and direction; paperwork overload; and changing analysis standards for assessing environmental impacts.

Formally implemented in the spring of 1989, the National Action Plan's short-term actions included a letter to line officers with Chief's direction, followed up by joint Deputy Chief and regional management meetings; regional action plans and inventories of available NEPA resources and skills; national team assistance on specific projects; a national newsletter on NEPA compliance; a national training workshop with followup on how to help interdisciplinary planning teams and EIS teams; and a state-of-the-art "answer book" with references.

Longer-term activities included a high-quality training course on NEPA and NFMA appeals and litigation processes and requirements as well as other, more specialized courses, including training in conflict resolution, the development of analytical models for estimating environmental impacts, and the expansion of the national database and library on NEPA compliance needs.

The national effort to improve NEPA compliance was applied effectively and energetically throughout the National Forest System. It continues to operate, and its activities have improved and expanded with time and experience. The best evidence of its effectiveness is the major reversal of the ratio of appeal wins versus losses since 1988. The number of new NEPA appeals and suits, nevertheless, has continued to grow, indicating dissatisfaction with national forest use and management among strong residual segments of public interest groups and individuals, which include commodity as well as environmental interests. Their attention generally focuses on commercial uses of the forest and related environmental concerns, and particularly on timber harvesting and management and its perceived environmental effects. In view of the progress national forests have made in meeting NEPA requirements and standards, it raises a question about the goal of the growing number of appeals and suits. Improved national forest NEPA compliance indicates more effective responses to Federal laws setting environmental standards that national forests management must satisfy. Under these circumstances, one would normally expect NEPA compliance appeals and suits to decline rather than rise. However, appeals and litigation are a means of stopping or more thoroughly exploring management decisions

that are not favorable to a group's or individual's interests. Some groups became quite sophisticated in the pursuit of these interests. One group, the Wilderness Society, for example, published two handbooks *How to Appeal Forest Service Plans* and *Issues to Raise in a Forest Plan Appeal* (Wilderness Society 1986a, 1986b).

Revision of the Rules of National Forest Land and Resource Management Planning

In March 1989, as an initial step for revising and updating the existing rules for the second cycle of national forest planning under NFMA, the Forest Service undertook a comprehensive review and critique of its land management planning experience. The critique, completed in May 1990, documented what had been learned in the first cycle of NFMA planning and suggested the best ways to respond to the planning challenges of the second cycle. A summary report, *Synthesis of the Critique of Land Management Planning, Volume 1* (Larsen et al. 1990a), and 10 other, more detailed reports documented the results. The critique involved more than 3,500 people inside and outside the Forest Service. More than 2,000 people participated in or had responsibilities for planning and providing guidance through formal workshops and interviews. They included members of the general public, interest groups, representatives of other resource management agencies, elected officials, Indian tribal leaders, forest supervisors, regional foresters, resource specialists, and members of interdisciplinary planning teams. An additional 1,500 interested people submitted written comments on the planning experience of the 1980's.

The findings identified six major areas where adjustments were needed: citizen, lawmaker, and Forest Service expectations of planning; the Forest Service attitude toward and conduct of public involvement; how the Forest Service conducts planning; simplification and clarification of planning procedures; implementation of plans, particularly to ensure that they are followed and used; and connections between appropriations and forest plans.

Some 272 detailed recommendations were combined into seven major recommendations:

- Reduce and clarify planning rules and direction, including a planned, step-by-step approach to forest plan revision and increased responsibility and authority of local resource managers.
- Inform and involve public interests early and continuously; increase line officer commitment to planning and improve analytic tools and their application to planning questions.
- Ensure that planning is adequately staffed with the variety of skills it needs and that research support is adequate to increase the effectiveness of integrated resource management.
- Strengthen and clarify the linkage between forest plans, programming and budgeting, and appropriation activities.
- Educate the national forest staff, citizens, and cooperators about the RPA, NFMA, and NEPA planning processes and how they fit into the national forest multilevel planning, decision-making, and management processes.
- Develop a strategy for revising forest plans and improve methods for monitoring and maintaining forest plans.
- Strengthen Forest Service quality control and management review mechanisms and disseminate results together with decisions from appeals and litigation to interested public (*Federal Register* 1991).

The critique's findings became valuable guidance in preparing the Forest Service's draft proposal to change land management planning regulations. The Forest Service published an advance notice of proposed rulemaking in the *Federal Register* in February 1991 (*Federal Register* 1991), soon after *Synthesis of the Critique of Land Management Planning* was published, to solicit comments on the draft planning regulations. The advance notice of rulemaking's text was strongly based on about a third of the critique. Readers were encouraged to study the critique's

reports along with the preliminary text. Other reviews and informational papers used to update the existing rule were the results of land management plan appeals and litigation, various published professional papers on the planning process, and related papers such as the Keystone Policy Dialogue, which addressed biodiversity on Federal lands. The advance notice restated the Forest Service's conclusion that although NFMA had some limitations, it was basically sound policy guidance. NFMA, for example, did not specifically address the ecosystem concept and management approach to national forest land and resource management planning, but the critique included a recommendation to "take an ecosystem approach to multiple-use, sustained-yield management ... in contrast to a resources approach...." (Shands et al. 1990). The advance notice's proposed regulatory text moved in that direction in its purposes and principles. It emphasized the need to manage national forest multiple uses, including environmental and amenity values, in an ecologically sound manner. Under integrated resource management, the proposed rule included ecological subunits such as biological communities and special habitats as management indicators in addition to the traditional management indicator species.

The Forest Service distributed 20,000 copies of the advance notice to interested persons and groups and invited comments on the rule. More than 600 responses provided 4,700 comments. Business and industry interests; Federal, State, and local government agencies; conservation and environmental groups; and Forest Service employees each provided between 9 and 11 percent of the comments, for a total of 41 percent. Recreation and other user groups, academics, and civic organizations each provided 1 to 2 percent of the comments — a total of 4 percent. The remaining 55 percent came from individuals. (*Federal Register* 1995). Following the processing of the comments on the 1991 advance notice, there was an extended delay in publishing a proposed rule — until 1995. The delay was influenced institutionally by a Bush Administration moratorium on the issuance of new regulations, the change in Administrations after the November 1992 presidential election, and a need to review the proposed rulemaking with the new Clinton Administration policy officials. Chief Robertson's 1992 announcement of

the intention to move the National Forest System toward an ecosystem approach in managing multiple uses added a new technical dimension to NFMA rule-making not addressed in the advance notice. The continuing northern spotted owl controversy in the Pacific Northwest in the early 1990's — a focal point for exploring ways to implement principles of ecosystem management — remained unsettled until late 1994. It created its own uncertainties and tensions about implementing an ecosystem approach to national forest management. There also were substantial litigation and court decisions in this period; these continually introduced new considerations about how and to what extent ecosystem management guidelines could be introduced into the NFMA regulations (*Federal Register* 1995). The Forest Service finally published its proposed rule in the *Federal Register* in April 1995. The proposed rule included a major new Forest Service finding and conclusion: "Principles of ecosystem management need to be reflected in the planning regulations."

The Forest Service has made its intention to move toward an ecosystem management approach clear and, in the last few years, it has actively promoted implementing ecosystem principles consistent with existing laws. Other Federal agencies have acted similarly. When the spotted owl controversy in the Pacific Northwest was settled in 1994, it became a particular case in point. The 9th District Circuit Court upheld the validity of an ecosystem approach in sustaining the Record of Decision for the Range of the Northern Spotted Owl from programmatic challenge (*SAS v. Lyons*, No. C92-479WD [W.D. WA Dec. 21, 1994]). Judge Dwyer, in rendering that decision, stated, "Given the current condition of the forests, there is no way the agencies could comply with environmental laws without planning on an ecosystem basis" (*Federal Register* 1995).

The Forest Service recognizes that the ecosystem approach to management is an evolving concept and that much remains to be learned about how best to implement its principles practically in managing multiple uses. The Forest Service issued the proposed rule as a transitional step for incorporating the principles behind the ecosystem approach into land and resource management planning consistent with NFMA. Although the existing "crazy quilt" frame-

work of Federal laws occasions some limitations and uncertainties for implementing ecosystem concepts, progress can be made within this framework. The Forest Service believes that existing statutes may need to be adjusted before the ecosystem approach can be transformed from an evolving approach to a fully operational reality for the National Forest System (*Federal Register* 1995).

The proposed planning rule's first principle requires that the National Forest System be managed to provide sustainable ecosystems that yield multiple benefits to present and future generations. It then defines people as a part of those ecosystems and defines the primary role of resource decisionmaking as meeting people's needs and desires within the capacities of those ecosystems.

- Forest plans will establish direction for the integrated management of soil, water, fish and wildlife habitat, grazing, timber, oil, gas, mineral, recreation, wilderness, cultural, historic, geologic, vegetative, air, visual, and other relevant resources.
- Management direction will focus on achieving objectives that will be described in terms of desired resource conditions, or ranges of conditions, associated with ecosystem variations.
- Objectives will be designed to achieve forest plan goals describing desired end results in broad general terms. These forest plan goals will link broad Forest Service goals expressed in the law, Executive Orders, regulations, or Forest Service directives and the RPA program to the desired resource conditions specified in the forest plan.
- The forest plan will not specify a time period for achieving its goals and objectives. Actually, the desired resource condition will be the basis for determining the capability of local national forest ecosystems to meet the multiple uses sought by national forest users.

Under the proposed NFMA planning regulations, projections of goods and service levels or management activity levels would not be any part of forest plan direction. Experience with existing plans has

shown that such projections are not reliable or predictable and are often not even determined by the plan; rather, they are determined by annual budgets and programs, actual market demands, and by appeals and litigation — processes and decisions not under the control of national forest managers. Thus, the state of forest resource conditions desired for soils and rangelands and other vegetation, historic or cultural site retention, or visual quality or wilderness experience and the associated management direction would determine the forests' capability to respond to them. The proposed rule also assumes that effective ecosystem management, properly implemented, including the management of endangered, threatened, and sensitive species habitats to avoid their extirpation or listing in the case of sensitive species, would automatically provide for habitat diversity as well as sustainability. The proposed rule focuses forest plans on achieving and sustaining desired resource conditions and responding to multiple-use demands according to the capacity of those ecosystems to supply them. Thus, forest plans would no longer include quantitative outputs except in the case of timber resources. NFMA explicitly requires quantitative output objectives for timber.

Under the proposed rule, national forest management would, in some ways, become more holistic, increase its emphasis on an interdisciplinary approach, and seek more effective public participation to integrate the management of its multiple resources and uses. The ecosystem approach would involve a broader geographic and landscape-oriented perspective in fitting the multiple uses into forest ecosystems. It would also consider conditions on other public and private lands outside the forest plan area to ensure that national forest lands are managed from a broad, ecological perspective rather than one limited to jurisdictional boundaries. This effort will involve improved and increased public participation to avoid impinging on the rights of private landowners and the authorities of other public agencies.

The proposed rule provides still another approach to integrated management of multiple uses in a way that will sustain both the forest uses and the ecosystems that support them for the benefit of future

generations. Its final form will depend upon the public comments on the purpose and content of the proposed rule closed in August 1995. A second proposed rule was drafted in response to the public comments and, as of March 1997, had been scheduled to be reissued for an additional 90-day comment period in mid-1997. It is still pending as this book is being published.

Wilderness Designation, Use, and Management

Between 1980 and 1995, public interests prompted congressional wilderness designations that more than doubled the area of national forest wilderness (see fig. 17, chapter 5). Most of these additions had been included in RARE II. Between 1979 and 1984, the designated national forest wilderness area rose by 17 million acres, from 15.1 million to 32.1 million, and the number of units nearly tripled, from 110 to 327, creating a huge challenge for wilderness administration and management. Designations in subsequent years came more slowly. Between 1985 and 1993, national forest wilderness grew by 2.6 million acres, to 34.6 million acres, with 397 units in 38 States. Nearly 93 percent of the wilderness area (32 million acres) was distributed among 254 units in 14 States in the Pacific Coast and Rocky Mountain Regions and Alaska. The remaining 7.4 percent (2.6 million acres) was dispersed among 143 units in 24 States in the eastern and central United States. Wilderness areas constituted 18 percent of the total National Forest System in 1993, 36 percent of the total National Wilderness Preservation System, and 74 percent of the wilderness in the lower 48 States. In 1994, Congress was considering an additional 6 million acres of national forest land for wilderness designation.

Wilderness use grew in the 1980's, but at a slower rate than during the 1970's. RVD use rose from 9.6 million in 1979 to 12.7 million in 1985, and thereafter more or less stabilized at an average of 12.4 million RVD's per year, varying between 11.6 million and 13.3 million per year until 1993.

Management of Wilderness

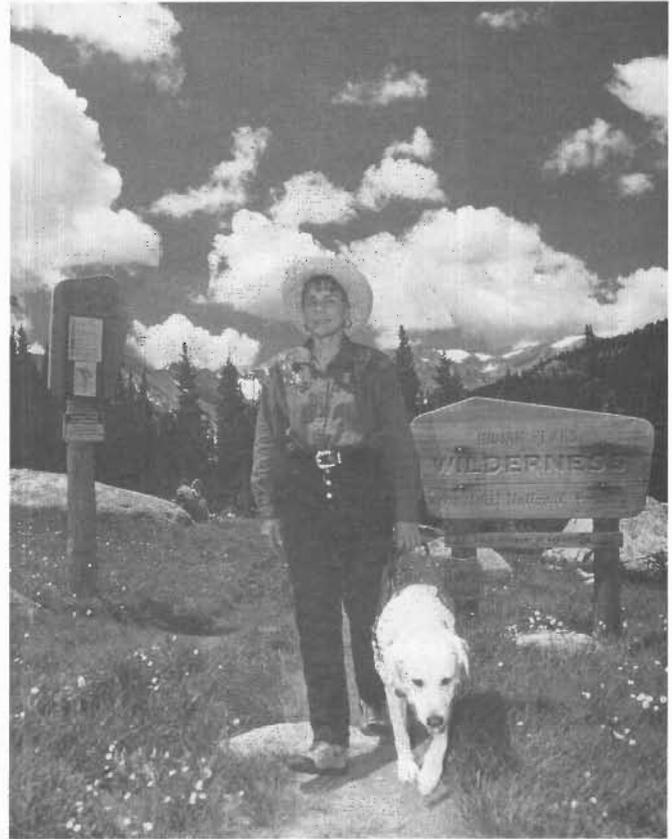
The rapid expansion of the national forest wilderness acreage and units, along with continued growth in

visitor use, particularly in the early 1980's, created a huge new workload to develop action plans and implementation schedules for nearly 300 new wilderness units covering almost 20 million acres. These plans and schedules were designed to ensure quality use and management of wilderness areas in ways that would maintain their quality and character. Wilderness managers' and researchers' knowledge and experience, available technology, and public involvement were used to determine the carrying capacity of the various wilderness units. Monitoring tools and techniques likewise needed to be identified, developed, and implemented to protect the wilderness from unacceptable changes. Wilderness plans also included standards and guidelines for recreation use, wilderness education, trail planning and maintenance, grazing use, fire management, motorized and mechanical equipment use, and other aspects of use and protection specific to each wilderness unit (USDI/USDA 1981–1989).

To handle the expanding workload, wilderness planning and management staffing increased slowly from 174 FTE's in 1979 to 196 FTE's by 1983, and then rapidly doubled to 386 FTE's by 1994 (USDA Forest Service 1994f). By 1994, action plans had been completed for all 397 national forest wilderness units (Thomas 1994).

In 1983, the Forest Service convened a National Wilderness Management Workshop at the University of Idaho. This workshop produced a national guide to provide consistency and direction for improving wilderness management practices — *Wilderness Management: A Five-Year Action Program*. The workshop was a cooperative effort of citizens, organizations, research and education institutions, State agencies, commercial recreation interests, and others who had a stake in wilderness management. The guidelines developed by the workshop emphasized enlisting the cooperation of wilderness users and interests to improve wilderness management practices.

The general Forest Service management goal for wilderness is to provide for scientific, scenic, educational, conservation, historical, recreational, and other uses consistent with sustaining the natural conditions of the wilderness resource and protecting



Hiking along a trail in the Indian Peaks Wilderness on the Arapaho-Roosevelt National Forest, Colorado, 1996.

such wilderness characteristics as solitude and unconfined opportunities for recreation and experiencing natural resources in their primeval state. National forest management activities to protect the wilderness include educating users on wilderness benefits and how to protect them, enforcing regulations established to protect wilderness, rehabilitating damaged areas, maintaining inventory data for wilderness uses and resource conditions, preparing and implementing plans for protecting wilderness quality for the use and appreciation of future generations.

Wilderness Management: 1980–1986

Due to the strong emphasis on recreation use through the 1980's, the actual management of wilderness continued to focus on managing people and their impacts. The greatest challenge was to provide for visitor use while protecting wilderness values and allowing natural ecological processes such as wild-fire to operate freely. Teaching wilderness users

about the nature of wilderness and how they could use it and enjoy it without degrading its quality was the principal national forest strategy — educating wilderness users rather than regulating them to protect wilderness quality. It was this “people approach to wilderness management” that generally increased visitors’ awareness and sensitivity and persuaded them to care more about the ways that they used and enjoyed the wilderness. National forest managers encouraged and received substantial assistance in their educational efforts from wilderness interest groups, outdoor writers, and outdoor equipment suppliers. National forest wilderness managers also depended increasingly upon volunteers to accomplish the annual workload. Wilderness volunteers grew from less than 100 person-years in 1980 to 178 person-years in 1986, when visitor use began to level off (USDA Forest Service 1981–1987).

Visitors concentrating at the more attractive sites and desirable wilderness locations continued to be a problem. This impacted not only visitor solitude, but also wilderness character and wilderness resources. Such visitor impacts on wilderness have always been highly localized — near trails, streams, lakes, and other forest attractions and the heavily used popular campsites often located near such attractions. The wilderness permit system was a valuable tool for limiting and dispersing such heavy use. In the early 1980’s, the Forest Service established an approach called “limits of acceptable change” (LAC) to assess when and where to impose use restrictions. Research began to provide information about site durability and user threshold levels beyond which user impacts would become substantial and difficult to reverse. Such studies helped wilderness managers decide where to encourage camping and other onsite uses and where to discourage them.

The identification of 13 national forests in 1994 as “urban national forests” where urban values, demands, and related uses had become dominant illustrated the intensifying use of wilderness areas observed throughout the 1980’s. These forests included the Arapaho-Roosevelt and Pike-San Isabel in Colorado; the Angeles, Cleveland, Los Padres, and San Bernardino in California; the Mt. Baker-Snoqualmie and the Gifford Pinchot in Washington

State; the Mt. Hood in Oregon; the Tonto in Arizona; the Wasatch-Cache-Uinta in Utah, Wyoming, and Idaho; the White Mountain in New Hampshire; and the Chatahoocche-Oconee in Georgia. These 13 forests included almost 4 million acres of national forest wilderness — more than 10 percent of all national forest wilderness — and were located within 1 hour’s travel time of a million or more people. The management environment on these forests as a whole was defined as chaotic, as the managers strived to respond to the expectations of the urban user group while protecting wilderness ecosystems. Urban users placed extremely heavy demands for immediate access to wilderness as well as to highly developed recreation areas, recreational waters, resource education, fire protection, firearm shooting areas, and law enforcement. In 1994, these 13 forests provided 82 million RVD’s of use, including wilderness visits — more than a quarter of the total national forest RVD use of 330 million (USDA Forest Service Urban Forest Supervisors 1994).

Despite the growing management effort, reported wilderness violation incidents grew from about 600 per year in 1980 to 1,650 in 1986, and continued to increase thereafter. Most violations were illegal use of motorized vehicles and equipment. Other violations included illegal outfitting and guiding, artifact and fuelwood thefts, camping and pet violations, cultivation of marijuana, destruction of Federal property, failure to abide by permit terms, and vandalism (primarily theft and damage to visitor vehicles at trailheads). Search and rescue missions remained more or less stable at about 300 per year. Fatalities ranged between 30 and 50. The number of serious injuries was much greater. Wilderness managers continued to be highly responsive to search and rescue requests in such emergency situations, even though it was evident that many emergency incidents and occasions of lost wilderness users could have been avoided had the visitors been properly informed or better prepared for wilderness challenges. The public, however, came to expect immediate action, such as helicopter lift-outs or rescue, which intruded into the wilderness environment and the wilderness experience of other wilderness users (USDA Forest Service 1981–1987).

Renewed Efforts To Upgrade Wilderness Management: 1987–1995

In the late 1980's, both the Forest Service and outside wilderness interests became aware that a number of factors were contributing to an inconsistent wilderness management philosophy and shortfalls in wilderness management. Ambiguities in wilderness legislation that permitted nonconforming uses, such as mining and grazing, and wilderness boundaries that were legislatively located next to areas of intensive development were two important sources of such inconsistency. Managers were sometimes uncertain about how such situations should be managed. Most managers were trained or practiced in production objectives, but were not schooled or skilled in a wilderness management philosophy, which was akin to preservation. Most focused their attention on managing wilderness for permitted recreation uses and were responsive to the growing demand for increased wilderness use. Many wilderness managers and users alike lacked a common understanding about what constituted a quality wilderness experience. But there was also a corresponding lack of services and opportunities for acquiring such understanding other than through an extended wilderness experience itself. Limited funding and staffing tended to lead to low priorities for wilderness management and the use of "least cost" or "shortcut" technology to solve wilderness management problems. Different interpretations of wilderness laws among managers, wilderness organization leaders, and politicians likewise contributed to the uncertainty and ambiguity of the wilderness management philosophy (USDA Forest Service Rocky Mountain Region 1989).

To gain a common understanding, acceptance, and support for a consistent wilderness management philosophy and to encourage wilderness managers to apply it on the ground, the Rocky Mountain Region's regional forester encouraged a wilderness philosophy for the region. He enlisted experienced regional wilderness managers and the help of many people with a longstanding interest in and practical knowledge about wilderness — and their organizations, including the American Wilderness Alliance, the Colorado Mountain Club, the Colorado Open Space Council, the National Audubon Society, the University of Iowa, and the Wilderness Society. Working

together, they produced and published the Rocky Mountain Region statement on wilderness management philosophy. It focused on wilderness values, uses, users, and management guidelines. Most of these have been incorporated into the Forest Service manual and handbooks (USDA Forest Service Rocky Mountain Region 1989).

Congressman Bruce Vento of Minnesota, Chairman of the Subcommittee on National Parks and Public Lands of the House Committee on Interior and Insular Affairs, spearheaded oversight hearings on national forest wilderness management and a stronger thrust for upgrading wilderness management direction and its consistent application. In March 1989, Vento wrote in a letter to the Chief of the Forest Service that the hearing record was almost unanimous that national forest wilderness management was weak and inadequate and leading to a decline in the quality of its wilderness (Vento 1989). His letter identified the major shortcomings documented in the hearing record and provided 14 recommendations on how to improve national forest wilderness management. These recommendations apparently became the basic guidelines for a major update of the National Forest System wilderness management philosophy and standards — improving the understanding and capabilities of wilderness managers and bringing wilderness management to an equal status with the other National Forest System functional management areas. Congressman Vento's recommendations called for the Chief's commitment and leadership in providing training to wilderness managers and other Forest Service employees on the history, philosophy, and value of wilderness; expanding the wilderness ranger staff; establishing a career ladder for wilderness managers; providing performance standards for all line officers responsible for wilderness management; consolidating wilderness areas fragmented by multiple-use unit boundaries; establishing directors of wilderness in the Washington Office and regional offices to give wilderness an emphasis equal to that of other functional resource divisions; establishing a national public education program on the values of wilderness and its proper use to reduce visitor impacts; and expanding wilderness research in cooperation with other Federal agencies. Vento also requested that the Forest Service report to Congress every 5 years on

the condition of national forest wilderness and the restoration of degraded areas. His closing guidance advised the Forest Service to request funding to accomplish these recommendations.

In 1989, the Forest Service's Washington Office enunciated its commitment to manage wilderness as an enduring resource in accordance with the following management principles (USDA Forest Service 1987a): manage wilderness as a distinct resource with inseparable parts; manage the use of other resources and activities within wilderness in a manner compatible with the wilderness resource; allow natural processes to operate freely within wilderness; attain the highest level of priority of wilderness character within legal constraints; preserve wilderness air and water quality; produce human values and benefits while preserving wilderness character; preserve outstanding opportunities for solitude or a primitive, unconfined recreation experience in each wilderness; control and reduce the adverse physical and social impacts of human use in wilderness through education or minimum regulation; favor wilderness-dependent activities when managing wilderness use; exclude the sight, sound, and other tangible evidence of motorized equipment or mechanical transport wherever possible within wilderness; remove existing structures and terminate uses and activities not essential to wilderness management or not provided by law; accomplish necessary wilderness management work with the "minimum tool"; establish specific management objectives, with public involvement, in a management plan for each wilderness; harmonize wilderness and adjacent land management activities; manage wilderness with interdisciplinary scientific skills; and manage special exceptions provided by wilderness legislation (for example, mining, grazing, and access to private lands) with minimum impact in the wilderness resource.

Thus, the problem with wilderness management in the late 1980's was not so much a matter of management objectives and principles, but a lack of consistency in understanding, commitment, and resources for their full implementation. A 1989 study by the U.S. General Accounting Office (GAO) addressed and confirmed these problems in their findings and recommendations (GAO 1989). The GAO report found that the shortfalls and unevenness of wilder-

ness management implementation were generally contributing to some deterioration in wilderness quality and that inadequate funding was a major contributing factor. It also reported that the full extent of the reported deterioration could not be determined because many areas lacked baseline data on wilderness conditions as well as current condition data. Some areas were in relatively good condition, but others often showed deterioration on trails and bridges and around popular camping areas.

Congress addressed the problem of inadequate funding by doubling the national forest wilderness management budget from \$13.1 million (constant 1994 dollars) in 1987 to \$27.7 million in 1994. This compared with an increase of \$4.8 million, or 58 percent, in the preceding 5 years, from \$8.3 million in 1979 to \$13.1 million in 1987. The Forest Service also took steps to improve its effectiveness and accountability in the use of funds appropriated for wilderness management. However, a 1991 GAO wilderness management study found major weaknesses in the Forest Service's use of and accountability for wilderness management funding (GAO 1991). It found that 37 percent of the wilderness management funding for fiscal years 1988, 1989, and 1990 had been reprogrammed without the approval of the House Committee on Appropriations and that less than two-thirds of the balance was getting down to the ranger district level where the wilderness management practices were implemented on the ground. The Forest Service responded promptly, and by September 1991, before the final GAO report was published, had implemented procedures to ensure that wilderness management funds were being spent as Congress intended, that the reprogramming of funds followed House Appropriations Committee reprogramming guidelines, and that there was greater accountability for the use of funding designated for wilderness management (GAO 1991). The problems of inconsistency in understanding, commitment, and implementation of wilderness management practices were addressed through a strong national training program for all national forest line officers, and more than 500 wilderness managers responded. By 1994, some 400 line officers and 500 wilderness managers had completed the course.

Currently, line officers tend to be more involved in making long-term wilderness decisions. Most national forest regions have provided local training for wilderness rangers (the number of local training programs for wilderness rangers remains limited, but their accomplishments have increased). Wilderness performance standards that reflect the seven goals the Chief identified for rapid wilderness management improvement are in place for all line officers who manage wilderness. They will help unlock managerial creativity and energy and achieve management excellence. The seven goals include integrating wilderness values, principles, and planning systems with ecosystem values, principles, and policies to promote natural, healthy, and diverse wilderness ecosystems. Wilderness ecosystems are visualized as setting an example and standard for the National Forest System's ecosystem approach to national forest management (Thomas 1994).

In 1993, the Forest Service training program for wilderness managers led to the establishment of the National Interagency Training Center and Research Institute for Wilderness Management in Montana. They are named, respectively, after former national forest managers Arthur Carhart and Aldo Leopold, who contributed so much to initiation of dedicated wilderness areas within the National Forest System. Both are staffed and operating, and Department of the Interior wilderness management agencies such as the BLM, the Fish and Wildlife Service, and the National Park Service have been invited to participate in their work.

In 1994, the Forest Service took steps to further strengthen the organizational effectiveness of National Forest System wilderness management. The first step, still pending, was a proposal to establish the Frank Church – River of No Return Wilderness Management Unit, led by a single supervisor reporting directly to one regional forester. This 2.4-million-acre area is the largest national forest wilderness in the lower 48 States and is currently administered by two national forest regions, six national forests, and 12 ranger districts. The consolidation of these multiple units and hierarchical administration into a single wilderness management unit would provide better user services, more effective administrative coordina-

tion, improved management consistency across the entire wilderness, lower overhead costs, and, above all, improved opportunities to preserve and manage the multiple units as a single ecosystem. Congress, however, had not yet approved this proposal as of the date of publication of this book.

The second step is the proposed creation of a national wilderness director and staff in the Washington Office that would elevate wilderness to an equal standing with other functional resource staffs such as timber, fish and wildlife, range, and watershed management. The wilderness director position was approved in 1994. As a result of downsizing in 1996, the Chief of the Forest Service has proposed to the Secretary of Agriculture that the wilderness staff be consolidated with the recreation and heritage staffs and that the wilderness director position not be filled. As of the date of publication of this book, the decision memo had been sent to the Secretary of Agriculture and no decision had yet been rendered.

The establishment of wilderness performance standards for regional foresters is the third step for increasing organizational effectiveness for wilderness management (USDA Forest Service 1994c). Thus, in 1996, the Forest Service's role in national forest wilderness management appears to be emerging as guiding light in both the wilderness stewardship movement and the development of an ecosystem approach to the management of natural resources.

Research Natural Areas

A continuing loss of natural landscapes, the wilderness and environmental movements, and the passage of the endangered species legislation during the 1960's and the 1970's gradually raised the awareness of the public, special interests, and the Forest Service that the window of opportunity for protecting examples of pristine natural areas was closing. In 1976, the NFMA requirements for protecting and maintaining biodiversity and for monitoring national forest plan implementation on soil productivity elevated this awareness within the Forest Service and created new incentives for accelerating the pace for establishing RNA's. The NFMA planning process gave special

consideration to identifying needed and desirable candidate natural areas. In the 15 years between 1980 and 1995, the number and area of RNA's more than doubled. Their number increased from 129 to 303 and their area grew from over 138,000 acres to more than 300,000 acres. The emphasis on their basic goal intensified: to preserve a representative array of biodiversity within all significant natural ecosystems and, through scientific research and education, compare their components and inherent processes with representative manipulated ecosystems. Thus, RNA's were seen as providing baseline data on ecosystem biodiversity and processes and their performance in the absence of management.

The RNA additions increasingly reflected the National Forest System's biological and ecosystem diversity. New additions focused on aquatic and riparian, shrubland, grassland, subalpine, and alpine ecosystems. Special efforts were also made to add areas representing ecosystems occupied by endangered, threatened, and sensitive species. The Jumpoff RNA (1988) on Utah's Uinta National Forest set aside an area of unusual quaking aspen forest

stands and sagebrush grasslands. The Mesita de los Ladrones RNA (1991) on New Mexico's Santa Fe National Forest set aside an area of minimally disturbed pinyon-juniper forest stands. On Arkansas's Ouachita National Forest, the Gap Creek RNA (1990) protected upland headwater stream habitat for the rare paleback darter and the southern ladyslipper growing on its banks, both of which were being reviewed for listing as threatened or endangered species. On Utah's Ashley National Forest, the Sim's Peak Pot Hole RNA (1991) protected excellent wetland, bog, and riparian areas within a mixed conifer forest. The Newaygo Prairie RNA (1988) on Michigan's Huron-Manistee National Forest set aside an area of various native prairie sedges and grasses, especially little and big bluestem.

As the RNA system expanded and national forests turned to an ecosystem approach in managing multiple uses, new questions arose about administering and managing RNA's. To what extent should RNA's be managed to preserve the original natural condition and habitats for endangered, threatened,

and sensitive species?

Protection from wildfire, for example, was altering habitats previously maintained by fire. Should prescribed fire be used to simulate the natural wildfires that have been excluded from these ecosystems? How should baseline information and the results of any non-manipulative research be effectively linked with the ecosystem approach to national forest management? How does one use the relatively site-specific information (ranging from 40 acres to 10,000 acres provided by RNA's) with the management of ecosystems over tens and hundreds of thousands of acres? These questions are



Dave's Draw Research Natural Area, established on the Pawnee National Grasslands, Colorado, in 1995, preserves typical rolling shortgrass and midgrass prairie dissected by high-plains wooded draws—all in excellent condition.

now being asked and addressed by Forest Service researchers and national forest managers to increase the effectiveness of the role of RNA's (Whitmore 1995).

Timber Resource Management

National forest timber resource management experienced its most challenging and difficult years during the 1980's and early 1990's. Administration and congressional policy officials continued to set program and budget goals for timber sales at 11 to 12 bbf per year throughout the 1980's. They also supported timber management programs that included intensive silvicultural practices to maintain timber productivity and ensure that future potential yields would sustain those harvest levels in the long term.

At the same time, the allocation of timber lands to wilderness and other specialized dominant uses and the NFMA requirement that timber lands be limited to those areas suitable for growing and harvesting timber reduced the suitable timber land base from 75 million acres in the late 1970's to 53 million acres in 1993 (USDA Forest Service 1993e; Liggett et al. 1995), concentrating the timber harvest on a smaller land and resource base. Throughout much of the 1970's, this growing concentration raised questions and concerns as to whether existing programmed timber sale and harvest levels could be sustained while meeting the rising demands for nontimber uses and environmental objectives such as biodiversity. By the mid-1980's, the relatively rapid congressional designation of selected RARE II study areas as wilderness on a State-by-State basis tended to ease this situation — releasing nondesignated roadless areas to multiple-use management and excluding their further consideration for wilderness until the next NFMA planning cycle 10 to 15 years hence. However, the release of nondesignated roadless areas seemed to shift the attention of wilderness and related environmental interests from the designation of new wilderness to precluding or delaying timber sale and harvest on the released roadless areas. These efforts focused on forestalling harvest of old-growth timber and centered in the Pacific Northwest. Timber harvest planning, sale preparation, and actual harvest on such lands

became increasingly burdened by appeals (table 7), litigation, policy challenges, public demonstrations, and even radically violent actions such as spiking trees planned for harvest, spilling sand into logging equipment motors, and slashing tires, and such nonviolent actions as obstructing logging by tree-sitting and lying down in front of moving logging equipment. In 1985, USDA Assistant Secretary for Natural Resources and the Environment Peter C. Myers expressed the view that despite the designation of 17 million acres of national forest lands for wilderness, for a total of 32.1 million acres, "it is clear that some groups still want even more lands designated as wilderness and are seeking to prevent areas in an unroaded condition from becoming roaded" (Myers 1986).

Despite these challenges, the Forest Service was consistently able to prepare, offer, and sell between 11 and 12 bbf of timber annually throughout the 1980's until 1989. In 1989, timber sales offered fell almost 10 percent short of the congressionally funded target, and timber actually sold declined even more. These declines were primarily attributed to a court injunction concerning the viability of the northern spotted owl population in the Pacific Northwest, its subsequent listing as a threatened species, and the need to protect its habitat, and individual timber sales appeals. Pressure from these sources continued to have an impact on the total level of national forest timber sales offered in the early 1990's and, by 1994, timber sales offered were down to 3.4 bbf and timber actually harvested was down to 4.8 bbf.

The largest part of this reduction related to timber harvest adjustments for wildlife and fish habitat objectives, particularly for protection of the habitats of endangered, threatened, and sensitive species. Inventory volume adjustments, soil and watershed considerations, recreation requirements, and other factors accounted for the balance. About half the reduction occurred in the Pacific Northwest and northern California in response to the Northwest Forest Plan (the spotted owl controversy).

Timber management planning and implementation became increasingly sensitive to NEPA requirements

during the 1980's and was dramatically moderated toward the multiple uses in national forest decision-making as increased weight was given to nontimber uses such as wilderness, wildlife, and recreation (Hoberg 1993; Wilkinson and Anderson 1987). In 1992, the Forest Service embraced the ecological approach to managing multiple uses on national forests. This step, with the help of extensive public participation, was seen as providing, in time, a more effective basis or framework for resolving the continuing public debate about the proper level and mix of national forest resource uses and their related management. A national hierarchical framework of ecological units was established for classifying and mapping national forest land and resources to provide an ecological basis for data collection, resource analysis, land and resource management planning, and implementation of forest uses and practices (USDA Forest 1991–1995, 1993c; Unger 1993).

Timber Volume Sold

Total timber volume sold during the 1980's averaged 10.7 bbf per year, slightly less than the 11.0 bbf per year sold during the 1970's decade. In the early 1990's, in response to continuing litigation and action over the spotted owl issue as well as individual appeals, 1994 timber sale offerings declined sharply to 3.4 bbf, below the level of sales and harvest in 1950! Actual volume sold in 1994 dropped even lower — to 3.1 bbf — about the 1945 level of national forest timber supply (see fig. 6, chapter 3).

During the 1990's, the decline was concentrated in the Pacific Southwest and the Pacific Northwest



Stand examiners measuring and recording tree data on timber inventory sample plot, Deschutes National Forest, Oregon, 1996.

Regions, but all other regions except the Eastern Region also experienced a decline in average annual timber sale levels. Eastern Region timber sales increased to 810 million board feet, 17 percent above the 1980 level (see fig. 14, chapter 4).

Potential for Timber Supply Disruption due to Appeals and Litigation Evaluated

In 1989, it became evident that national forest plan and timber sales appeals and litigation were impairing the National Forest System's ability to meet congressionally programmed targets and budgets. National forest timber actually sold during the 1980's declined slowly, from an average 11.3 bbf in 1979, 1980, and 1981 to an average of 11.1 bbf between 1986 and 1988, then dropped sharply to 8.4 bbf in 1989. The timber harvest for the same years rose from 9.2 bbf to 12.4 bbf. As a consequence, the inventory of sold-but-uncut timber declined steadily during the 1980's. These trends were heavily concentrated in Washington, Oregon,

and California, where the spotted owl and old-growth had become a major national issue. The Assistant Secretary of Agriculture for Natural Resources and the Environment, George Dunlop, directed the Forest Service to document this potential disruption of the national timber supply and identify its root causes (Dunlop 1989). The study, "An Analysis of an Emerging Supply Description," completed in June 1990, found that the timber supply under contract to forest product mills that depended on national forest timber had been reduced to an average of 1.6 years, compared with the historical level of 2 to 3 years considered necessary to sustain normal mill operations (Larsen et al. 1990b). This reduction was not seen as critical from a national viewpoint, but it was on the verge of becoming critical for 20 forests with less than 1 year's supply under contract.

Appeals, court decisions, and changes in policy, regulation, and statute had a profound effect in constricting the timber sales volume in the pipeline and under contract. It usually takes 3 to 8 years to initiate, prepare, and offer a timber sale. Increased controversy had raised timber sale preparation costs by 25 to 33 percent and contributed to the loss of many timber sales from the preparation pipeline, thereby, raising the acres needed in some state of sale preparation to meet congressional timber sale targets by 40 to 60 percent. In addition, the continuing controversy and changes in NEPA standards required reworking some 20 to 33 percent of each year's sales, revising or completely redoing many EA's, and revisiting many project decisions. Improving NEPA documentation constituted 70 percent of the increased workload, changing sale unit layouts about 20 percent. (Larsen et al. 1990b).

The timber supply reduction study uncovered a complex of underlying causes for the disruption of the timber sales preparation pipeline and called for several remedial actions: improving the effectiveness of the public participation, including multiparty conflict prevention and mediation, in planning and decisionmaking; increasing the clarity and understanding of the NEPA and NFMA processes and improving their application, and strengthening the Forest Service's responses to appeals and litigation.

This strategy was carried out effectively. It improved the quality of NEPA documents and the success rates in court suits, but did not immediately stem the growth of appeals or litigation.

To reduce the opportunity of appellants to reopen issues already decided, the study recommendations also proposed the revision of the appeals regulations. Postdecision appeals were a special problem because they often involved individuals who had chosen not to participate in the NEPA-generated predecision public involvement process, raised issues that the NEPA procedures did not address, and usually did not include earlier NEPA process participants in the postdecision appeals negotiations.

In 1992, the Forest Service proposed a revision of its administrative appeal process. It chose to limit appeals solely to final decisions approving, revising, or significantly amending national forest land and resource management plans. The proposal's thrust was to expand opportunities for predecisional public involvement in national forest decisionmaking. Its objective was to minimize the impacts of postdecision appeals, reduce uncertainties about national forest timber sale offerings, and lower the number and cost of timber sale appeals (USDA Forest Service 1992c). In November 1991, the Senate held hearings on the impact of appeals on national forest timber sale programs and, in 1992, enacted legislation establishing a separate appeals procedure for *project-level* decisions (U.S. Congress 1992). This legislation did not affect the Forest Service administrative appeals processes for forest plans and regional guides or for permits and authorizations.

The new national forest project-level appeals legislation streamlined the public comment and appeals process, improved predecision information sharing and the opportunity for mediating appeals with the public, shortened the overall time for resolving appeals, and limited appeals to people who had participated in the predecision public involvement and comment process. The final implementing regulations for this process became effective in January 1994. They required that project-specific EA's be made available to for a 30-day public comment

period prior to final decision, that national forest managers respond to these comments, and that the final decision be printed in a newspaper.

The public had 45 days to appeal the final decision. National forest managers were to offer to meet with appellants within 15 days of the date of the appeal to attempt to mediate or resolve the appeal issue. The appeal-deciding officer had 45 days from the date of the appeal to render a decision. These new procedures made the regional forester the client for appeals, and depending on the regional forester's decision reduced appeals to the Chief.

In 1994, the first year of operation for the new appeals process, the number of new appeals, excluding those for forest plans, was down to 496, compared with a peak level of 2,631 appeals in 1993 under the previous appeals process. Face-to-face informed appeal resolution meetings led to resolution or partial resolution of 36 appeals. Twenty-four appeals were withdrawn. Fourteen were dismissed for untimeliness, lack of agency authority, or absence of appellant standing. However, 124 appellants on 474 appeals declined to participate in national forest offers for informal disposition meetings. Nine appellants took their appeals to court for resolution. In most cases, the appeals were resolved within the 45-day timeframe provided by the law (Unger 1995).

In 1995, the Forest Service reported that this new appeal process was promoting the open expression of ideas and encouraging the public to join in identifying and analyzing natural resource management options before project-level decisions were made. The improved public input was producing better decisions and contributing to higher quality NEPA decisions.

The Northern Spotted Owl and Old-Growth Management Controversy

Concerns about the adequacy of management for the old-growth habitat needs of the relatively rare northern spotted owl in the Pacific Northwest and northern California — the owl's general range — emerged in the 1970's. The concerns intensified and became controversial in the early 1980's. In the late

1980's and early 1990's, protests, appeals, lawsuits, and court rulings produced a virtual management gridlock. The public debate intensified during those years, and its focus expanded from the old-growth needs of the spotted owl to a concern for all old-growth-dependent species and old-growth ecosystems. Ultimately, the issue led to a drastic reduction of national forest timber sales and harvests in parts of Washington, Oregon, and California.

Concern for the habitat and survival of the northern spotted owl first arose in Oregon in 1972, when researchers observed and reported that the northern spotted owl was most often found in old-growth forests and that timber harvesting was progressively reducing the area of such forests. This concern was shared by the Department of the Interior's Fish and Wildlife Service (FWS) and the BLM and the Oregon Wildlife Commission, who in 1973 formed the Inter-agency Oregon Endangered Species Task Force to help preclude other species from becoming threatened or endangered in Oregon. The Task Force initially addressed the northern spotted owl and recommended that State and Federal agencies reserve 300 acres of old-growth habitat around each spotted owl site as an interim protection measure. The idea of site-by-site reserves became the model for management guidelines until the late 1980's. At that time, there were 100 known spotted owl sites in Oregon, but both the BLM and the Forest Service deferred such action until a State-wide management goal was established (USDA Forest Service 1993g).

When the ESA was passed in 1973, the northern spotted owl was not included on the Federal list of threatened and endangered species. Therefore, the ESA did not immediately impact the management of the spotted owl's habitat. However, the Oregon Wildlife Commission endorsed its listing as "threatened" on Oregon's threatened and endangered species list — a list that did not have any Federal statutory standing. NFMA regulations, on the other hand, required the maintenance of viable populations of all native vertebrate species in national forest planning areas. This meant that national forest management could not cause the listing of any additional species as threatened or endangered — a stronger requirement than that provided by the ESA, which only called for maintaining individual species.

NFMA required maintaining the integrity of species populations and, therefore, their habitats' integrity as well (USDA Forest Service 1993g).

In 1976 and 1977, the Interagency Oregon Endangered Species Task Force recommended a long-term goal to maintain "... 400 pairs of spotted owls on public land in Oregon" and the preparation of a plan to reserve habitat management areas supporting clusters of three to six pairs with a minimum of 1,200 acres of contiguous area per pair. A core of at least 300 acres of the oldest available old-growth forest would be included for each pair. Habitat management areas with multiple pairs would be no more than 8 to 12 miles apart (less for single-pair areas). Where pairs of owls within habitat areas were less than a mile apart, core areas for at least two pairs would be included. Several other criteria were also specified in terms of a range of values. The Forest Service's Pacific Northwest Region agreed to implement these spotted owl management guidelines in Oregon through the national forest land and resource management planning process. Its share of the long-term goal was 290 pairs. However, where a range of habitat criteria values had been proposed, only the minimum levels were actually implemented. Even so, it became apparent by 1978 that implementing these guidelines would significantly impact the annual timber harvest on Washington and Oregon national forests. Nevertheless, the region increased its spotted owl surveys and extended them into Washington State national forests and, in 1980, the regional forester directed national forest managers to protect habitat for all confirmed owl pairs in Washington in accord with the Oregon guidelines. In 1981, he raised the goal to 112 pairs for national forests in Washington State. Also in 1981, the Pacific Southwest Region developed regional standards and guidelines for spotted owl management; they largely followed the Oregon model, and implementation began in 1982 under NFMA land management planning procedures (USDA Forest Service 1993g).

In 1981, concerns arising from the continuing harvest of old-growth forests led the U.S. Fish and Wildlife Service to review the northern spotted owl's status. It concluded that this subspecies still did not meet ESA listing requirements. However, its report observed that the owl's dependence on coniferous

old growth made it extremely vulnerable, and if old-growth harvest trends continued, the owl could become listed in a short time. In 1982, the Forest Service and BLM established the old-growth wildlife research and development program for western Oregon and Washington, which by 1986 had evolved into the spotted owl research, development and application program and included California. The program generated a variety of studies and numerous reports and publications. The Pacific Northwest Region's final regional guide for national forest planning was issued in 1984. It called for assessing the effects of habitat management areas on 375 owl pairs during the development of Washington and Oregon national forest plans. When the region modified the spacing guidelines between reserved habitat management areas to maintain a more effective distribution of owl populations, its owl target was subsequently increased to 551 pairs. By the end of 1984, a network of spotted owl habitat areas had also been established on national forests in northwestern California and the western Sierra Nevada (USDA Forest Service 1993g).

Late in 1984, the Wilderness Society, in concert with other conservation groups, initiated an administrative appeal of the Pacific Northwest Region's habitat guidelines for the spotted owl. They argued that the guidelines were inadequate and that the decision to protect the spotted owl's habitat was a major Federal action requiring an EIS. The Chief of the Forest Service denied the appeal, but the Department of Agriculture reversed his ruling and called for a supplemental EIS on the northern spotted owl standards and guidelines. In the same year, a small group of environmental activists in Oregon convened to develop a strategy for achieving ESA listing of the northern spotted owl. They believed there was an adequate scientific basis to do so. However, they also felt that the public's awareness of old-growth forests and their values was so limited that a proposal to list the spotted owl would cause significant political opposition. Their strategizing led them to undertake an educational campaign of talks and organized meetings with newspaper editorial boards and to forge a coalition with groups in Washington State, where there was strong pro-environmental support.

In 1986, a blue ribbon advisory panel, organized by the National Audubon Society in 1985, recommended that additional habitat be maintained to support at least 1,500 pairs of spotted owls in California, Oregon, and Washington. The following year, 1987, the Sierra Club Legal Defense Fund established a Seattle office and entered into a legal strategy to seek an ESA listing for the spotted owl. The strategy included a legal challenge to the BLM's decision to not prepare a supplemental EIS on the spotted owl and a series of legal suits in the Seattle District Court challenging the Pacific Northwest Region's strategy for meeting the NEPA and NFMA requirements for old-growth habitat management for the spotted owl. In the same year, the U.S. Fish and Wildlife Service again reviewed the status of the spotted owl and again ruled that listing was not warranted.

In 1988, environmental interests appealed that decision to the Seattle District Court and won a court order to readdress the listing ruling on the basis that the decision was not biologically determined or sound. The Wildlife Society produced a biological assessment of old growth as a critical and specialized habitat for wildlife and released a position statement that identified old growth as an especially important, but decreasing, wildlife habitat. In this way, wilderness, environmental, and wildlife interests became increasingly involved and focused their efforts on developing the issue for listing the owl as endangered and broadening the issue to include all wildlife species that were dependent on the maintenance and proper management of old-growth ecosystems to sustain their populations (USDA Forest Service 1993g; Hoberg 1993).

The first climax in the northern spotted owl issue occurred in March 1989, when Seattle District Court Judge William Dwyer issued his first injunction on national forest timber sales that involved old-growth timber stands near spotted owl sites in Washington and Oregon. In December 1988, the Forest Service had issued its final supplemental environmental impact statement on the Pacific Northwest Region's guidelines for managing spotted owl habitat. The preferred alternative directed 13 national forests to establish a "spotted owl habitat network" providing

old-growth habitat areas for the owl that varied from 1,000 acres per pair in southern Oregon to 3,000 acres per pair on the Olympic Peninsula. The owl habitat was to be located within 1.5 to 2.1 miles of the "core area" for an owl pair. Habitat areas with three or more pairs could be no more than 12 miles apart. For single pairs, habitat areas had to be less than 6 miles apart. The Washington Department of Wildlife, timber interests, and environmental groups promptly appealed the decision for opposing reasons. The Assistant Secretary of Agriculture denied all of these appeals. Environmental groups then successfully sued for an injunction against timber sales in old-growth areas near spotted owl sites (USDA Forest Service 1993g; Hoberg 1993).

Congress, responding to a similar lawsuit on BLM lands, had enacted section 314 of the FY 1988 appropriations bill to exempt BLM timber sales from such litigation. The Dwyer injunction on national forest timber sales escalated the threat of further judicial challenge to timber sales and led the Northwest congressional delegation to recover its control over the issue. It organized the "Timber Summit" with major interest groups to collectively work out a compromise solution — a process that was aborted when the congressional delegation developed its own compromise, known as the Hatfield-Adams Amendment of 1989, and enacted it as section 318, a rider to the Interior Department and Related Agencies Act for FY 1990. Environmental interests strongly opposed the delegation's compromises. The timber industry accepted the compromise, although they would have preferred a more favorable proposal and unsuccessfully offered an alternative providing for a harvest of 4.8 bbf per year for the region. Section 318 declared that the Forest Service supplemental EIS on the regional guidelines for spotted owls and BLM's supplemental management plans for spotted owls were sufficient environmental analysis for preparing timber sales for FY 1990 and, in this way, preempted Judge Dwyer's injunction and other ongoing litigation. It also significantly expanded the acreage of spotted owl habitat areas on national forest and BLM lands and directed the formation of an interagency scientific committee to develop a new spotted owl plan in addition to authorizing the cutting of "ecologically significant" old-growth stands, but only where they were needed to meet the legislatively

authorized harvest levels (USDA Forest Service 1993g; Hoberg 1993).

In 1989, the Forest Service, responding to congressional direction, established the interagency scientific committee and charged it with developing a "scientifically credible conservation strategy for the northern spotted owl." The 17-member team was chaired by the Forest Service's Jack Ward Thomas and included representatives from the four Federal agencies concerned with northern spotted owl habitats in Washington, Oregon, and California; environmental interests; the timber industry; and the university community. The committee completed and released *A Conservation Strategy for the Northern Spotted Owl* in April 1990. It proposed a network of habitat conservation areas (HCA's) that, for the most part, would support 20 or more owl pairs spaced at intervals of 12 miles or less throughout the northern spotted owl's range. Timber harvests were precluded in the HCA's, and the migration routes between such areas were to be managed to disperse owls between them. The strategy provided specific guidelines to ensure that the forest canopy inside and outside the HCA's would be managed to support the northern spotted owl population strategy. The strategy required the reservation of 5.8 million acres of timberland not previously reserved from timber harvesting and became a key "building block" in the development of an ecosystem approach to resource management in the Pacific Northwest (USDA Forest Service 1993g). In June 1990, shortly after the release of the proposed Conservation Strategy, the FWS, following its fourth review of the northern spotted owl's status, listed the northern spotted owl as *threatened* throughout its range.

Environmental groups responded strongly to the Conservation Strategy under a general theme of the preservation of "ancient forests." They successfully pursued court injunctions for national forest timber sales for noncompliance with section 318 guidelines in the Seattle District Court. In 1990, they succeeded in a suit against section 318 itself. The Ninth Circuit Court of Appeals struck section 318 down as unconstitutional — arguing that Congress had failed to amend the statutes underlying the decision in the litigation that section 318 preempted. This was a severe, but temporary, setback to the Northwest

congressional delegation and their strategy for circumventing environmental lawsuits against timber sales. Although the Supreme Court unanimously overturned the Ninth Circuit Court ruling, the efforts of environmental groups to nationalize the spotted owl and old-growth issue were effective in undermining the use of the appropriation rider mechanism to restrict the impact of environmental legislation on national forest old-growth harvests. For example, attorneys general from 17 States and 458 law professors and deans addressed the congressional leadership with letters opposing such restrictions on judicial review. Major national environmental groups, including the Sierra Club, the National Wildlife Federation, and the National Audubon Society, joined the issue. Feature stories and articles appeared in national magazines such as the *New Yorker*, *National Geographic*, and *Time*, placing emphasis on setting aside "ancient forests" that were in decline and located almost entirely on national forests. In these circumstances, the strong jurisdictional concerns and environmental focus of the congressional committees that authorized environmental programs escalated their defense of the environmental statutes that they had written. National public interests in the environment and the spotted owl and ancient forest issue reinforced those concerns. Thus, environmentalists were able to renew their option to sue relentlessly and undermine the regional congressional delegation's use of legislative riders to exclude the planning and management of old-growth harvests on national forests from judicial review (Hoberg 1993).

The Bush Administration, concerned about the proposed Conservation Strategy's economic impacts, appointed a task force led by the Assistant Secretary of Agriculture for Natural Resources and the Environment to review the strategy and find lower cost alternatives. In lieu of any report, the task force issued a press release in September 1990 announcing that Pacific Northwest Region national forests would be managed in a "manner not inconsistent with" the Conservation Strategy proposed by the interagency scientific committee. This decision did not have the benefit of an EIS or a formal statement of adoption in the *Federal Register*. In the fall of 1990, the Seattle Audubon Society brought suit against the Forest Service for failing to adopt a credible conservation

strategy meeting the requirements of ESA, NFMA, and NEPA. During the trial, the economic and social impacts of reducing national forest timber sales in spotted owl habitats were strongly argued. The timber industry, however, joined with the Forest Service attorney and supported the soundness and adequacy of the interagency scientific committee's strategy. The Seattle Audubon Society argued that the strategy was unsound and inadequate. In May 1991, Judge Dwyer decided the suit in favor of the Seattle Audubon Society and ordered the Forest Service to establish standards and guidelines that would ensure the northern spotted owl's viability on national forest lands. He also enjoined further national forest timber sales in northern spotted owl habitat areas until the Forest Service had completed and adopted a plan for complying with NEPA, NFMA, and ESA. The Forest Service was given 10 months to adopt such a plan. In the meantime, timber sales in national forest owl habitats within the owl's range came to a halt (USDA Forest Service 1993f; Hoberg 1993). Total national forest timber volume sold dropped to 6.4 bbf in 1991 and 4.6 bbf in 1992.

The Forest Service returned to the drawing board, as directed by Judge Dwyer's 1991 ruling, prepared a final EIS, released a record of decision in March 1992, and selected a management alternative that was the equivalent of the interagency scientific committee's strategy reflecting the 1990 state-of-the-art and scientific knowledge. In the same month, the Seattle Audubon Society brought suit against the EIS and the record of decision on the basis that, contrary to NEPA requirements, the final EIS had not considered new data for weighing the impact of continued logging on the spotted owl habitat and their populations. Contrary to NFMA requirements, the EIS did not prescribe practices to protect northern spotted owl habitat, nor did it assess the viability of other old-growth-dependent species. Judge Dwyer again ruled in favor of the environmentalists and again enjoined timber sales until a satisfactory plan became available. He found that the Forest Service had not taken into account the latest scientific data indicating that the spotted owl numbers were declining faster than previously determined, nor had the Forest Service and the BLM coordinated — a violation of NEPA.

Judge Dwyer also argued that the EIS had failed to address the viability question for species other than the northern spotted owl, which drastically shifted the objective of the whole process to "planning for the entire biological community" rather than just for the viability of the northern spotted owl populations. Although the Forest Service was justifiably taken aback by this profound shift in the planning objective for the spotted owl EIS, it again returned to the drawing board to do still another, more complex and holistic ecosystem assessment of timber harvesting and resource management to ensure the viability of all old-growth-dependent vertebrate species populations (USDA Forest Service 1993g; Hoberg 1993). The Forest Service named a team of agency scientists and technical experts under the direction of Jack Ward Thomas to develop a new EIS to evaluate the impacts of timber and resource management on all species, including at-risk fish populations associated with old-growth forests, and recommend measures that ensured their viability.

In late 1992, the House Agriculture and Interior Committees considered alternative ways to resolve the multiple-species aspect of the northern spotted owl habitat management issue, but were unable to come up with any substantive legislation that ensured protection of all vertebrate species consistent with the district court ruling and direction. Thus, the Committees proposed no legislation for consideration by the full House. The Bush Administration had examined options to review NFMA's viability regulations in 1991, but could not find a way to overcome NFMA's diversity concept and the legislative history or to ensure that the spotted owl issue would not be redefined in ESA terms. Thus, without any feasible congressional or executive policy options to respond to the spotted owl issue and lift the judicial injunction on national forest timber sales in the Pacific Northwest, northern spotted owl habitat management and the related timber supply problems became a political issue in the 1992 Presidential election (Hoberg 1993). During the Presidential campaign, Bush articulated this politicized issue as a "jobs versus owls" question with a preferred solution that would amend related environmental legislation in favor of maintaining timber supplies and jobs. The Clinton campaign played down "jobs versus environment" as a "false choice" and argued for a

"Timber Summit" where the conflicting Pacific Northwest interest groups could jointly work out a compromise solution.

After the 1992 election, President Clinton scheduled a regional "Forest Conference" for April 1993 to convene the stakeholders and resolve the northern spotted owl issue. The shift from "timber" to "forest" was made to cover more ground and more issues. The change from "summit" to "conference" was made to avoid diminishing the importance of an international summit meeting with the Russians immediately following the Forest Conference. The President, the Vice President, and six cabinet officers were the primary conveyors. Neither the Northwest congressional delegation nor the Forest Service were invited to speak. The agenda consisted of a series of panels made up of scientists, environmentalists, loggers, mill owners, local government, American Indian tribal government representatives, union officials, and others. The Forest Conference received national attention. Interest groups each evaluated the issue to reflect their particular viewpoints and achieve their particular ends. Environmentalists focused their views on clean water and salmon habitat restoration objectives in old-growth management, in this way appealing to the more popular environmental objectives. Timber interests emphasized the loss of jobs and related social and community impacts.

The President closed the conference with a commitment to develop a plan that was "scientifically sound, ecologically credible, and legally responsible within the framework of existing language and which would break the gridlock over Federal old-growth management within the range of the northern spotted owl in the Pacific Northwest and California" (Hoberg 1993; FEMAT 1993). He established three interagency working groups to develop the plan: the forest ecosystem management assessment team (FEMAT), the labor and community assessment team, and the agency coordination team.

He directed the FEMAT to develop an ecosystem approach to forest management, including restoring biodiversity for late-successional and old-growth forests, protecting the long-term productivity of these forests, sustaining levels of renewable resource use,

and maintaining rural economies and communities. The planning effort was to include a range of alternatives covering a medium to a very high probability of ensuring viable populations of all vertebrate species. The FEMAT's assessment was to receive peer review by properly credentialed reviewers. The FEMAT's report, *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*, was published in 1993 as part of a draft supplemental EIS on the range of alternatives to be considered in selecting a management plan for the northern spotted owl.

The President announced his preferred alternative as "option 9." This option provided large areas as habitat reserves to protect and improve northern spotted owl populations and riparian reserves to protect anadromous fishery habitats. The preferred alternative also established a timber sale volume of 1.2 bbf per year, which FEMAT advised was the maximum level legally feasible under the existing laws. The timber industry was stunned by the reduction. Environmentalists, on the other hand, were "outraged" that some timber sales would be permitted in the reserved areas under restrictive conditions. To relieve the jobs and economic impacts of reduced timber sales, the President's plan also included a proposal for a \$1.2 billion economic assistance program. An option to include a provision that would preclude further judicial review was also considered, but not adopted.

The Speaker of the House of Representatives, Washington State Congressman Tom Foley, made it clear that Congress could not endorse the preferred alternative and noted that congressional authorizing committees would block any suggestions for revising existing environmental laws (Hoberg 1993). Following the completion of the final supplemental EIS and the release of the record of decision in 1994, USDA and the Department of the Interior jointly adopted option 9 with slight modifications. Option 9 was initially referred to as the "President's plan." This title was later changed to the "Northwest Forest Plan."

When compared with the timber industry's 1989 compromise proposal to the Northwest congressional delegation for spotted owl habitat management that would have permitted a timber sales level of 4.8 bbf per year, the Northwest Forest Plan was an enormous

achievement for environmental interests. The plan also expanded forest management focus from maintaining the viability of the spotted owl population to a more holistic ecosystem approach addressing the viability of all vertebrate species' populations dependent upon old-growth habitats. In addition, the Northwest Forest Plan actually came very close to the environmental interest group ideal for preserving most of the remaining old growth on Federal lands within the northern spotted owl's range (Hoberg 1993).

Nevertheless, the Seattle Audubon Society, with 12 other environmental organizations, brought suit against it. The Sierra Club and three other environmental organizations filed separate suits. The environmental complaints contended that the new plan's compliance with environmental laws was still inadequate and sought an order to remand the plan to the agencies for further analysis and an injunction against all or nearly all timber sales in the meantime. The environmental groups also challenged certain procedures used in developing the plan. The Northwest Forest Resources Council, representing timber interests including loggers and mill owners, also brought suit against the plan, on both substantive and procedural issues (U.S. District Court 1994).

Judge Dwyer adjudicated the suits in late December 1994 in the U.S. District Court in Seattle. He upheld the Northwest Forest Plan and the Forest Service's decision to adopt it. He denied various claims by the numerous environmental plaintiffs as well as challenges from the timber industry. He found that Federal agencies had acted within their lawful scope in adopting the Northwest Forest Plan. The question was not a matter of whether the court would have written the same plan, but whether the agencies acted according to the requirements of the law. The answer to that question was "yes." This ruling, if upheld on appeal, marked the first time that the Forest Service and the BLM had worked together to preserve ecosystems common to their lands and manage northern spotted owl habitat forests under a plan ruled lawful by the courts (U.S. District Court 1994). Judge Dwyer also noted that, "Given the current condition of the forests, there is no way the agencies could comply with environmental laws without planning on an ecosystem basis." This

seemed to signify that the Forest Service and BLM had sufficient legal authority to apply an ecosystem approach to natural resource management.

Two environmental groups, the Native Forest Council and Save the West, have since filed appeals with the Ninth Circuit Court in San Francisco for relief from Judge Dwyer's decision on substantive grounds. The Northwest Forest Resources Council has also filed suit with the Ninth Circuit Court on procedural grounds. Both suits contribute a note of uncertainty about the finality of the Seattle District Court rulings.

The Below-Cost Timber Sale Issue

As the spotted owl issue unfolded during the late 1970's and early 1980's, environmental interests also began to question the purpose and justification of below-cost timber sales on national forests — sales whose receipts were less than the cost of preparing and administering them. The below-cost timber sale issue focused on the question of whether national forests should be offering timber sales that were prepared primarily for the timber market where their costs exceeded their revenues. The issue was first precipitated by a paper published in *Science* magazine by Marion Clawson, economist with Resources for the Future (Clawson 1976). He analyzed timber sale receipts and expenditures for each of the national forests and regions and found extreme variances in their profitability. He concluded that many sales were being made in areas where timber values were much too low to yield a net return and "should be abandoned for timber-growing purposes." While such timber stands could be valuable for other uses and worth managing for those uses, he felt that "the growing of timber was not economically sound." Dr. Clawson's analysis led to congressional hearings and to a legislative proposal to ban timber sales where their costs exceeded their revenues. The issue, however, became controversial and generated much confusion in Congress. The Forest Service opposed the proposal. It argued that such sales were justified by the benefits of road access, such as improvements to wildlife habitats and insect, disease, and wildfire control (Wilkinson and Anderson 1986).

The below-cost timber sale issue became quite heated as wilderness and environmental interests pressed it at the national level, especially after 1983,

when Congress had largely resolved the RARE II wilderness evaluations and recommendations on a State-by-State basis and released roadless areas for multiple-use management. The issue continued to harass the Forest Service throughout the 1980's. In the 1990's, it abated somewhat as timber sale injunctions and the final approved 1994 Northwest Forest Plan brought national forest timber sales to relatively low levels and contributed to major timber stumpage price increases and a reduced incidence of below-cost timber sales. Nevertheless, in 1994, the Clinton Administration targeted below-cost timber sales as an area for reducing unjustified Government costs.

In 1980, Tom Barlow, working for the Natural Resources Defense Council, compared annual timber receipts for each forest for the 1974 to 1978 period with related timber harvest expenditures. He found that timber stands did not recover the costs of timber management and reforestation on more than half the forests nationally (Barlow et al. 1980). The GAO (1984) and the Congressional Research Service conducted similar studies (Wolf 1984; Beuter 1985). Although these studies used somewhat different data, methods, assumptions, and time periods, their results were similar to Clawson's and Barlow's. In 1985, Robert Repetto, using most of the foregoing study results, identified 74 national forests that consistently offered below-cost timber sales. Of these forests, 45 were located in one of the four Rocky Mountain and Intermountain Regions, 24 were almost evenly divided between the Eastern and Southern Regions, 5 were located in the Pacific Southwest Region, and two were in Alaska. None were identified in the Pacific Northwest Region (Repetto 1985).

In the 1970's and early 1980's, the Forest Service could not determine the exact amount of timber sold at below-cost levels. Nevertheless, Administration policy officials and national forest managers were not insensitive to the below-cost sales issue. The policy direction for the 1980 RPA program, for instance, called for increases in timber supplies from national forests, but constrained such increases to regions where they could be cost-effective. A comparison of the 1975 and 1980 RPA programs reveals that the timber sales projected by the 1980 RPA for 1985 and 1995 were reduced by 20 to 30 percent. The bulk of the 1985 reductions occurred in the Rocky Mountain

Regions and Alaska, where the 1975 RPA program had more than doubled timber sale offerings. The 1980 RPA concentrated increases to softwood production in the Pacific Northwest, California, the northern Rockies, and the South, where timber sales increases could be cost-effective (USDA Forest Service 1980a).

In 1985, the Wilderness Society found that 30 out of 55 national forests with consistent below-cost sales had issued draft or final NFMA plans proposing increased sale volumes above those offered between 1979 and 1984 (Emerson 1986). USDA policy officials remanded several forest plans that had proposed major long-term increases in below-cost timber sales. Because the final EIS's and records of decision for those forest plans had not justified the increase in below-cost timber sales, the remand called for their rigorous justification in terms of nontimber benefits or a revision of the plans (Myers 1986).

Below-cost national forest timber sales were justifiable where they effectively served multiple-use purposes other than timber supply. The Ninth Circuit Court of Appeals validated this principle in the Jersey-Jack case in 1985. Environmental interests had sued to enjoin the construction of a logging road into the Jersey-Jack Roadless Area on Idaho's Nez Perce National Forest as a violation RPA's requirement that roads meet needs in an economically and environmentally sound way. The evidence indicated that the road costs would exceed the value of the timber accessed. The Ninth Circuit ruled that RPA did not require that timber road costs be exceeded by the value of the accessed timber. It was reasonable for national forest managers to consider benefits other than timber returns in determining whether the road was economical. The Nez Perce had claimed that the road would produce benefits from motorized recreation, fuelwood gathering, and access to the area by local residents. The proof of such benefits was not questioned because the issue was whether multiple-use benefits could be considered at all, rather than the actual worth of the benefits (Wilkinson and Anderson 1986).

Wilderness supporters and environmentalists generally recognized that below-cost timber sales could contribute benefits to uses other than timber supply.

They were not opposed to below-cost timber sales where such benefits were overriding and timber harvesting was the lowest cost method of providing them. However, they also felt there was "a growing body of evidence that many alleged multiple-use benefits of logging did not exist or were simply too uncertain to justify the environmental damage and costly public expenditures required to support below-cost timber sales." Environmentalists and others expressed concern that the Forest Service was significantly overstating the multiple-use benefits of logging. As a result, it was "building too many roads and logging too much land" (Emerson 1986). The general Forest Service response to the below-cost issue was to point out "the fact that: timber sales produce a variety of other resource benefits and many costs are the result of requirements for other resources" (Stout 1995).

Forest Service leadership at the time felt the issue was an effort by a few key interests to protect the remaining unroaded national forest lands for future wilderness designation (Myers 1986; Stout 1995). Unfortunately, the Forest Service did not have the documentation to justify the multiple-use, joint-benefit argument for below-cost sales. As the issue continued to be pressed, it gained a wider following. The Forest Service proposed and discussed a strategy for documenting the multiple-use benefits and cost of below-cost timber sales, but failed to adopt one until Congress directed it to do so in 1985. The House Appropriations Subcommittee on the Interior and Related Agencies decided it was time for the Forest Service and GAO to develop a separate accounting system that would allow the members of the Committee and others to understand the relationship between below-cost timber sale costs and other resource requirements (Liggett et al. 1995; Stout 1995).

The Forest Service established a task force to develop, field test, and evaluate procedures to account for and display timber sale benefits and costs. The final report, presented to Congress in April 1987, included a financial accounting system — based on accrual accounting principles — that documented cash costs and receipts of each individual forest's actual timber sales on an annual basis. A second component, an economic report, estimated the long-term benefits

and costs of the annual timber sale program and other multiple uses and reflected the Forest Service's justification for defending below-cost timber sales. A third component, a socioeconomic report, presented the effects of the timber program and annual harvests on community employment and income. These components were collectively referred to as the Timber Sale Program Information and Reporting System (TSPIRS).

TSPIRS became operational in FY 1989. The first TSPIRS report found that 65 out of 123 national forests had timber revenues less than costs and an average harvested volume per forest of 2.0 million board feet. The total volume of below-cost sales made up 16.8 percent of the National Forest System's total timber harvest. For FYs 1990 to 1992, costs exceeded revenues on 66 forests. Their average harvested volume was 1.8 million board feet (USDA Forest Service 1993f, 1995f).

In 1993, TSPIRS excluded forests with less than 1 million board feet of timber sales or no commercial sales from the below-cost category — dropping below-cost sales forests to 47. In FY 1994, primarily because timber prices had risen 50 percent, in part due to decreased supply caused by timber sale injunctions and harvest declines in the Pacific Northwest, the number of below-cost forests declined to 36. In 1994, average revenues per thousand board feet on the below-cost forests were \$112.85, compared with \$75.59 in FY 1993.

In FY 1993, the Forest Service Timber Management Division began to report on three different timber sale purpose categories in TSPIRS and in other reports. A timber commodity component included all commercial sales where timber supply was the primary purpose of the sale (USDA Forest Service 1993f). In FY 1994, these made up 67 percent of the total harvested volume. A stewardship component included timber sales designed to achieve primarily ecological and nontimber resource benefits vegetative through management — 26 percent of the total timber harvest. A personal use component — 7 percent of the total harvest — included sales of fuelwood, Christmas trees, ferns, and boughs to individuals for personal use and not for remanufacture or resale.

Some 490,000 families and individuals used this component (USDA Forest Service 1995f).

In FY 1993, the Clinton Administration asked the Department of Agriculture and the Forest Service to gradually phase out below-cost timber sales. In his address "A Vision of Change for America" on February 17, 1993, President Clinton justified this request:

The Nation can no longer afford subsidies and giveaways to those who don't need them, and we must assure the taxpayer is fairly compensated for services and resources provided by the government.... Timber sales from some national forests do not cover the cost to the Government of making the timber available for sale.

The President's FY 1994 budget proposal included a 4-year phaseout of below-cost sales — an estimated cost savings of \$46 million for FY 1994 and \$86 million by FY 1998 (USDA Forest Service 1993h). The Department of Agriculture, in a hearing before the Senate Subcommittee on Agricultural Research, Conservation, and Forestry, testified that it was committed to meeting the President's goal, but that the Forest Service would have to proceed slowly in the first year because it had to develop data and information to achieve the goal. That information included the nature and extent of below-cost timber sales and TSPIRS's adequacy to provide such information. TSPIRS was a forest-level information tool on the annual performance of the overall timber program and did not provide data on individual sales. Phasing out below-cost sales would require sorting out individual below-cost sales. Stewardship and personal-use sales would presumably be excluded. The sorting would be limited to commercial timber sales and require both reliable allocation of costs to individual sales and credible prediction of timber sale prices and revenues. It would also involve determining the causes of below-cost sales to evaluate potential cost reductions and increase the efficiency of the overall timber program.

Although there were several 1992 and 1993 congressional hearings on phasing out below-cost sales, including President Clinton's proposal for the FY 1994 budget, no definitive action emerged. The House

Appropriations Committee acknowledged the President's proposal in its report and expected that the Forest Service would establish credible rules and procedures for identifying and phasing out below-cost timber sales. The congressional appropriations bill included a "sense of the Congress" statement that such rules be issued at the earliest date possible. The report also advised that such rules provide regional foresters with the flexibility and discretion to make an orderly transition to above-cost status for timber sales, be sensitive to impacts on dependent communities, and minimize economic impacts and community disruption (U.S. House of Representatives 1994a).

The Senate Appropriations Committee in its report further advised that any below-cost phaseout proposal take account of all cost factors that influenced the profitability of the national forest timber sales. It noted that interests opposed to timber sales have no incentive to minimize timber sale costs for environmental standards, archeological protection, and the multiple laws for a wide variety of objectives that drive costs upward — increasing the possibility of below-cost sales. The shift to an ecosystem approach to management may also drive costs upward, but timber values may not increase correspondingly. Thus, the likelihood of below-cost sales rises (U.S. Senate 1994). The conference report advised the Forest Service to continue implementing its efforts to achieve cost savings in its timber program (U.S. House of Representatives 1994b).

Timber Harvests

During the 1980's, despite the interests of wilderness and environmental groups and the growing pressures from appeals, litigation, and demonstrations to reduce national forest timber sales and harvests, the average annual timber sales and harvest nationally were largely sustained. Timber harvests declined sharply in the early 1980's, as housing starts and timber demands responded to double-digit interest rates, averaging 8.3 bbf per year through 1983 (compared to an annual average sales volume of 11.0 bbf). However, as housing and timber demands began to recover in 1984, the harvested volume rose to 12.7 bbf in 1987 and remained at or above 12.0 bbf in 1988 and 1989. As a result, the total

timber harvested for the decade was about equal to that sold, 107 bbf (see fig. 15, chapter 5).

In the early 1990's, timber actually harvested declined precipitously, from 10.5 bbf in 1990 to 4.8 bbf in 1994, as injunctions against timber sales in the spotted owl range took hold and the Northwest Forest Plan became effective. An even greater reduction in actual timber sold — from an average of 10.7 bbf per year in the 1980's to less than 3.1 bbf in 1994 — indicated further declines in the regular harvest of standing live timber.

Clearcutting

Clearcutting on national forests declined sharply with the reduction in timber harvest because many of the timber sales and much of the harvest volume carried silvicultural prescriptions for clearcutting old-growth and overmature timber stands and establishing new stands. Between 1978 and 1993, the area clearcut declined from 310,000 acres to 133,000 acres (table 9). Total area harvested rose from a low of 613,000 acres in 1986 to a peak of 904,000 acres in 1990 and then dropped to 732,000 acres in 1993. The percentage of harvested area clearcut dropped even more dramatically — from more than 38 percent in 1986 to 18.4 percent in 1993. The area of timber sold with a clearcutting silvicultural system reveals an even stronger trend away from this prac-

tice — a drop of 74 percent, from 329,000 acres in 1986 to 86,000 acres in 1993. However, this sharp decline in planned clearcuts did not set in until after 1988, when the Chief demanded that clearcutting be reduced (Murphy 1994).

In 1992, when Chief Dale F. Robertson committed the Forest Service to adopt an ecosystem approach for managing multiple uses, he simultaneously announced that clearcutting on national forest lands would be reduced by 70 percent from the 1988 level. Although more than 80 percent of this objective had been accomplished by 1991, it was unclear how much of this achievement was attributable to injunctions on timber sales in the northern spotted owl's range. The Chief's directive called for greater use of individual tree and group selection, green tree retention, seed trees, and other regeneration systems that collectively would provide more visually pleasing and more diverse vegetational conditions on a forest-wide basis. Clearcutting was specifically limited to one or more of the following forest plan objectives or management guidelines: improve wildlife habitat, especially for threatened, endangered, and sensitive species, or improve water yield values and provide for recreation, scenic vistas, utility line and road corridors, facility sites, reservoirs, and similar developments; minimize the occurrence of potentially adverse impacts from insect or disease infestations,

windthrow, logging damage, and other factors affecting forest health and to rehabilitate lands actually damaged by such factors; provide for the regeneration and growth of preferred tree species or other vegetative species that are shade intolerant; rehabilitate stands poorly stocked due to past management practices or natural events; or meet research needs.

Road Construction

The direction, criteria, and procedures for selecting road design standards were revised in 1982 to comply

Table 9. Trend in clearcutting and total area harvested on national forests, 1984–1993

Fiscal Year	Clearcutting		Total Area Harvested	
	Area Sold	Area Harvested	Thousand Acres	Percent Clearcut
	thousand acres			
1984	N/A	243	N/A	-
1985	N/A	250	N/A	-
1986	329	236	613	38.4
1987	320	257	673	38.2
1988	324	283	728	38.9
1989	248	257	839	30.6
1990	204	229	904	25.4
1991	138	187	796	23.4
1992	95	163	756	21.5
1993	86	133	732	18.4

Source: USDA Forest Service 1995g.

more closely to actual forest use needs. The new direction minimized reconstruction of existing roads, reduced road standards, restricted the amount of resurfacing, reduced slash disposal levels on road rights-of-way, and closed some roads when timber sales were completed. The transportation program was also directed to areas where limited road investments were needed in the short term to continue current management and use. This was a partial effort to reduce the double-digit inflation and, in the longer term, to design roads that met forest use standards to reduce long-term road costs — a substantial contributor to below-cost sales (USDA Forest Service 1983). The leveling off and actual decline in national forest recreation use in the mid-1980's helped this effort, as it reduced the pressure for constructing and reconstructing roads for recreation.

Road construction dropped to 8,730 miles in 1982, compared with more than 10,000 miles per year in the preceding 5 years, and continued to drop in the balance of the 1980's to a low level of 5,540 miles in 1989. This progressive decline was facilitated by the near completion of the national forest arterial access system in all regions except the Northern Region. The same was generally true for collector roads, except in the few forests with large unroaded areas where some new road construction was still required (USDA Forest Service 1987b). The typical forest road project in the latter 1980's and early 1990's was the construction and reconstruction of relatively low-standard local roads — single lane, 12 to 14 feet wide, with dirt or gravel surfacing — to provide timber sale access. In future years, many of these roads would be used for the recreation purposes and management of other resources and uses.

As timber harvests declined sharply in the early 1990's, road construction dropped to even lower levels, reaching 3,400 miles in 1993. New construction declined more than reconstruction, from 38 percent of the total miles constructed and reconstructed in 1986 to 24 percent of the total in 1993. Total road system growth slowed accordingly. It rose from about 300,000 miles in 1980 to 343,000 miles in 1985 and increased only 25,000 miles over the next 8 years, to a total of 369,000 miles in 1993. Arterial roads made up about 5 percent of the total road mileage. Collec-

tor roads were 20 percent of the total system and linked to local roads — 75 percent of the total road system — within a watershed or timberland to arterial roads.

About 55 percent of the road system was being maintained for use by high-clearance vehicles such as pickup trucks, four-wheel drive vehicles, and logging equipment, and about 25 percent for use by low-clearance passenger cars. The balance, about 20 percent of the roads, was permanently closed to motorized traffic. To prevent undesirable resource impacts, reduce reconstruction and maintenance costs, and avoid unnecessary road damage, roads were closed or restricted to motorized traffic needed to achieve resource management objectives. More specifically, restrictions and closures were used to protect wildlife during migration, mating, birthing, or rearing periods; reduce the risk of wildfires; avoid risks to public safety during periods of high fire danger; protect road investments during inclement weather and unstable road conditions; and protect the public during periods of heavy timber sale activity (USDA Forest Service 1987b).

Those roads no longer needed to manage national forests were being obliterated and revegetated. In 1992, for example, 4,000 miles were obliterated. In the same year, special appropriation language authorized the use of road maintenance funds for this purpose. Often, road obliteration contributed to riparian area restoration, water quality improvement, and wildlife habitat improvement (USDA Forest Service 1993c). In 1993 and 1994, an additional 4,422 miles of roadways were obliterated.

Road Analysis and Display System

In 1986, USDA completed a 10-year analysis (1975 to 1985) of annual cost variability per mile (unit costs) of road engineering, construction, and related support activities among forests and regions (Fedkiw 1986). The results revealed more variation in unit costs than could be explained or understood. To control such costs and evaluate the cost efficiency and consistency of these unit costs, the Forest Service's Engineering Division designed and implemented the Road Analysis and Display System (ROADS) in 1987.



Examples of national forest road design and standards: from top, arterial or high, collector or intermediate, and local or low.

Road design direction was revised in 1982. National forest road system managers successfully reduced road costs by applying less demanding design criteria and standards and more rigorous land use planning for roads. For example, when intensive land use planning revealed that perennial use of new roads was not necessary, the proportion of intermittent-use roads — with lower design standards than roads built for continuous use — was increased. In some regions, intermittent roads were heavily seeded to grasses or other native vegetation to serve as linear wildlife openings. Other improvements included deferring road construction costs by using fewer surfacing materials on new roads in favor of more frequent reconstruction in later years. Costs were transferred to users through the construction of steeper grades, rougher running surfaces, and other cost-saving standards that met projected traffic requirements and environmental and safety considerations. A USDA Office of Inspector General (OIG) audit during 1986 and 1987 found that national forest managers had established reasonable controls over road system design and costs and had made significant progress in reducing them (USDA Forest Service 1988b).

Silvicultural Examinations and Practices

In the 1980's, silvicultural examinations increasingly became the primary means to provide the necessary data for planning site-specific projects such as timber sales, reforestation, and timber stand improvement, and to integrate these practices with other overlapping and complementary uses of the same lands and adjoining areas. In the 1990's, silvicultural examinations were adapted to and became an important tool for fitting timber management practices with the ecosystem approach to forest land and resource management. They now provide data on the existing ecological habitat; tree stand conditions such as age, size, health and vigor; use capabilities; and forest growth and mortality trends for specific use and management areas. The data are used to develop site-specific integrated land and resource management prescriptions that meet forest plan management area direction.

Silvicultural examinations were first formally scheduled and reported in 1975, when they covered 4.8 million acres. They achieved a peak level of

9.0 million acres in 1979, when NFMA planning was implemented throughout the National Forest System. They averaged 6.8 million acres per year during the height of the NFMA planning effort, from 1980 to 1985. Thereafter, they dropped to the normal management needs, an average of 5.2 million acres per year. In 1993 and 1994, as timber sales and harvests were reduced to their lowest levels in modern times, silvicultural examinations declined to 2.5 million acres per year (USDA Forest Service 1994f).

Reforestation

Reforestation practices include planting, seeding, and natural regeneration with or without site preparation. The acres reforested declined from 434,000 acres in 1980 to 370,000 in 1985 — the year the Forest Service reported that it had eliminated the national forest regeneration backlog. The initial backlog in the 1970's was estimated to be 3.1 million acres. In the decade between 1975 and 1985, a total of about 1 million acres of the backlog were successfully reforested or seeded; 700,000 acres were examined and found to be satisfactorily stocked and not in need of reforestation; another 1 million acres were withdrawn due to changes in land use classification such as wilderness designation; 200,000 acres were allocated for multiple-use purposes such as retention of wildlife forage areas; and 100,000 acres were withdrawn for other reasons, such as land exchanges (USDA Forest Service 1985). During the 5 years between 1980 and 1984, an average of 87 percent of all regeneration treatments successfully met stocking objectives. In 1993, the average percentage of success 3 years after planting rose to 90 percent (USDA Forest Service 1985, 1994e).



Recently thinned young pole timber in even-aged hardwood management unit, Daniel Boone National Forest, Kentucky, 1991.

At the close of 1985, 820,000 acres needed regeneration — representing a normal 2-year reforestation level at the early 1980's average. (It usually takes 2 years of lead time to prepare a site and grow seedlings adapted to it.) After 1985, reforestation needs rose sharply, to a peak of 1.2 million acres in 1990 as timber harvest escalated to near record levels and wildfires between 1987 and 1989 caused extreme fire damage in the western regions. Stand losses from a 1988 Utah bark beetle outbreak also contributed to this acceleration. The acres actually reforested between 1989 and 1992 reached a historic peak of nearly 500,000 acres per year. In 1993, only 441,000 acres were reforested, and in 1994 reforestation dropped to a more normal level of 300,000 acres as timber harvest levels were reduced and the area damaged by wildfire was reforested.

Annual seedling production at national forest nurseries rose from an average of 118 million seedlings per year in the latter 1970's to 136 million per year

as the national forests worked to reduce the reforestation backlog. Seedling production dropped to an average of 122 million per year from 1986, after the backlog reforestation was completed, to 1994, except for 1990 and 1991, when seedling production averaged 134 million per year to meet the increased reforestation needs due to increased timber harvest acreage and extensive wildfire damage in the late 1980's.

Timber Stand Improvement

In 1980, timber stand improvement opportunities were estimated to be 1.7 million acres. This total was reduced to 1.25 million acres by 1991 as the area treated each year — an average of 375,000 acres per year — equaled or exceeded the accumulation of new opportunities. Between 1991 and 1994, timber stand improvement treatments fell to 264,000 acres per year. By the end of 1994, because new needs increased more than treatments, the total timber stand improvement opportunities rose to 1.4 million acres (USDA Forest Service 1995c). Pre-commercial thinnings, mainly in coniferous plantations, made up 60 percent of these treatments. Release and weeding constituted 30 percent, fertilization 8 percent, and pruning 2 percent.

Forest Growth, Mortality and Potential Yield Trends

Net annual national forest timber growth continued to increase, as it had since 1952 and before (fig. 25). It reached a peak level of 3.4 billion cubic feet per year in 1986 and then declined slightly, by 3.2 percent, to 3.2 billion cubic feet per year by 1991. This slight decline largely reflects increased mortality rather than actual growth decline after 1986. National forest timber mortality reached a low point of 1.01 billion cubic feet per year in 1976 and then began to increase to 1.05 billion cubic feet per year in 1986 and 1.20 billion cubic feet per year in 1991, indicating an accelerating increase. National forest timber harvests in 1991 were 2.0 billion cubic feet — less than 59 percent of the net growth. The sharp decline in timber sales and harvests in the early 1990's signaled a continuing rise in mortality and further decreases in net growth. These trends do not contribute to the improvement of overall forest health, which has become a new public issue in recent years. The national patterns are similar for

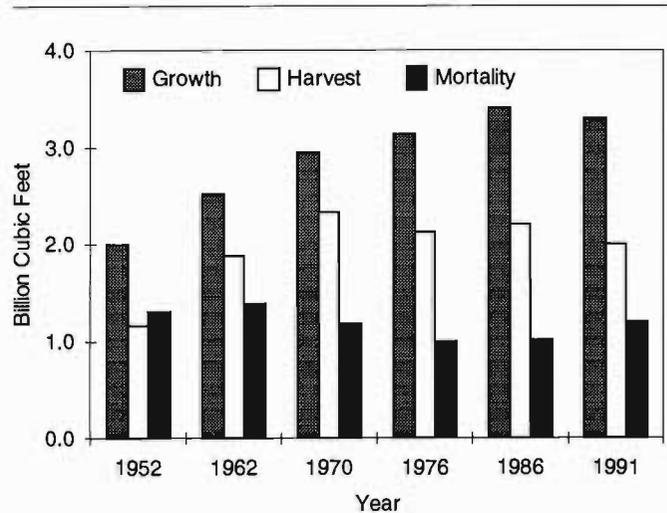


Figure 25. National forest timber growth, harvest, and mortality, 1952–1991

Source: USDA Forest Service; Waddell et al. 1989; Powell et al. 1993.

softwoods and hardwoods (Powell et al. 1993; Waddell et al. 1989).

Regional patterns for timber growth and mortality are similar to the general national pattern for all national forest regions except those on the Pacific Coast, including Alaska. Net timber growth, primarily softwoods, continued to increase in the latter regions to a peak of 1.1 billion cubic feet per year in 1991, while mortality continued to decline to a low 400 million cubic feet per year as the old growth was increasingly harvested. National forest timber harvests in the Pacific Coast regions were just equal to the net growth of 1.1 billion cubic feet per year. With the major reduction of old-growth Pacific Coast timber harvests in 1991, this balance of net growth, mortality, and harvests is likely to involve increased mortality and slower net growth in future years. Increased wildfire losses can also be expected.

The long-term sustained-yield capacity (LTSYC) for timber harvest on national forests is estimated to be 12.16 bbf per year. The LTSYC is the estimated annual net forest growth for a fully managed national forest condition with current management intensity and practices. This is reflected in forest

plans for all regions except the Pacific Northwest Region, where LTSYC is based on the *Final Supplemental EIS on Management of Habitat for Late-Successional and Old Growth Forest Related Species within the Range of the Northern Spotted Owl*. Table 10 shows the distribution of the LTSYC by national forest regions. The comparison of LTSYC with the estimated current allowable sale quantity (ASQ) — 7.56 bbf — indicates that the current ASQ is well below the growing capacity (potential yields) of a fully managed condition of national forests, with today's management intensity in every national forest region.

less than 1 percent of the national forest lands. An even smaller area was treated with insecticides or fungicides, about 550,000 acres per year between 1980 and 1988 and then less than 200,000 acres per year between 1989 and 1992. This sharp drop in pesticide use resulted directly from the 1988 forest health strategic plan.

The 1988 forest health plan recommended increased forest-level staffing for pest monitoring, detection, and evaluation; improved support and decision systems for integrated pest management; and increased emphasis on maintaining and restoring forest health through silvicultural management and practices, including integrated pest management (IPM) — the decisionmaking and action process for incorporating biological, economic, and environmental evaluation of pest-host systems to manage pest populations (USDA Forest Service 1981-1995; 1988a).

The 1992 Forest Health Strategic Plan

Another forest health strategic plan was prepared in 1992 as a direct response to five 1992 congressional hearings that focused on the health of western

forests that had been altered by successful fire control and other practices and were now being severely damaged by drought, pest epidemics, and wildfires. Congress wanted to know and asked how forests so damaged could be restored and how similar future damage could be prevented (USDA Forest Service 1993b; 1994b). The Forest Service established a forest health steering committee and task team to respond to this request. In addition to National Forest System, Research, and State and Private Forestry experts, it included several State foresters and one State entomologist. The 1992 Forest health strategic plan, which was published in 1993, built on the background of the 1988 plan and

Table 10. National Forest System long-term sustained-yield capacity and allowable sale quantity by region, 1994.

Region	Long-term Sustained Yield Capacity (LTSYC)	Allowable Sale Quantity (ASQ)	ASQ as a Percent of LTSYC
	(billion board feet)		
Northern	1.99	1.12	.56
Rocky Mountain	0.79	.44	.56
Southwest	0.85	.44	.52
Intermountain	0.65	.39	.60
Pacific Southwest	1.43	1.12	.78
Pacific Northwest	1.63	1.38	.85
Southern	2.56	1.34	.52
Eastern	1.52	.87	.59
Alaska	0.72	.47	.65
Total	12.16	7.56	.62

Source: USDA Forest Service Timber Management Staff.

Pest Management and Forest Health

State and Private Forestry continued to lead national forest pest management activities and directly coordinate cooperative pest management activities with other ownerships that shared common pest problems with the national forests. During the 1980's and early 1990's, pest detection and evaluation surveys were conducted on a relatively stable average area of 120 million acres each year. Pest outbreak prevention and suppression activities continued to be conducted on only the highest priority areas, which varied from 500,000 to 1.5 million acres per year —

linked forest health with the ecosystem approach to management. It recognized that outbreaks of some natural pests were exceeding historic levels — often due to past management practices, including wildfire suppression, which had created favorable conditions for pest populations. It also recognized the linkage between pest outbreaks and fuel buildups and the increasing intensity of wildfires.

The 1988 forest health plan cited the following factors that contributed to more destructive pest outbreaks: stand ages exceeding the existing tree species entomological and pathological rotation ages, planting and regenerating disease-prone varieties in areas where the same disease is known to occur, letting stand densities increase, planting or naturally regenerating extensive monocultures, failing to remove infected overstory trees during timber harvest, and failing to provide a substitute for the forest mosaic created by uncontrolled natural wildfires (USDA Forest Service 1988a).

The eight components of the 1988 forest health plan were decentralizing pest management to the forest level to work more directly with resource managers in developing and implementing forest plans, effective public communication and involvement, the role of integrated pest management, funding for pest suppression, environmental analyses of pest-host interactions, availability of acceptable pesticides, the development of new technology, and forest health monitoring.

The four new components proposed by the 1992 plan were restoring forest health in the ecosystem management framework, managing introduced pests, excluding exotic pests, and providing for international cooperation in forest health protection. The 1992 plan identified the desired state of forest health as a condition where natural and nonnatural influences such as pests, atmospheric deposition, silvicultural treatments, and harvest practices do not threaten long-term resource management objectives. This linkage integrates forest health directly into national forest land and resource management plans.

Western Forest Health Initiative

In September 1994, Chief Jack Ward Thomas chartered a western forest health initiative team to

identify approaches to restore western forested ecosystem health. The team addressed all forested western lands — national forests, industrial, non-industrial private, and other public lands. It gathered and evaluated forest health management project information from all 92 western national forests, 16 States, all research facilities, and tribal governments. This evaluation found that not all forests were threatened by insects or disease, nor were they all in immediate risk of catastrophic change by fire. However, forest health problems were widespread and all could not be immediately addressed on all lands. The practical approach was to treat those landscape segments that were most at risk to fire, insect, and disease damage and to ensure the fullest protection of the landscape, especially in those areas with the highest risk of habitat loss to threatened, endangered, and sensitive species population recovery. The team identified three hazard reduction categories: areas of potential catastrophic loss of key ecosystem structure, composition, and processes; areas requiring restoration of critical ecosystem processes; and stressed sites in need of rehabilitation (USDA Forest Service 1994b).

In 1994, in response to this assessment, western forest managers scheduled the implementation of 335 high-priority forest health projects. By 1995, 64 of these projects had been completed; 248 were expected to continue, with completion dates extending from 1996 to 2000; and 23 were withdrawn due to lack of funds or excessive deterioration of salvageable, fire-damaged timber (USDA Forest Service 1996a). The total area of the projects covered 2 million acres. Individual projects ranged from less than 500 acres to more than 150,000 acres — about a third were less than 500 acres. The average project size was almost 6,000 acres. Projects involving timber management, primarily reforestation (34 percent); fuel management (16 percent); habitat management (6 percent); watershed improvement (4 percent); range improvement (2 percent); various combinations of management activities (37 percent); and other (1 percent) were implemented. In addition, national forest managers also began implementing some 40 western forest health initiative team recommendations to restructure existing procedures that could prevent timely and effective responses to forest health problems. These recommendations called for

improving communication and coordination with related internal Forest Service interests and external organizations, increasing the flexibility of budget and program planning, and changing existing laws or obtaining new legislation on matters affecting national forest management.

In 1994, the national forest land ethic incorporated the objective for sustaining healthy ecosystems: "Management of the national forests to meet human needs while maintaining the health, diversity, and productivity of ecosystems." Chief Thomas declared "ensuring ecosystem health as a foundation for all life, a concept that builds on Leopold's definition of land health as a vigorous state of self-renewal a first priority in managing national forests for multiple uses" (Thomas 1995; USDA Forest Service 1994d).

Exotic Pests and Log Imports

The discovery of three new exotic forest pests — the Asian gypsy moth, the common European shoot beetle, and Eurasian poplar leaf rust — in the United States in 1991 and 1992 and the recent industrial expansion of log imports from foreign lands elevated risks for protecting the Nation's forest health. The United States has typically not been a big importer of logs. However, domestic log supply reduction on the West Coast opened its markets for timber imports. Pest assessments for larch logs from the Russian Far East, Monterey pine from New Zealand, and Monterey pine and native hardwoods from Chile revealed a serious risk of introducing damaging new pests to U.S. forests. (Fowler 1996).

The far eastern Russia risk assessment revealed the threat of the Asian gypsy moth. It is a greater threat to North American forests than the established European gypsy moth. The Asian gypsy moth feeds on a larger number of hosts and can disperse more quickly because the females can fly. The first Asian gypsy moth infestations on the West Coast were located near the ports of Portland, Oregon, and Tacoma, Washington. These infestations have been eradicated, but the fact that the moth came into the country aboard Russian grain ships elevates concerns and risks. The United States and Russia have developed a monitoring and inspection program to reduce the chance of future introductions. (Fowler 1996).

Vegetation and Animal Control

The Forest Service reduced herbicide use to control unwanted vegetation on rights-of-way and forest and range management areas by 50 percent, to less than 120,000 acres. The use of chemicals for animal damage control was reduced from 115,000 acres in 1983 to less than 7,000 acres by 1992 (USDA Forest Service 1981–1995).

Fire and Fuel Management

Wildfire damage during the early 1980's was below average. Between 1980 and 1984, the average annual burn was 118,644 acres — less than 1 percent of the total National Forest System. Favorable weather and soil moisture conditions which were not conducive to wildfire ignition or spread were important contributors. The most dramatic fire event was the Mount St. Helens eruption in 1980 and the fires it ignited. National forest managers were faced with a unique problem of keeping fires from moving out of the devastated area and protecting the health and safety of firefighters in the hazard zones. A comprehensive action plan and command center for directing and coordinating the firefighting teams helped suppress the wildfires. (USDA Forest Service 1981b).

During the first half of the 1980's, the average annual number of fires reported on national forest lands was 9,000. Nationwide, half were lightning-caused and half were human-caused. However, the ratio between human- and lightning-caused fires differed enormously between the western national forests, where 80 percent were lightning-caused, and the southern national forests, where 80 percent were human-caused. Among the human-caused fires, arson was the most frequent cause, at 32 percent; campfires caused 21 percent; and smoking, 11 percent. Various other human causes, each at 9 percent or less, accounted for the remaining 36 percent.

As directed by Congress in 1978, the Forest Service undertook a comprehensive analysis of national forest fire management policy and implementation strategies to develop an economic model for planning fire management. The model, completed in 1980, compared alternative wildfire responses for each national forest with the corresponding sum of

the estimated suppression costs and the value of natural resources lost to those fires. The optimum response strategy and fire management budget level was the one that produced the lowest sum of costs plus resource losses. This planning system, the National Fire Management Analysis System (NFMAS), was first used in 1981 to allocate a \$174 million budget for fire management. Some forests received higher budget allocations, some received lower than their traditional allocations, and others received about the same. Each year's experience has been added to the model's database to improve its performance over time.

The National Interagency Incident Management System (NIIMS), which uses an incident command organization, interagency coordination and communications, and a terminology common to all wildland firefighting agencies, continued to be implemented during the early 1980's. It uses the most cost-effective firefighting resources for each situation, regardless of agency jurisdiction. It was, and still is, used to manage larger wildfires and produces substantial savings. The Forest Service led the development of NIIMS by providing training and guidance for participating agencies and by transferring NIIMS technology to wildfire fighting, search and rescue efforts, hurricane disaster relief, law enforcement, and planning for other natural disasters (USDA Forest Service 1986). The NIIMS system has also been successfully used in plane crashes and is now being used internationally as part of International Forestry's disaster assistance support program.

In 1984, despite the extensive lightning activity and ignitions, the total area burned on national forests was very low, less than 99,000 acres, and the smokejumper program achieved the historic mark of 100,000 jumps. During the 1984 fire season, national forests fully used smokejumper capability to respond to major lightning-caused wildfires throughout the Pacific Northwest. In the same season, national forest managers monitored 65 lightning-caused prescribed wilderness fires.

Wildfires Worsen After 1984

The 1985 fire season was the worst experienced nationwide, particularly in the South and West, since

1934 and ushered in 5 more years of extreme drought in the West and even more severe fire seasons. The overall fire situation required a massive response from all parts of the Nation and set a record for interagency mobilization of people and equipment. The National Interagency Fire Coordination Center (NIFC) in Boise, Idaho, moved more people and resources over a broader geographical area in the shortest time period in its 20-year history. More than 17,000 firefighters were mobilized at one time. The national forest area burned totaled 463,950 acres. The 1985 fire season in many ways was a fortuitous experience in firefighting logistic, for there were far worse seasons to come in 1987 and 1988 (USDA Forest Service 1986).

The 1986 national wildfire season was another severe one, but the area burned was less than 295,000 acres. The 1987 fire season, particularly the "Fires of



Severe wildfire damage associated with heavy fuels, Colville National Forest, Washington, 1988.

September," became the most destructive national forest fire season since 1929, burning more than 1,066,000 acres. Rainfall 25 percent below normal created extremely dangerous burning conditions in northern California and southwest Oregon. In late August and September, more than 11,000 lightning strikes ignited 1,900 fires — a ratio of one fire for every six lightning strikes compared with a typical ratio of one fire per 100 strikes. NIFC mobilized more than 25,000 people and record amounts of supporting equipment and aircraft during the peak of the firefighting. Almost 3 bbf of timber were destroyed, damaging wildlife habitats, range forage, visual resources, and cultural resources. In some situations, suppression forces had to be shifted from protecting national forest resources to protecting human life and developed property. Tragically, 12 firefighters lost their lives. (USDA Forest Service 1988b).

Efforts to rehabilitate damaged watersheds began as soon as the fires were controlled. Thousands of acres were seeded to grass to prevent erosion, 105 miles of stream channels were cleared, and erosion control structures were installed on damaged watershed sites to stabilize soil and protect downstream water uses. Several hundred culverts were installed to improve drainage on nearly 2,000 miles of road to avoid erosion. Trees were felled on the contour on more than 4,000 acres of damaged watershed areas to check erosion.

The 1988 season continued the extreme fire activity that began in August 1987. Continuing severe drought created an extremely high fire potential



A very hot, intense fire through a stand of mature timber destroyed ground cover and damaged soil on the West Yellowstone Ranger District, Montana, during the 1988 West Yellowstone Area Conflagration.

throughout the western United States. National forests experienced more than 11,000 fires that burned nearly 1.5 million acres — a level not exceeded since 1919, when 2 million national forest acres were burned. More than 41,000 fire personnel were mobilized in 1988, including trained crews from 39 States and Canada. Some 5,600 military personnel and 4,000 emergency firefighters were also trained and mobilized. Ninety percent of all fire starts on national forests were suppressed at 10 acres or less as a direct result of planned and available fire protection forces.

The most intensive fire situation developed in the Greater Yellowstone Area — mainly inside Yellowstone National Park. A combination of severe drought, natural fuel accumulations, and insect-killed trees created extreme fire behavior conditions with high rates of spread. Strong ember-carrying winds started new fires. Intense fires completely consumed fuels and threatened several communities.



Residence destroyed by intense wildfires, Los Padres National Forest, California, 1990.

National forest firefighting forces played a major role in suppressing eight major fires covering more than 1.1 million acres in Yellowstone National Park and 566,600 acres of national forest outside Yellowstone (USDA Forest Service 1989c).

The severity of the 1988 fire season — particularly the fact that several wildfires that began as natural fires had been allowed to burn in national forest wilderness areas and in Yellowstone — led the Secretaries of Agriculture and the Interior to review the wilderness “let burn” fire management policy. Wilderness fire policy became a major public issue. The review improved coordination among the Forest Service, Department of the Interior agencies, and the National Association of State Foresters and communication with the public. It endorsed the existing prescribed natural wildfire policy and recommended preparing regional and national contingency plans to constrain natural fires under extreme burning conditions and planned ignitions to supplement natural prescribed fires in reducing heavy hazardous fuel accumulations (USDA Forest Service 1990b).

1989 was another droughty year. National forests prepared contingency plans for areas with extreme fire risks; provided supplemental funding for early emergency fire planning, training, and firefighting equipment; increased tools and equipment in all fire caches; and accelerated contracts for aircraft, fire retardant chemicals, caterers, shower units, and other suppression resources. In 1989, western national forests had 6 percent fewer wildfires. Most were ignited by lightning. Advanced preparation and rapid mobilization kept these fires small, and favorable weather closed the fire season by the end of August. The area burned was 424,000 acres.

An improved version of the NFMAS was introduced in 1990. It determined the most efficient fire management organization as one that minimized the sum of presuppression costs, suppression costs, and resource losses. This improved the allocation of fire management budgets and increased fire management efficiency at the national forest level.

From 1990 to 1993, drought conditions persisted — with some abatement in 1991, when only 143,000 acres burned, and in 1993, when a return of moist weather conditions kept the burn to 239,000 acres. Even so, the average annual area burned was 310,000 acres, 1.7 times the average burn in the 40 years between 1945 and 1984, before the conflagrations of the late 1980’s. National incident management teams were dispatched to 20 major fires on national forests in 1990 and 26 in 1992. Six firefighters lost their lives on Arizona’s Tonto National Forest in 1990 when wildfire overran their crew. It became clear in these years that fuel buildup on national forests needed special attention and could

Chapter 6

only get worse in future years. (USDA Forest Service 1991-1995).

The most severe and damaging wildfire season on national forests in recent times came in 1994. More than 14,400 fires were fought on almost 1.5 million acres. Forty-nine States supported national forest suppression efforts by supplying firefighting crews. The military provided more than 4,000 troops. More than 100 major fires were suppressed in the six western national forest regions. At the peak of the firefighting activity in August, more than 25,000 firefighters were assigned to fires at one time. Large fire-damaged areas accompanied the tragic loss of 28 lives across the West (USDA Forest Service 1995d). National forest fire management expenditures in 1994 reached a recordbreaking total of nearly \$1 billion. These extraordinary costs became a special concern to policy officials because real dollar expenditures (after inflation) for national forest fire suppression had not increased since 1970 (Bell et al. 1995).

Fuel Management

During most of the 1980's and early 1990's, fuels were reduced on about 950,000 acres per year. This effort included three components: the direct fuel management program, timber sale brush disposal, and the prescribed burns and mechanical fuel reductions for range and wildlife habitat improvements. On average, each component made up about a third of the total average annual achievement. Brush disposal declined from 352,000 acres to 225,000 acres as national forest timber harvests were reduced in the early 1990's. In the same period, the



Heavy fuel (middle ground) of beetle-killed lodgepole old-growth, green old-growth in background, and young lodgepole regeneration with low fuel buildup in the foreground, Gallatin National Forest, 1980. The area largely escaped the 1988 Yellowstone fires except for a fringe of intense burn in the foreground.

directly funded fuel management program increased from 347,000 acres to 385,000 acres — it had previously averaged less than 300,000 acres per year.

The directly funded program's focus was to reduce the inflammable material buildup on forest floors in areas with a history of large, costly, and destructive fires and the potential for the recurrence of such fires. Brush disposal and the prescribed fires and mechanical biomass reductions for wildlife habitat and range improvement supplemented the direct program's achievements. However, the western forest fires between 1986 and 1992 made it obvious that the scale of such efforts was not matching the scale of the national forest fuel hazard problem.

The 1987 "Fires of September" demonstrated that fire crews could directly attack wildfires and contain them in areas that had received intensive fuel treat-

ment. However, direct attack was not an option on areas that had not had intensive fuel treatments. The combination of high fuel loadings and extremely dry weather caused high spread rates, high fire intensities, and dangerous fire behavior — conditions too dangerous for fire crews to attack directly. The fire experiences of 1987 to 1992 made it clear that with current fuel management treatment levels, it would take many, many more years to make wildfires easier to control (USDA Forest Service 1992b).

In 1994, Chief Jack Ward Thomas, alerted by the disastrous loss of life, resources, and costs in fighting wildfires in that year and the preceding decade, asked for a Forest Service assessment of its fire management strategy (USDA Forest Service 1995h). That report basically recommended shifting fire management away from its traditional focus on control and suppression to become a working tool in the ecosystem approach to management, establishing cooperative agreements for fighting wildfires on the wildland-urban interface, and improving leadership's ability and workforce capabilities to respond to wildfires.

Two studies elaborated on these broad recommendations (USDA Forest Service 1995b; Bell et al. 1995). They reported that timber cutting, domestic livestock grazing, insect control, and prolonged absence of periodic low-intensity burning had resulted in changes in species composition and stand structure that had disposed about 39 million acres of fire-adapted forests to insect and disease attacks and severe stand-replacement wildfires. Both studies recommended increasing mechanical and prescribed burning to 2 or 3 million acres per year to reduce fuel loadings in fire-adapted forests. They also recommended that forest plans address wildfire consequences and set mechanical treatment and prescribed burning objectives for areas with excessive fuel loads. They also recommended developing an interdisciplinary workforce capable of maintaining, restoring, and protecting fire-adapted forests and training, qualifying, and making 75 percent of the total national forest workforce available to respond to fire emergencies by the year 2000. Other recommendations included intensifying line officer training to better redeem fire management responsibilities,

clarifying responsibilities by renegotiating cooperative fire agreements with States and local communities and other partners at the wildland-urban interface, and phasing out the Forest Service's current role as the primary fire protection agency in urbanized and developing rural areas. These recommendations clearly elevated the role of fire management in protecting and managing national forest ecosystems in the future and set new directions and strategies for fire and fuel management on national forests in the 21st century.

Management of Rangelands

In 1980, 102 million acres, or 55 percent, of national forest lands were in grazing allotments: 58 million acres were "forested" rangeland and 44 million acres were classified as "rangeland." (USDA Forest Service 1981a). National forest range managers continued to improve range and rangeland watershed conditions to increase national forest allotment-forage and browse-grazing capacity in keeping with water quantity and quality, wildlife habitat, scenic quality, and wild free-roaming horses and burros resource objectives. For 1984, the goal was equivalent to 10 million animal unit months (AUM's) of livestock grazing. This goal was attained; authorized allotment grazing use rose to 10.1 million AUM's in 1983 and was sustained through 1987 (USDA Forest Service 1981-1995).

Domestic Livestock Use

Actual grazing use, however, remained at a stable 8.8 million AUM's through 1986 and then dropped to 7.7 million AUM's by 1992, responding to persistent severe drought conditions. The authorized or permitted grazing likewise declined after 1986 to about 9.1 million AUM's by 1993 (USDA Forest Service 1981-1995).

The number of cattle grazed on national forests remained very stable at 1.3 million per year between 1980 and 1988, but it declined by 100,000 by 1993. The number of sheep grazed in 1980 likewise was 1.3 million, but their numbers began to decline in 1983; by 1993, they numbered less than 1 million, a drop of 300,000 sheep (USDA Forest Service 1981-1995).

Range Management Activities

In 1980, there were 10,754 grazing allotments encompassing the entire 102 million acres of national forest rangelands. However, only the 52 million acres classed as suitable rangeland were used to determine the carrying capacity for domestic livestock grazing. The number of allotments increased to 11,069 in 1982, but steadily declined thereafter, to 9,343 in 1993. The number of paid permits and permittees also declined, from more than 15,000 to 9,113. Since the area of suitable rangeland remained about the same, the reduction in allotment numbers represented a consolidation of some units for management efficiency.

Many small grazing operators withdrew from the cattle industry as beef consumption declined steadily, from its peak 28 billion pounds in 1976 to 24 billion in 1993. Per capita beef consumption declined even more: from 128 pounds in 1976 to 93 pounds in 1993. Total cattle numbers declined similarly, from a peak of 132 million in 1975 to 99 million in 1993. Most of the waived grazing capacity was picked up by larger operators who remained in the cattle business (USDA Forest Service 1981–1995, 1986–1994). The decline in permittee numbers also reflected a shift from counting individual permittees holding grazing association permits on national grasslands to just counting association permits.

The number of allotments where the prescribed treatments in approved allotment management plans were being implemented ranged between 7,400 and 7,600 — generally tending to increase. In 1991, 7,600 allotments were implementing approved plans and 400 more plans were ready to be implemented. Almost 82 percent of the allotments were or would be under satisfactory management. In 1992, national forest range managers changed their method of assessing the adequacy of range management within grazing allotments (USDA Forest Service 1989c). These changes increased attention to multiple uses, delegated more management authority to local managers, and added new measures for assessing range health and applying an ecological approach to vegetation analysis. These changes helped a growing number of public groups and individuals interested in range uses other than livestock grazing to focus their attention on the management of range vegeta-

tion. The new approach focused on vegetation management objectives that the new national forest plans had established for national forest grazing allotments.

Under the new approach, epitomized as “Change on the Range,” national forest managers introduced new measures for rangeland vegetation analysis and forest plan vegetation objectives to reflect an ecosystem approach to management (USDA Forest Service 1989c). Range condition assessments related to the full gamut of rangeland use and management objectives. Cattle forage would no longer be the sole criterion for range condition. This approach reduced the area suitable for livestock grazing to less than 50 million acres (USDA Forest Service 1989c).

In 1993, forest plans included 97 million acres where grazing was authorized by permits — 5 percent less than in 1980. These plans identified range vegetation management objectives on 74.3 million acres. Resource objectives were being met on 34 percent of this area largely through livestock management. An additional 30 percent was progressing toward meeting forest plan objectives. About 15 percent was not meeting or progressing toward forest plan objectives and required revised allotment plans, and 21 percent was still being evaluated to determine its status (USDA Forest Service 1994e).

“Change on the Range” separately identified and assessed riparian areas within grazing allotments. In 1993, grazing allotments included nearly 2.5 million acres of riparian areas, 60 percent of which was meeting or moving toward forest plan objectives. An additional 16 percent was not doing so, and the remaining 24 percent was being evaluated (USDA Forest Service 1994e).

Rangeland conditions and productivity were maintained and improved by both structures and vegetative management. National forests typically installed about 1,300 miles of range fencing; water developments at 1,600 sites, including about 260 miles of water pipelines; and 300 other site-specific practices each year. About 140,000 acres of seeding and fertilizing and mechanical, controlled burning or chemical brush and range plant treatments were



Rider moves cattle to another rotational grazing unit, Big Horn National Forest, Wyoming, 1990.

applied each year. Some 1.5 to 2.5 million acres of rangeland were benefitted each year.

Noxious Weed Control

Noxious weed infestations continued to spread on national forest lands. They adversely affected wilderness, soil conditions, aesthetic quality, riparian areas, aquatic ecosystems, hydrology, and land productivity, as well as the forage supply and its nutritional values to wild and domestic animals. During the 1980's, national forest managers treated noxious weeds on about 21,000 acres per year (USDA Forest Service 1981–1995)

In 1983, the principal noxious weeds were estimated to infest 1.6 million acres and were spreading at the rate of 7 percent per year (USDA Forest Service 1987b). By 1995, that acreage had increased to 6 to 7 million acres (Clark 1996). This not only reflected the continuing spread of noxious weeds, but also increases in the number of species and changes in the definitions and criteria for noxious weeds (Clark 1996).

In the early 1990's, the effort to contain the spread of noxious weeds on national forests doubled, to an average of 41,000 acres per year (USDA Forest Service 1981–1995). In 1995, the Forest Service undertook the lead for developing a USDA interagency strategy for noxious weed control to integrate noxious weed management with ecosystem analysis, resource assessment, and national forest planning. It recognizes the primary importance of cooperation with all parties affected by noxious weed infestations and the increasing threat that noxious weeds pose to wildland ecosystem integrity, especially wilderness and research natural areas (USDA Forest

Service 1996b).

Role of Public Participation

During the 1980's, range users, wildlife groups, and other resource interests increasingly participated in national forest range planning and management. This approach improved cooperation among the interest groups and helped to identify needed forage and structural improvements and to accelerate their implementation to protect and improve range vegetation and achieve a better distribution of grazing and foraging animals. Public issues and management concerns about range conditions, the spread of noxious weeds, the impacts of national forest plans, and about water quality, riparian areas, wildlife, and scenic beauty nevertheless grew during the 1980's and were an important factor in bringing about "Change on the Range." Public concerns were underscored by GAO reports on range conditions, particularly on overstocked allotments and riparian areas (GAO 1988a, 1988b). Under "Change on the Range," national forest managers emphasized restoring rangeland riparian areas, improving

rangeland conditions, and developing new partnerships with interested groups and individuals. In 1989, for the first time, national forests collected data on deteriorated riparian areas that were receiving treatment to improve their vegetative condition and reported 42,727 such acres for that year (USDA Forest Service 1986–1990).

In 1990, representatives of the Forest Service, livestock organizations, and wildlife interests called a joint conference to review how effectively forest plans were addressing the longstanding conflict between livestock and wildlife. As a result, the Forest Service in 1992 launched "Seeking Common Ground" in the Western States. It sought project proposals from Government agencies, livestock producers, and wildlife organizations to demonstrate practical solutions to big game and livestock management issues. A panel of experts evaluated the proposals. Selected proposals were implemented in 1993 with both public and private funds. These on-the-ground project achievements will be monitored and reported on when they are fully implemented. (USDA Forest Service 1991–1995).

Issuance of New Grazing Permits

In 1994, as national forest managers anticipated the expiration of some 4,000 grazing permits between 1995 and 1997, a question about the need for NEPA analysis for grazing allotment plans and issuance of grazing permits arose. A growing number of lawsuits involving NEPA and the issuing of grazing permits had been decided in the plaintiffs' favor. The USDA Office of General Counsel (OGC) advised the Forest Service to develop procedures to expeditiously complete NEPA analyses before grazing permits were reissued. Because there was no legal requirement to issue a permit when the existing permit expired — even though the current permittees legally had the first opportunity to receive such a permit — the OGC saw the issuing of a permit as a discretionary act and, therefore, within the purview of NEPA. National forest range managers, on the other hand, believed grazing permits implemented the decisions made in NEPA-based allotment and forest plans. They felt that grazing permits did not require additional NEPA evaluation or documentation. The Forest Service, however, followed OGC's interpretation and streamlined the NEPA process. Existing per-

mits were categorized by range allotment conditions and unacceptable environmental effects from the allotment management plans. Where permit issuance required mitigation measures that reduced livestock or any other allotment management plan adjustments, they would be implemented in the interim until a new NEPA analysis could be completed. However, in the summer of 1995, the Rescissions Act (P.L. 104–19) required national forest managers to issue new grazing permits when existing permits expired or when current permittees sold base holdings and to schedule new NEPA analyses for all grazing allotments. The legislation extended the timeframe for updating grazing allotment NEPA analyses to 2010 (Clark 1996).

Emergence of the "County Supremacy" Movement on Federal Lands

In the early 1990's, grazing interests were a strong and dominant force in the emergence of the current "County Supremacy" or "Home Rule" movement on western national forests and BLM lands. In more recent years, a number of western counties adopted ordinances declaring that the Federal Government has no authority to manage Federal lands. Their contention, under the "Equal Footing Doctrine," was that States, at the time they were admitted to the Union, acquired administrative authority over any Federal lands that remained open and unclaimed (Clark 1996). This movement, however, received a serious setback in 1996 when the U.S. District Court in Las Vegas, Nevada, ruled that ordinances adopted by the Nye County Nevada, County Commission did not apply to Federal lands and that Federal agencies had complete regulatory control over the lands they were charged to administer (U.S. District Court, Las Vegas, NV 1996).

The expansion and persistence of the "County Supremacy" movement has raised questions about how the Forest Service and other Federal agencies can more effectively involve local communities and whether new legal tools are needed to provide local communities with a more effective voice in the management process. National forest managers for the Humboldt and Toiyabe National Forests, the locus of the Nye County suit, have proactively sought formal written agreements with Nevada counties in hopes that such agreements will lead to greater

understanding and better working relationships. (Humboldt-Toiyabe National Forests 1996; Howell 1996).

Mineral Exploration and Development

The Forest Service's role in managing mineral exploration and development continued to be focused on protecting surface resources and ensuring that mineral exploration and mining activities did not have significant adverse environmental impacts. This work was closely coordinated with the BLM and the Geological Survey, who have the administrative and technical responsibilities for subsurface resources under Federal mineral laws. National forest managers annually conducted 25,000 reviews and evaluations for lease applications, prospecting permits, notices of intent, operating plans, actual mining operations, mineral claim validations, geophysical exploration permits, and surface resource use permits for mining of private mineral estates and on reserved outstanding mineral rights on national forest lands purchased under the Weeks Act of 1911. These reviews and evaluations included appropriate environmental

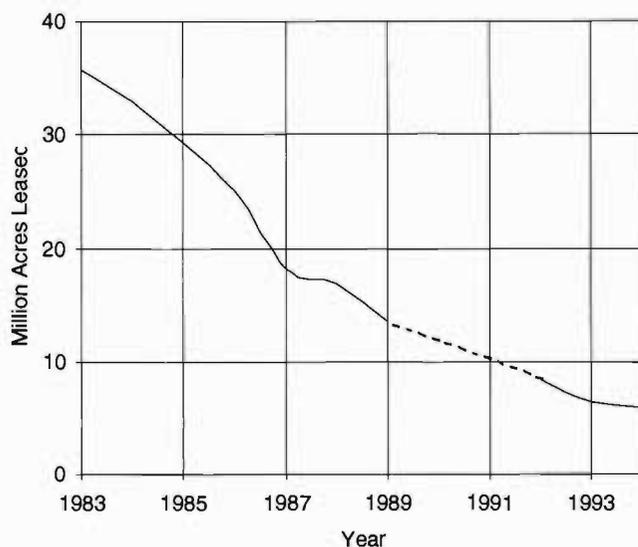
documents where significant environmental impacts were possible.

Oil and Gas Leases

About half of the aforementioned reviews were conducted for oil and gas leases. The number of acres of national forest land leased for oil and gas exploration and potential development rose from 18 million acres in 1977 to a peak of 35 million acres in 1983. Thereafter, as the energy supply situation eased and the 10-year leases expired, the leased acreage dropped to 18 million acres in 1987 and to less than 6 million acres by 1994. The number of leases declined similarly, from 24,600 in 1983 to 8,800 by 1994 (fig. 26) (USDA Forest Service 1981–1995).

The number of oil- and gas-producing leases, however, rose steadily, from 500 in 1980 to 2,014 in 1994. Oil production rose from 8 million barrels in 1977 to a peak of 22 million barrels in 1988, then declined to 12 million barrels by 1994. Gas production was sustained throughout this period at about 210 billion cubic feet per year to 1993. In 1994, gas production increased by more than 50 percent, to 325 billion cubic feet.

(a) Number of acres leased



(b) Number of leases

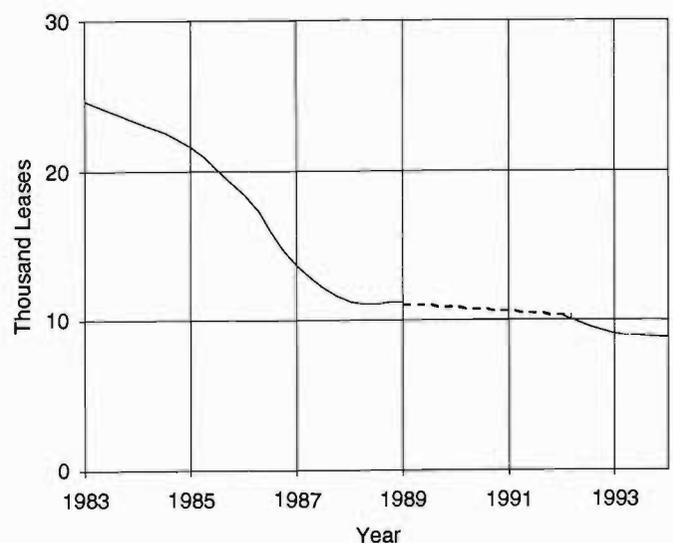


Figure 26. Oil and gas leases on national forests, 1983–1994

Source: USDA Forest Service, Minerals and Geology Management Area tabulation.

In 1987, Congress enacted the Federal Onshore Oil and Gas Leasing Reform Act, which gave the Forest Service authority to regulate and approve all surface-disturbing activities for gas and oil leases and lease operations rather than just making recommendations to the BLM. The Secretary of the Interior's authority to issue oil and gas leases on national forest lands was made contingent on Forest Service determination that such lands were suitable for leasing. This determination required a pre-lease NEPA environmental analysis and followup compliance inspections and enforcement. The new responsibility gave national forest managers the initiative to identify the highest priority tracts and put them on the market rather than respond to industry initiatives to apply for oil and gas leases (Robertson 1988). The Forest Service's implementing regulations for the Act were effective in 1990, but by that time the demand pressure for oil and gas exploration and development on national forest lands had fallen to its lowest level in 20 years.

The new regulations allowed the Forest Service to use staged decisionmaking and environmental analysis at each step of the permitting process — an approach that made it possible to defer environmental analysis of production plans and activities for areas with unknown potential, speculative interest, or no history of drilling or production until the operations stage (USDA Forest Service 1989b).

Coal and Geothermal Leasing

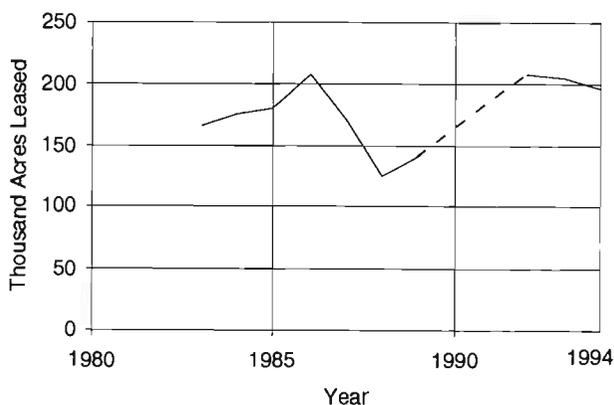
Coal leasing expanded similarly. Leased acres rose from less than 150,000 in the 1970's to 208,000 in 1986 and then declined to 122,000 acres in 1988 as leases expired more rapidly than they were renewed or new leases were issued. Thereafter, the leased acreage rose again and reached almost 197,000 acres in 1994 (fig. 27). In 1994, coal leases on national forest lands were producing 114 million tons, compared to 7 million tons in 1980. One surface coal mine on national forest lands in Wyoming, the largest surface coal mine in the world, was producing 3 percent of all coal mined in the United States (USDA Forest Service 1981–1995).

In 1983, geothermal energy leases occupied more than 700,000 national forest acres. By 1986, the leased acreage had risen to more than 1.2 million. In 1994, however, geothermal leasing was down to 286,000 acres, a result of lower oil prices. The first geothermal power facilities on national forest lands began operation in 1981. By 1994, three geothermal powerplants were operating on national forest lands.

Minerals Leased on Acquired National Forest Lands

Lead and phosphate are leased on acquired national forest land primarily in the Eastern States. In 1993, national forests were producing 95 percent of the

(a) Number of acres leased



(b) Production

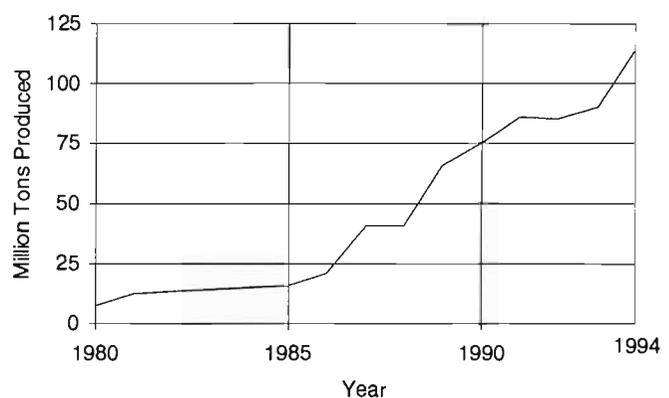


Figure 27. Coal leases and production on national forests, 1980–1994

Source: USDA Forest Service.

Nation's lead output, and phosphate mines were producing a total of 5.5 million tons.

Locatable Minerals

Locatable minerals include gold, silver, copper, zinc, molybdenum, and other minerals. Out of 7,000 active, locatable mineral mine sites, only 1,200 are currently producing.

The passage of the Federal Land Policy and Management Act of 1976 (FLPMA) required owners of unpatented lode and placer mining claims located before 1976 to file a record in the office where the original claim notice was filed, with a copy to the BLM, along with a "notice of intent" to hold and work the claim by 1980. This requirement made it possible, in the early 1980's, for the Forest Service to identify legitimate claims and have BLM null and void claims where location notices had not been filed.

Mineral Materials

Mineral materials include sand, gravel, stone, pumice, cinders, and other fairly commonplace materials used for local construction, road construction and maintenance, and landscaping. National forests managed more than 1,000 pits and quarries and sold these materials to the private sector (public sector use was free). National forest managers took care to ensure that lands disturbed in extracting these materials were properly reclaimed.

Soil, Water, and Air Resources

During the 1980's and early 1990's, the primary role of soil, water, and air resources management was to coordinate the protection of soil productivity, watersheds, waterflows, and air quality with other resource management activities. This role, including inventory, monitoring, and land management planning activities, constituted 88 percent of the total soil, water, and air workload (USDA Forest Service 1994f). The balance was devoted to installing soil and water improvements. Much of the management and coordination input that the soil, water, and air resources staff provided was directly implemented by the

resource management staffs they assisted. The benefits of this coordination came largely in the form of avoiding undesirable or adverse impacts on national forest soils, waters, and airspace. Over the nine decades of national forest management, the absence of major widespread problems with soil productivity, watersheds, waterflows, and water quality on national forests has largely been a reflection and measure of the quality of soil and water resource coordination and management. From the time of Gifford Pinchot, the long-term protection of soil and water resources has been the primary concern of national forest managers.

Coordinating Resource Management With Soil and Water Objectives

More than 50 percent of the total workload of the soil and water program has been providing technical assistance and coordination to timber management, minerals exploration and development, range management, engineering, and other resource activities to protect soil productivity, waterflows, and water quality. Timber sale planning, including roads, has constituted the largest share; mineral exploration and development was the next largest component. Such coordination integrates soil and water objectives into the planning for all other national forest resources and uses and recommends ways to prevent soil loss or damage and water quality impairment from land-disturbing resource management activities. As both timber harvests and mineral exploration and development declined in the 1990's, these efforts were scaled down to less than 30 percent of the soil, water, and air management workload (USDA Forest Service 1981–1995). The dominant workload shifted to inventorying and protecting long-term soil resources and riparian areas; ensuring adequate stream flows for fisheries, recreation, and municipal watersheds; improving watersheds; and protecting wilderness resources from air pollution (Bryant 1996).

In 1988, while States were developing regulations to control nonpoint pollution under section 319 of the Clean Water Act, the Forest Service approved a strategy to minimize nonpoint sources from national forest land and resource management activities. This strategy provided for the design and application of

"best management practices" (BMP), monitoring to ensure the practices were in place and effective, and applying mitigation measures where unacceptable impacts had occurred or could occur. National forest managers developed cooperative agreements with State agencies that spelled out the roles and responsibilities of each in preventing nonpoint pollution sources. The national forest regions developed handbooks for minimizing nonpoint pollution. The guidelines in these handbooks were incorporated by reference into national forest land and resource management plans (USDA Forest Service 1989c; Bryant 1996).



Volunteers in a community replanting project on the Wasatch Forest in the area of an arson-caused fire, Uinta National Forest, Utah.

Followup monitoring was exemplified by the water monitoring stations on Arkansas's Ouachita National Forest below 21 timber stands, where resource managers found unacceptable herbicide contamination. As a result, application methods and herbicide mixing locations were modified to maintain water quality. On Alaska's Chugach National Forest, monitoring of placer mining's effects on anadromous fish streams led to the installation of additional sediment-collection ponds to meet State water quality standards.

Soil and Water Inventories

Between 1950 and 1993, soil surveys were completed for almost 70 percent of national forest lands. They included the determination of soil suitability, productivity, and reforestation potentials; erosion and soil stability problem areas; soil and vegetation effects on water yields and water quality; and baseline information to monitor changes caused by management activities. Soil inventory work and analysis produced maps and interpretations that resource

managers increasingly used to make more informed decisions on sensitive land management activities such as planning timber sales, locating potential recreation sites, determining where and how to use prescribed fire, identifying the sites and routes most suitable for road construction, estimating soil productivity for range forage, and many others. During the latter 1980's, many national forests began to monitor timber management effects on soil productivity. In 1991, for example, Oregon's Malheur National Forest monitored soil quality to determine the effects of timber management on soil compaction. The results indicated that the regional soil compaction standards were being exceeded and potentially were impacting soil productivity on many acres. National forest managers adopted best management practices to avoid or mitigate such excessive compaction (USDA Forest Service 1981-1995). In 1989 and 1990, Louisiana's Kisatchie National Forest monitored soil erosion following site preparation with a roller drum chopper and slash burning on

selected reforestation areas. The initial results showed that erosion was within the tolerable loss limits defined in the forest plan.

Long-Term Soil Productivity Study Initiated

In 1990, the National Forest System and Forest Service Research established a nationwide cooperative study to identify and quantify the kinds of changes different soils could sustain without losing long-term productivity and to set soil compaction and organic matter content threshold standards on benchmarks for designing forest practices, monitoring soil condition trends, and assessing the effectiveness of soil and water conservation. The project sought to better understand the basic relationships between soil properties and the long-term productivity of the Nation's major forest ecosystems. In 1991 and 1992, the Forest Service installed study plots in Louisiana, North Carolina, Minnesota, Michigan, California, and Idaho. Universities, other agencies, Canada, and New Zealand expressed interest in cooperating in this study as it was being put in place (USDA Forest Service 1991–1993). In 1995, information was being compiled on early findings and the current status of this widespread study effort.

Shift Toward an Ecological Approach and Emphasis

Some national forests began to introduce an ecological approach to soil inventories in the late 1980's and early 1990's. In 1990, Michigan's Huron-Manistee National Forest applied the Integrated Ecological Classification System to 80,000 acres to improve resource capability determinations and to increase its knowledge of the linkages between ecological processes and land management. This ecological approach added vegetation and sometimes hydrologic information to the soils data, making interpretations of ecological processes easier and more reliable. Other regions and forests introduced similar approaches. In 1991 and 1992, Idaho's Targhee National Forest and Wyoming's Bridger-Teton National Forest classified vegetative types and designed ecosystem unit maps that could be linked with the soil inventories (USDA Forest Service 1991–1993).

In 1992, Forest Service researchers working with national forest managers developed a draft National Hierarchical Framework for Ecological Units to

address an ecosystem approach to national forest resource management. They also developed a national ecological database to manage information from expanding ecological inventories. The National Hierarchical Framework of Ecological Units was completed in 1993 and the Chief's Office directed national forest managers to use it in developing an ecological approach to future land and resource planning (Unger 1993).

"Ecological units" are terrestrial mapping units determined by macroclimate, geomorphology, geology, soils, and potential natural vegetation and reflect predictable and uniform capabilities and responses to management. The National Hierarchical Framework — built on earlier work by Robert G. Bailey, "Ecoregions of the United States," compiled in 1976, and by W.A. Wertz and U.F. Arnold, "Land Systems Inventory," completed in 1972 — is a way of mapping and using ecological units at several different scales. In 1995, the ecological mapping effort added a hierarchical framework of aquatic ecological units to identify and differentiate aquatic ecosystem components (Bryant 1996).

Water Resource Surveys

National forests conducted watershed condition surveys on more than 35 million acres to assess water quality conditions, predict the timing and amount of runoff, and prevent floods. This information was used to identify and prioritize opportunities to improve the management of activities that could adversely impact water quality.

In 1988, national forests classified and assessed the condition of 17,600 miles of stream channels. In the same year, the Northern and Intermountain Regions, in cooperation with the State of Idaho's effort to quantify water uses, inventoried 30 percent of the water uses and improvement needs on Idaho's Snake River. These inventories identified fish, recreation, wildlife, timber, watershed, and range improvement needs and provided a quantitative basis for national forest water rights claims for streamflows in the Snake River Basin (USDA Forest Service 1989c).

In 1993, the Forest Service opened the Stream System Technology Center at Fort Collins, Colorado, to improve the basic knowledge of mountain stream

systems and processes and to develop operational tools, provide training, and give land managers technical support as they worked to secure "favorable conditions of waterflow" and maintain stream-flow conditions provided in the 1897 Organic Act.

Soil and Water Monitoring

Monitoring determined whether resource management prescriptions were being properly designed and fulfilling soil, water, and air resource objectives and covered a wide range of practices throughout the National Forest System. In 1986, for example, monitoring timber sale operations on the Goat Creek Drainage on Washington State's Gifford Pinchot National Forest confirmed that BMP's such as removing floating logging residues, suspending logs over stream channels, and leaving all embedded logs in the channels were effective in preventing unacceptable stream turbidity increases (USDA Forest Service 1987b). Monitoring determined that ripping compacted soils and seeding to grass was effective in restoring more permeable soil conditions on California's Los Padres National Forest (USDA Forest Service 1987b). In 1987, water quality monitoring at 200 Pacific Northwest Region sites established that timber harvesting BMP's were effectively meeting State water quality standards (USDA Forest Service 1988b). Sample monitoring on eight California national forests demonstrated that properly applied BMP's on ski slopes, offroad vehicle trails, timber harvest areas, and roads were at least 95 percent effective in preventing nonpoint source pollution (USDA Forest Service 1988b). These examples illustrate that in soil and water monitoring is becoming a tool to ensure that environmental quality standards are met in managing multiple uses and that they are effective in maintaining or restoring ecosystems over time.

Riparian and Wetlands Management

Riparian and wetland areas make up about 5 percent of the national forest land base. Over half of this area is in Alaska. Most of the balance is located on the eastern and southern national forests. In the extensively arid low-rainfall areas of the Western States, this percentage is closer to 2 percent. In the Southern Region, it is 8 percent; in the Eastern Region, it is 7 percent.

During the 1980's, national forest managers gave increasing attention to improving management and protection of riparian areas and wetlands. The public increasingly saw these areas as key to productive fisheries and wildlife habitat, diverse scenery and recreation sites, flood reduction, quality water for downstream users, and continued groundwater recharge. Forest plans introduced standards and guidelines to maintain and improve them. Regions and forests developed forest plan implementation approaches that stressed riparian values. The Intermountain Region prepared a 1988–1992 riparian action program defining its goals and objectives for improving riparian area management. By 1990, all regions had begun to implement riparian area strategies on areas and sites with unsatisfactory conditions to achieve forest plan standards. In the same year, an analysis of 359,000 riparian area miles in the six contiguous western national forest regions found that only 57 percent met current forest plan goals. The balance were classed as moving toward or failing to meet the goals (Bryant 1996).

A 1991 national strategy for improving riparian areas called for an integrated approach in applying forest plan standards to riparian areas and wetlands. It set national, regional, and forest on-the-ground riparian goals, including the completion of an inventory of the ecological health of riparian areas by 1995. This inventory had not been completed as this book was published.

The Quinn River riparian rehabilitation demonstration project on Nevada's Humboldt National Forest was initiated with the cooperation of the EPA and the Nevada Department of Environmental Protection. National forest managers installed in-stream structures, stabilized streambanks, planted willows, and fenced off a riparian pasture to improve riparian conditions. They also monitored a channel cross-section for water chemistry, temperature, and macro-invertebrates to assess the area's future responses to the management (USDA Forest Service 1991–1995).

Water Rights

In response to the 1978 Supreme Court ruling in *New Mexico v. United States* (the Rio Mimbres case) and the growing realization of the importance of

both consumptive and in-stream flow-water uses on national forest lands, the Forest Service in the 1980's began to file claims for beneficial water uses in various Western States. Policy and case law had previously encouraged regional foresters to simply notify States of their Federal reserved water rights and uses without quantifying them. With increasing competition for water and shifts in the relationship between the Federal Government and States over water management, the Forest Service had to quantify its water-rights claims in all adjudications and defend them against legal attacks by other water users and the States themselves. In 1992 and 1993, for example, the Forest Service was involved in water-rights adjudications in Idaho, Montana, Nevada, Oregon, Colorado, and several other Western States (USDA Forest Service 1981–1995; Glasser 1996).

Soil and Water Resource Improvements

National forest soil and water improvements are usually applied to situations where resources have been impaired or are seriously threatened. The first priorities are to maintain and restore degraded or threatened water quality and to maintain or restore damaged or threatened soil productivity. Improvements are funded with appropriated funds and Knutson-Vandenberg Act funds (also known as KV funds) from timber harvest receipts. KV funds are applied to correct and improve watershed conditions only on timber sale areas. These improvements increase water's infiltration into the soil and reduce overland waterflow, which can potentially erode the soil, reduce productivity, and increase stream sedimentation. KV-funded range, wildlife, and fish habitat improvements such as livestock fencing, fish pools, and reseeding vegetation are also designed to improve watershed conditions.

The Forest Service has also cooperated with States, using funds authorized by the Surface Mining Control and Reclamation Act to make improvements to abandoned coal mine sites. The work on many of these projects has been done by human-resource programs and volunteers. There are still more than 25,000 abandoned mines on national forest lands, but only about 10 percent involve hazardous situations. Some still need treatment to meet the Clean Water Act standards (Bryant 1996).

In 1980, 38,000 acres of soil and water resource improvements were installed. This level dropped to about 11,000 acres per year by 1986 as the staffing and funding for such improvements was heavily retrenched. Inventory and resource coordination staffing, however, was maintained and integrated with other resource activities to meet soil, water, and air resource objectives. With the restoration of soil and water staffing and funding in the early 1990's, soil and water improvements were again being installed on 35,000 to 40,000 acres per year (USDA Forest Service 1981–1995).

Emergency rehabilitation following wildfires and floods has also made important contributions to restoring and maintaining water quality and soil productivity. Depending upon weather conditions, such damage varies widely from year to year. During the severe drought conditions in the latter 1980's and early 1990's, emergency rehabilitation exceeded 100,000 acres per year for 6 years. In more normal years, such measures would range from a few hundred to 50,000 acres. Flood damage on national forest lands ordinarily is less extensive than wildfire damage. The most intensive emergency flood rehabilitation work was in 1985, when unusual weather patterns caused major floods and severe damage to national forest watersheds, stream channels, transportation systems, and recreation and administrative facilities in Arizona, California, New Mexico, and Utah, involving about 25,000 acres of restoration work (USDA Forest Service 1981–1995).

Air Quality Management

In 1977, the Clean Water Act gave national forest managers special air quality protection responsibilities at 88 congressionally designated class I areas in national forest wilderness (areas that were wilderness in 1977 and larger than 50,000 acres). All regions developed screening processes to determine which air quality values should be protected and monitored and how to evaluate the potential air quality impacts from atmospheric emissions originating from national forest activities and from nonpoint sources. Using automatic cameras, they assessed effects on visibility and terrestrial and aquatic habitats in class I airsheds. National forest managers notified State officials when monitoring

showed adverse effects of air pollution on visibility or water quality or foliar damage from ozone in any of the class I airsheds. States had the lead in determining mitigation measures and further study needs to remedy such situations. Some class I airsheds already had existing adverse effects from air pollution. These were documented. National forest managers and States cooperated to develop State implementation plans (SIP's) to meet air quality guidelines and protect resources and environmental quality in these cases.

The emergence of prescribed fire as a major resource and ecosystem management tool raised the paradox of actually producing some air pollution (smoke from prescribed fires) while working to improve the health, productivity, and resilience of certain national forest resources and ecosystems. The National Forest System and many external interests have accepted this apparent contradiction between preserving air quality and the need to create limited air pollution. But there are outstanding issues, particularly in heavily populated areas with air quality problems from other sources, where the citizens feel that national forest smoke management is not sufficient to satisfy local air quality goals. Often, however, communities are ready to accept the smoke from prescribed fires as a favorable or even tradeoff with smoke from wildfires.

Each year, national forest managers review with States some 40 to 80 applications, received from major oil, gas, and other commercial developments on or near national forests, for new facility emissions source permits for prevention of significant deterioration of air quality (USDA Forest Service 1981–1995). In such cases, national forest managers, working together with the EPA, States, and the involved industries, affirm that air quality values on national forest lands are protected. These determinations often lead to improved control measures for proposed facilities to mitigate or prevent any further degradation.

More Forest Service specialists monitored air quality and visibility at selected sites across the Nation — increasing from 32 in the early 1980's to more than 55 in 1993. In cooperation with States, the EPA, and the National Park Service, they also operated nine IMPROVE (interagency monitoring of protected

visual environments) network sites and developed lichen monitoring and ozone leaf damage protocols that most regions are implementing (USDA Forest Service 1981–1995).

In 1988, national forest and EPA specialists sampled airborne chemical pollution in 888 acid-sensitive lakes where air pollutants had significantly degraded the lake's buffering capacity for such pollutants. This monitoring continues at the most sensitive sites. National forest specialists also collected acid rain data as a part of the national acid deposition program and network (Bryant 1996).

In 1994, the Forest Service developed the National Strategic Plan for Air Resource Management to ensure that air resources were considered in the ecosystem approach to resource management. The strategy provided for stronger coordination and continuity in air quality management efforts across the National Forest System and directed resource managers to become more proactive and less reactive in carrying out their role. The strategy gave forest managers a consistent approach for addressing interregional air issues affecting the management of national forest ecosystems and gave the regions a framework for their local strategic plans. Its five guiding principles included integrating air resource management with other disciplines, basing recommended actions on science, forming partnerships to achieve resource management goals and sharing them with other Federal agencies, striving for excellence, and obeying the law (USDA Forest Service 1994g).

Weather Monitoring Program

A national weather monitoring program was established in 1986 to incorporate meteorological expertise and weather and climate information into overall management of multiple uses and to help improve the existing fire danger rating system. To improve accuracy and reliability, this program improved the siting, coordination, and maintenance of about 300 remote automatic weather stations. By 1988, the Forest Service had completed a comprehensive Service-wide weather information communication needs assessment and selected specifications for a new Weather Information Management System (WIMS) to gather, process, distribute, and store

weather data and information. The new WIMS was developed and tested during the next 5 years and became operational in 1993 at the National Information Technology Center in Kansas City. WIMS is linked with the National Weather Service telecommunications network that supplies integrated weather data and climate information for resource management and fire management (USDA Forest Service 1981–1995). Nationwide, the Forest Service operates more than 500 remote automatic weather stations.

Outdoor Recreation Use and Management

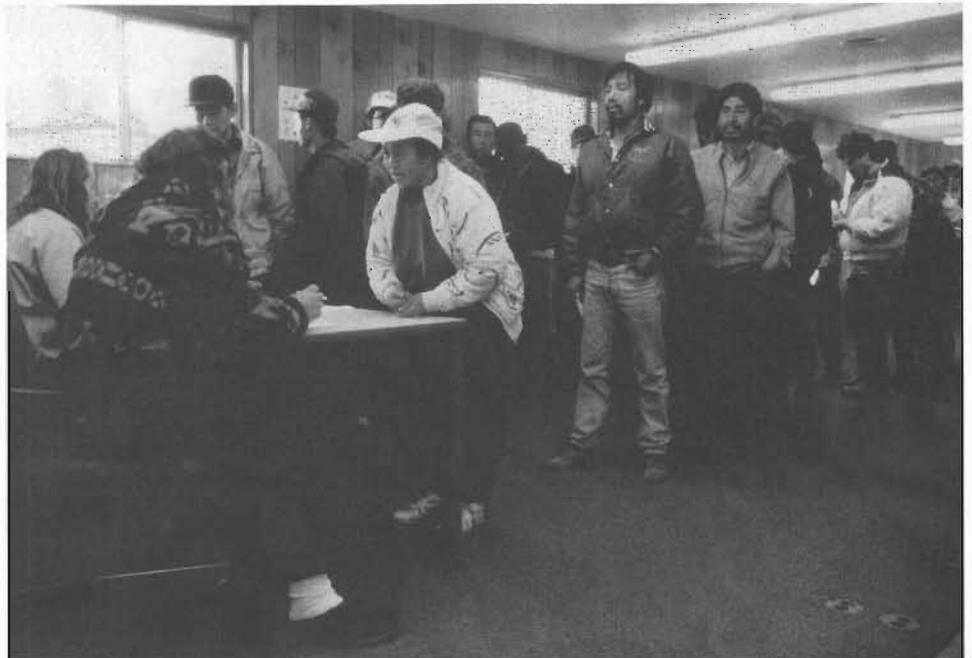
During the 1980's and 1990's, national forests offered the most extensive and diversified outdoor recreation opportunities, activities, and experiences within the United States for the American people. The spectrum of outdoor recreation activities ranged from pristine wilderness challenges to urban team sports; from organized group activities to individual hunting and fishing trips; from guided auto tours through scenic corridors with distinctive aesthetic, cultural, and historical sites to whitewater rafting; from skiing high mountain slopes to hiking more than 100,000 miles of trails; from birdwatching to volunteers exploring and developing archeological projects; and from swimming and boating to hang gliding. These opportunities were located in all parts of the country, but were concentrated in the West, where more than 80 percent of the national forests are located and more than 80 percent of the RVD's occur.

Recreation Use of National Forests

Outdoor recreation use on national forests reached a peak of 236 million RVD's in 1981 (see fig. 8, chapter 3), then declined to 225 million RVD's in 1985 before

beginning to rise again. Some of the decline can be attributed to changes in RVD counting, but major shifts in recreation use patterns also contributed. Repeat visits to national forests rose from 60 percent to 77 percent of the total visits. The number of visits of shorter duration, less than 4 hours, increased from 14 percent to 48 percent. Visits longer than a day dropped from 70 percent to 21 percent. The percentage of all trips involving 2 hours or less of travel time increased from 43 to 72 percent, while trips with more than 8 hours of travel time decreased from 23 percent to 6 percent.

These patterns were common to all Federal lands, including the national parks, although visitor use declines on some Federal recreation lands began earlier and ended earlier than those on national forests (Cordell et al. 1990). The cause of this shift and the temporary decline in RVD's appears to be associated with a decline in leisure time that began in 1976 and continued into the 1980's. It was attributed to an increase in urbanization and two-worker households. People began to take shorter vacations at places closer to home (Domestic Policy Council 1988).



Forest staff issuing special use permit for gathering wild matsutake mushrooms growing on the Chemult Ranger District, Winema National Forest, Oregon.

Between 1980 and 1986, dispersed recreation use, including hiking, snowmobiling, skiing, hunting, fishing, driving for pleasure, and wilderness experiences, were 64 percent of the total national RVD use. The other 36 percent occurred at developed sites: campgrounds, picnic areas, boat landings, ski slopes, private resorts, recreation residences, concession sites, swimming beaches, observation sites, and visitor centers. Private facilities such as lodges, resorts, and recreation residences provided 43 percent of the developed site use, while national forest facilities provided 57 percent.

Even with the visitor use decline in the early 1980's, servicing and maintaining developed national forest sites became a major management challenge as recreation management funding was reduced by 18 percent between 1980 and 1986. This funding was not fully restored until 1990 (USDA Forest Service 1994f). Recreation management staffing had declined by 24 percent by 1986, and likewise was not restored until 1990. As a result, the visitor capacity of forest-operated facilities that remained open to public use declined by 22 percent between 1980 and 1986. In addition, the capacity of open facilities with full services decreased from 65 percent in 1980 to 29 percent in 1985. (USDA Forest Service 1981–1995).

Between 1980 and 1986, funding for recreation site construction was reduced by a third, with most of the available funds being used to upgrade health and safety (drinking water and sanitation) at developed sites. These management efforts increased visitor use and comfort, although the quality of the visitor's experience may have been reduced with more people using the available facilities. For example, in the early 1980's, visitor use at developed sites



Forest Service employees discussing national forest universal accessibility with local community user interests, 1990.

declined by only 4 percent while the capacity of forest-operated facilities declined by 22 percent. However, this decrease was partially offset as volunteers and human-resource programs provided maintenance and services for 10 to 15 percent of the total capacity in addition to the services of the national forest programs (USDA Forest Service 1981–1995).

RVD use began to rise again in 1987, to 238 million, and continued to grow, to 296 million visitor days in 1993 — an average annual rate of 3.9 percent compared with a 1.2-percent population growth rate for the same period. After 1986, funding for recreation management grew by 7.9 percent per year and staffing by 8.1 percent per year. The annual developed site capacity grew by 3.4 percent per year. Annual developed site use rose to 116 million RVD's and constituted more than 39 percent of the total RVD use. The Forest Service attributes much of this sudden reversal in RVD trends to the development and implementation of the new national recreation strategy in 1988 — to improve the effective use of national forest recreation opportunities.



Fishing dock on Bellaire Lake, Arapaho-Roosevelt National Forest, Colorado, provides safer access for wheelchair users.

National Recreation Strategy

The National Recreation Strategy emerged as a national initiative in response to the priorities set in completed national forest land and resource management plans. The primary objective was to improve the quality of the user experience through better services and more effective maintenance of recreation sites and facilities. The ultimate goal was greater user satisfaction. A secondary objective was to expand partnerships with other recreational agencies and private enterprises — using incentive grants to encourage their participative funding of national forest recreation opportunities and services. The strategy's third dimension was to improve the American public's awareness, understanding, and appreciation of the management of multiple uses and use opportunities on the national forests (USDA Forest Service 1987–1995).

Implementation plans focused on expanding recreation use and improving user satisfaction in "urban" national forests. A national campground reservation

system became operational and served 367 campsites in 1989. In 1990, it was serving almost 600. By 1990, many national forests were installing "sweet-smelling toilets" in response to visitors' number-one complaint. The Forest Service was also developing local national forest visitor maps to meet user information needs.

Universal Access to Recreation Opportunities

In 1987, the Forest Service adopted "universal design principles" to ensure access to all recreation users, especially children, the elderly, and people with sensory, cognitive, or mobility disabilities. In the following years, national forests conducted accessibility surveys and more

than 100 training workshops on access surveys, awareness of people's needs, and "universal design." The Forest Service developed partnerships for access with more than 90 community organizations to complete more than 600 accessibility projects across the Nation. The Forest Service developed and published *Universal Access to Outdoor Recreation: A Design Guide* as a tool for guiding outdoor recreation access planning and design in a partnership with Project Play and Learning in Adaptable Environments, Inc. A new chapter was added in 1993 to help designers and planners apply the design guide's technical specifications to existing and new recreation sites. The Forest Service developed a partnership with Wilderness Inquiry and American Outdoors to produce a manual that would help outfitters and guides apply universal design principles in their programs and services (USDA Forest Service 1987–1995).

Scenic Byways and Tourism on National Forests

In 1988, the Forest Service designated its first scenic byway — a national forest travel route that traverses

scenic corridors of outstanding aesthetic, cultural, and historical interest — on Tennessee's Cherokee National Forest. This initiative responded to the largest recreational use among national forest visitors: driving for pleasure and viewing scenery, which represented 32 percent of the total RVD use. Ten scenic byways were designated in 1988. By 1990 there were 75, and they totaled 3,800 miles of scenic roadway and a ferry system (the Alaska Marine Highway) spread across 31 States from Alaska to Florida and from New Hampshire to California. By 1993 there were 120 national forest

scenic byways covering more than 6,900 miles in 34 States. Visitors driving for pleasure and viewing scenery increased by 31 percent from 1987 to 1993, while total visitor use of national forests increased by only 24 percent (USDA Forest Service 1987–1995).

In a parallel initiative, national forest managers developed tourism partnerships with local, regional, and State organizations to help diversify and strengthen the economies of rural communities. The tourism initiative focused on the role national forests could play as special attractions, scenic backdrops to many rural communities, and suppliers of campgrounds, trails, resorts, ski areas, and scenic vistas. In 1992, the Forest Service sponsored an interagency conference on tourism. The Forest Service, Department of the Interior agencies, the Army Corps of Engineers, and the Travel and Tourism Administration endorsed a memorandum of understanding to work together to promote tourism.

Urban National Forests

Urban national forests, those with a million or more people living within about a 1-hour drive, were given special recognition and separately classified in 1987. By 1995, the National Forest System had



Scenic opening on the Sandia Crest Scenic Byway, Cibola National Forest, New Mexico.

13 recognized urban national forests. All except the two most recently designated, the White Mountain National Forest in New Hampshire and the Chattahoochee-Oconee National Forest in Georgia, were in the West. One out of every seven Americans is within a 2-hour drive of these urban forests. Populations within a 2-hour drive of these forests ranged from 2 million at the Mt. Hood National Forest near Portland, Oregon, to 15 million at the Angeles and Los Padres National Forests in southern California.

Because of their complex relationships with adjacent governments, interest groups, and large, diverse populations, these forests are unique. RVD use at these forests exceeded 73 million in 1993 and concentrated one quarter of the total national forest RVD use on just about 10 percent of its land base. The urban national forests provide dramatic mountainscapes and scenic backdrops for Los Angeles, Seattle, Portland, and Salt Lake City, where they become an integral part of those cities' images as desirable places to live.

Frequently, recreation use on many urban national forests has the appearance of a "city park." Yet often, these heavily used areas are not providing the level

of services metropolitan people desire. Some sites are now showing severe heavy-use impacts. Riparian areas have been historically popular with metropolitan visitors, but their use has been compromised in many places. The traditional rural setting and orientation of national forest management has not always served urban forests effectively. Finding a balance between serving large metropolitan populations, meeting preferences of rural interests, and protecting the resources and environment on these forests presents a difficult challenge. Planning management that will effectively meet such demands is an important step in protecting national forest resources and their environment and ensuring their sustainable management and use by future generations (USDA Forest Service, Urban National Forest Supervisors 1994).

Interpretive Services

During the 1980's and early 1990's, interpretive services matured into a broad national educational effort to better acquaint Americans with national forests and the extraordinary opportunities to learn about the outdoors and enjoy the wide diversity of recreation, aesthetic, and educational experiences it provides. National forest interpreters guide visitors on field visits and trips that introduce them to the natural and cultural wonders of the national forests and grasslands and how they are managed. Their interpretive services cover a wide variety of partnerships. In northern Minnesota, several small lake resorts and local foundations work with the Superior National Forest to place forest interpreters at resorts to lead hikes, tour local sawmills, and provide educational programs. Their customers have responded

by staying longer and repeating visits. The State of Alaska formed a partnership to provide forest interpreters on board the State ferry fleet (the Alaska Marine Highway), which travels between Bellingham, Washington, and Skagway, Alaska, through the scenic Inside Passage. Interpreters provide talks, films, children's programs, and narration about the Inside Passage's historical, cultural, and natural resources. Dude ranches near Jackson, Wyoming, fund interpreters from the Bridger-Teton National Forest to provide evening programs and interpretive trail rides sponsored by the ranches. In Oregon and Washington, Mobility International USA, Telephone Pioneers of America, the Easter Seal Society of Oregon, and local civic groups work with the Pacific Northwest national forests to build interpretive trails and fishing platforms and to erect interpretive signs for people with disabilities. Although some interpretive services are administered by national forest staff, many are heavily dependent upon volunteers, partnerships, and many nonprofit interpretive associations.



Forest Service interpreter assists visitors at overlook site, Mt. Baker-Snoqualmie National Forest, Washington, 1992.

Nonprofit interpretive associations have been established as public service organizations to further the interpretation and understanding of natural resources and their management on national forests. These associations provide visitor center staffs, sell maps and books at visitor centers and national forest offices, prepare brochures and a wide range of other publications, and purchase new equipment for interpretive programs. There were 44 nonprofit interpretive associations in 1988 and 57 in 1995. National forests use the net revenues of these associations, mainly from sales of maps and books, for recreation improvements. Such contributions rose from \$170,000 in 1985 to more than \$2 million by the early 1990's (USDA Forest Service 1981–1995).

“Challenge Cost-Share” Program Expands Recreation Partnerships

In 1988, as an initial part of the National Recreation Strategy, the Forest Service launched the \$500,000 pilot “Challenge Cost-Share” program to encourage partnerships with private and other public interests on recreation improvement projects. The response to Challenge Cost-Share was spontaneous and strong as partnerships emerged with local, county, State, and national agencies, plus private interest groups, senior citizens, people with disabilities, veterans, correctional facility inmates, students, utility companies, recreation industries, timber operations, interpretive associations, and private businesses. The partners provided more than \$900,000 for recreation improvements, nearly \$2 for each Federal dollar (USDA Forest Service 1987–1995). They provided natural resources education, improved campground access for visitors with disabilities, developed interpretive sites, investigated archeological sites, and prepared and funded many publications.

In 1989, the Federal portion of Challenge Cost-Share increased to \$3 million, and partners responded with more than \$7 million. This approach has continued to grow; in 1993, the partners contributed \$34.2 million and the Federal Government \$16.6 million. The total partnership contribution since 1988 has been \$90 million, and the Federal share has been \$45 million.

Volunteer Services Contribute to Recreation Program

In addition to the partnerships in the early 1990's, volunteers and participants in the “Touch America Project” — a volunteer program that gives youth between 14 and 17 job experience and environmental awareness through work on public lands — were contributing work valued at about \$25 million per year to recreation-related projects. This contribution was almost two-thirds of the total work contributed by all Forest Service volunteer programs (USDA Forest Service 1992b). Thus, while volunteers were an important component of the National Recreation Strategy's implementation, they contributed in their own way to educating the American public about national forest and grassland services and benefits.



Regional Forester Elizabeth Estill (at right), Rocky Mountain Region, Denver, Colorado, consulting with Human Resources Staff, 1996.

Heritage Management

During the 1980's and early 1990's, heritage management (formerly cultural resources management) evolved into a progressive recreation initiative to make cultural, historical, and archeological artifacts accessible for visitor education and enjoyment. Earlier efforts had focused largely on surveys and inventories to preserve and protect these artifacts where land-disturbing management activities might have damaged or destroyed them. Heritage management staffing steadily increased from 159 FTE's in 1980 to 410 FTE's in 1994 (USDA Forest Service 1994f). Funding increased even more rapidly, from \$7.6 million to \$28.3 million.

Between 1980 and 1994, heritage programs staff surveyed 40 million acres for archeological, historical, and cultural artifacts. Tens of thousands of such artifacts were identified, and hundreds were listed in the National Register of Historic Places. In 1989, a new initiative, "Windows of the Past," was introduced as a part of the National Recreation Strategy to convert the preservation of cultural artifacts into recreation opportunities for visitors. Its objectives were to increase visitor awareness of archeological, historic, and cultural resources; to strengthen the public's interest in protecting those resources; and to develop partnerships and recruit volunteers to get the job done. "Windows of the Past" contributed thousands of person-hours of work to heritage projects. Historic cabins, lighthouses, bridges, and archeological sites were stabilized and protected, making hundreds of new recreational and educational opportunities available and providing interpretive services to improve visitor experiences.

In 1991, the "Passport in Time" initiative offered national forest visitors an opportunity to work with professional archeologists and historians on excavation and restoration projects, oral history collections, and surveys. In that year, 600 volunteers contributed 21,000 hours on 49 projects nationwide. By 1993, national forests had 1,300 volunteers working on 92 projects. Because volunteer interest was so strong, a second season of archeological and historical excavation and restoration offered 15 to 20 winter projects. In 1994, the Passport in Time recruitment brochure for the summer-fall season invited volunteers to assist with 86 projects on 62 national forests

(Schamel 1994). During 1994, some 1,200 volunteers contributed more than 57,000 hours to 120 Passport in Time projects on 68 national forests (USDA Forest Service 1995d).

Trails

In 1980, there were more than 101,000 trail miles on national forests, including 301 national recreation trails totaling more than 3,500 miles and parts of eight national scenic or historic trails. National forests administered two of the latter: the Pacific Crest and the Continental Divide National Scenic Trails (USDA Forest Service 1981b). By 1987, national forests included parts of 17 national scenic or historic trails and administered four of them. The



Volunteers assist at a Passport in Time project site in Strawberry Valley, Uinta National Forest, Utah.

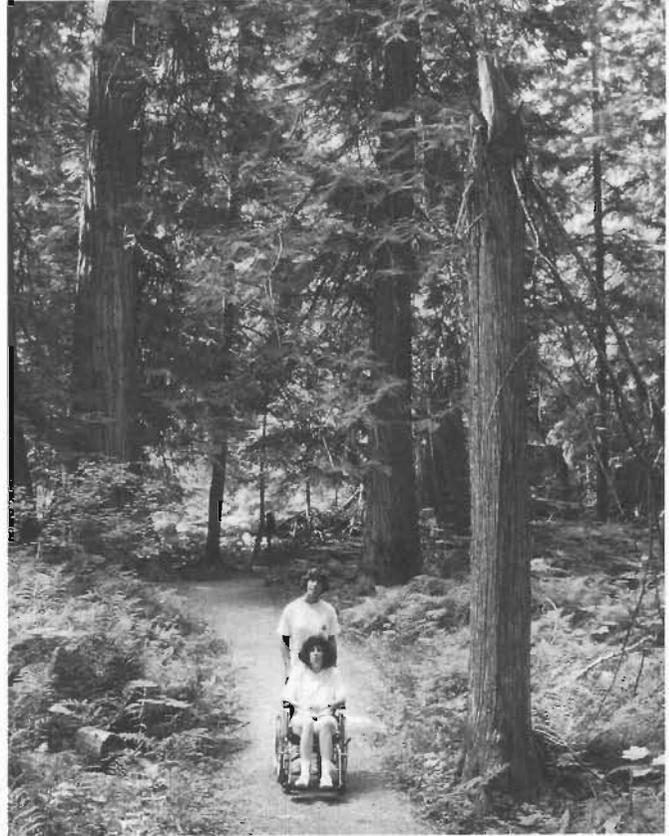
additional trails were the Nez Perce National Historic Trail (1,170 miles), designated in 1983, and the Florida National Scenic Trail, (1,300 miles), designated in 1986 (USDA Forest Service 1981–1987).

During the period of retrenched outdoor recreation funding, actual useable trail mileage declined to less than 100,000 miles, even though the total miles of trail built and rebuilt exceeded 6,000 miles. The decline was due to reduced maintenance support and a 36-percent reduction in trail construction and reconstruction funding. During this period, trails that could not be maintained to acceptable standards were simply closed. Human resource programs and volunteers built or rebuilt fully a third of the total trail miles (USDA Forest Service 1981–1987). As the new National Recreation Strategy was implemented, trail construction and reconstruction funding increased each year, and by 1994 was four times its average early-1980's level (USDA Forest Service 1994f). Trail maintenance was likewise improved. Many closed trails were reopened. By 1994, the total available trail miles had risen to more than 121,000 miles (USDA Forest Service 1987–1995).

National forest trails were used by cross-country skiers, hikers, horseback riders, offroad vehicle riders (including motorcyclists and snowmobilers), bicyclists, and recreationists with disabilities. RVD use of trails rose from about 21 million per year in the early 1980's to 30 million in 1993 — from less than 9 percent to more than 10 percent of total RVD's. Trail rehabilitation, together with the creation of loop trails to access vistas and historical sites, and joining forest trails with urban park trails were among the trail construction priorities (USDA Forest Service 1981–1995).

Tread Lightly

The Forest Service and the BLM developed the "Tread Lightly" initiative to educate motorized equipment users about proper trail and primitive road use and care. It received strong support from organized offroad vehicle (ORV) users, vehicle manufacturers, and other public land management agencies. In 1990, the Forest Service, the BLM, ORV use organizations, vehicle manufacturers, conservation groups, and ORV users successfully founded a nonprofit, privately funded educational corporation,



Visitors enjoy giant Ross Crest Cedars on the Kootenai National Forest in Montana, 1992.

Tread Lightly, Inc., that promotes environmentally sound ORV use on public and private lands. It also produces and distributes outdoor conservation ethic brochures to ORV users (USDA Forest Service 1987–1995).

Leave No Trace

In 1992, the Forest Service joined the BLM, the National Park Service, the Bureau of Reclamation, and the Fish and Wildlife Service in the "Take Pride in America" campaign to expand the scope of the "Leave No Trace" program — a Forest Service-initiated user ethics program directed primarily to backcountry users. These agencies developed a memorandum of understanding with the National Outdoor Leadership School to explain the "Leave No Trace" ethic to Forest Service employees and public-land visitors engaged in nonmotorized recreation activities. It emphasizes responsible wildland use among urban populations and encourages train-

ing and research on proper practices to minimize wildland use impacts. This led to the establishment of a nonprofit, privately funded education corporation, Leave No Trace, Inc., in 1995.

Wild, Scenic, and Recreational Rivers

At the beginning of 1980, there were 23 designated river segments in the National Wild and Scenic River System, totaling almost 2,300 miles. By 1993, the National Wild and Scenic River System had grown to 153 rivers or river segments, totaling 10,410 miles. National forests managed 96 of these rivers or river segments, totaling 4,316 miles, or more than 41 percent of the National Wild and Scenic River System mileage. Thirty-two percent of this mileage was on wild rivers — about a quarter of all wild river segments in the national system (USDA Forest Service 1994e). National forests managed 27 percent of all scenic rivers. The balance of national forest-managed wild and scenic river segments are called recreational rivers. (National Park Service 1994).

The National Forest System's goal in managing wild and scenic rivers is to enhance the qualities that led to their designation and avoid any degradation. This goal permits recreation activities, a variety of agricultural practices, and residential development on non-Federal lands within designated river corridors. It informs users about the care of designated river segments and alerts them to respect other property owners' rights. A permit system is used to keep the use of the most popular wild, scenic, and recreational river segments within their carrying capacities (U.S. Geological Survey 1992).

Special Recreation Areas

At the beginning of 1980, there were eight national

forest national recreation areas and two special management emphasis areas. By 1994, there were 51 legislatively designated special recreation areas with a total of more than 8.4 million acres. The 41 additional areas included 11 national recreation areas, 7 national scenic areas, and 4 national monuments. Six of the new national recreation areas were located in the East and the South, with the balance in the West. The national scenic areas were located in California, Georgia, Virginia, and Washington (one area each) and in Oklahoma (two areas). The seventh, the Columbia River Gorge National Scenic Area, included parts of national forests in Oregon and Washington.

The four national monuments were Admiralty Island and Misty Fjords on Alaska's Tongas National Forest, dedicated in 1980; the Mount St. Helens National Volcanic Monument on Washington State's Gifford Pinchot National Forest, dedicated in 1989; and the Newberry National Volcanic Monument on Oregon's



Family and friends enjoy a nature trail specially designed for comfortable travel by persons with visual or other disabilities, George Washington National Forest, Virginia, 1991.



National forest interpretive specialist leads workshop on the Oregon Dunes National Recreation Area, Siuslaw National Forest, Oregon, 1987.

Deschutes National Forest, dedicated in 1991. The remaining 19 additions were designated as special emphasis areas to respond to local rather than national interests. Ten were very unique roadless areas on Alaska's Tongas National Forest that had failed to achieve wilderness designation. Others were in the Lake Tahoe Basin Management Area in California, the Oregon Cascade Recreation Area, the Green Spring Special Management Area in Missouri, and the Lee Metcalf Recreation and Wildlife Area in Montana. The legislative dedication of these special recreation and management areas ensures priority management attention to their recreational use and qualities and that other uses will not detract from them.

Wilderness, wild, scenic, and recreational rivers and special area designations, together with the extension of the trail system and the many components of the National Recreation Strategy, gave outdoor recreation management the strongest, most aggressive thrust yet experienced in 90 years of managing national forest use. They were accompanied by informational and educational efforts that addressed the multiple-use aspects of national forest management and aggressively sought to improve the public's understanding of the management of multiple uses.

Law Enforcement

The rapid visitor use expansion brought increased law enforcement responsibilities — a challenge that was met, in part, by educating the public about national forest use and care. The Forest Service revised public use regulations to make them more understandable and less burdensome to users and to improve the protection they provided to national forest resources, property, and employees.

National forest managers carried out Federal laws on national forests. Local law enforcement officers, primarily county sheriffs,

protected visitors and their property. During the 1980's and early 1990's, the Forest Service compensated about 400 law enforcement agencies out of some 750 eligible jurisdictions for the help they provided under the cooperative law enforcement program (USDA Forest Service 1981–1995). Law enforcement incidents and violations grew throughout the 1980's and 1990's, but the most rapid growth occurred after 1988. Reported incidents and violations rose from about 5,000 per year in 1988 to 112,000 in 1992. Violations included vandalism, timber theft, wildland arson, unlawful removal of archeological artifacts, prohibited vehicle use, illegal occupancy and use (including the cultivation and manufacture of illegal drugs), and activities hazardous to user health and safety. About 170 special agents and 600 uniformed civil law officers performed investigations and enforcement. In the first half of the 1980's, the Forest Service sent more than 100 employees per year to the Federal Law Enforcement Training Center for high-quality law enforcement courses such as "Criminal Investigation" and "Law Enforcement for Land Management Agencies." The Forest Service staffed three instructor positions at the center to plan and offer interagency courses. In the early 1990's, the Forest Service was sponsoring

basic and advanced law enforcement training for 300 to 500 staff and line people per year.

The investigation and prosecution of vandalism to archeological and cultural resources, pollution, illegal digging, and theft began in the mid-1970's and remained a great and growing concern through the 1980's and early 1990's. In 1986, for example, the Utah interagency task force cooperated with national forest officers to recover some 300 items of archeological significance, including 14 baskets valued at a quarter of a million dollars.

Marijuana Cultivation on National Forests

Illegal marijuana cultivation became a problem and concern on national forest lands in the late 1970's. The primary concern was the risk national forest visitors, contractors, and employees encountered from the growers tending or guarding their high-value, illegal crops. Despite Forest Service efforts to eradicate it, the area cultivated on national forests grew rapidly, from an estimated 220,000 acres in 1980 to more than 1.5 million acres in 1982. In 1983, the area cultivated had been reduced by more than 50 percent, to 692,000 acres, through eradication efforts. Sustained effort further reduced the area to 573,000 acres in 1984. But in 1985, the acreage almost doubled, to 946,000 (USDA Forest Service 1981–1995).

The enactment of the National Forest Drug Control Act of 1986 strengthened the Forest Service's role in marijuana eradication. It authorized the arrest of people suspected of producing illicit drugs on national forest lands. Between 1986 and 1989, the Forest Service apprehended 200 to 250 suspects per year and destroyed 200,000 to 250,000 marijuana plants. In the 1990's, the marijuana investigation intensified. By 1993, more than 600,000 plants were being eradicated annually from more than 8,000 sites. There were more than 1,000 arrests per year. By 1994, a total of 1,800 special agents and 433 full-time law enforcement officers were performing investigations and enforcement activities (USDA Forest Service 1981–1995).

Wildlife and Fisheries Management

In the 1980's and 1990's, the National Forest System provided a wide variety of habitats for more than 3,000 species of birds, mammals, reptiles, fish, and amphibians, and for more than 10,000 plant species. During the first half of this period, wildlife and fisheries management focused on maintaining the viability of native vertebrate populations. This involved protecting special habitats such as old growth, riparian areas, trout streams, snags, and wetlands, and ensuring the productivity of selected species such as elk, deer, turkeys, bear, and salmon for recreational and commercial uses. It also required preparing recovery strategies for threatened and endangered species such as the bald eagle, red-cockaded woodpecker, northern spotted owl, grizzly bear, black-footed ferret, and others. The number of listed threatened and endangered animal and plant species occurring on national forests rose from 90 in 1980 to more than 290 in 1995. Three basic strategies were used to achieve this objective: multiple-use management coordination with timber, range, and mineral management to ensure the consistent application of practices with wildlife and fishery uses and objectives on the disturbed lands; habitat investments to mitigate the offsite impacts of other resource activities; and targeting conservation and recovery strategies to address the needs of threatened, endangered, and sensitive species (USDA Forest Service 1981–1995).

During most of the 1980's, the full integration of wildlife and fisheries management with timber, range, and mineral resource activities received the highest priority. For example, when wildlife and fishery staffing and funding were reduced between 1980 and 1986, staffing and direct funding for resource coordination and integration and threatened and endangered species actually increased. The reductions occurred in direct habitat improvement funds. Some reductions were offset by increased use of KV-funded wildlife and fishery improvements. These rose from 49,000 acres in 1980 to 200,000 acres by 1986. KV funding and intensified coordination for wildlife and fishing purposes made timber management a particularly important factor in meeting deer, elk, and turkey habitat objectives. Some timber sales, for example, were planned to improve elk habitat by harvesting in areas that would provide

forage closer to cover. National forest elk populations increased by 70,000 through this period. The declines in white-tailed and mule or black-tailed deer, mountain goat, and black bear populations bottomed out in 1980, and these species were on the increase by 1987. Moose, caribou, pronghorn, antelope, bighorn sheep, and mountain lion populations continued their upward trend on national forest lands through the 1980's (Thomas 1988).

Management Practices: 1980–1986

The total direct habitat improvement treatments, including those funded by KV, declined from a peak of more than 600,000 acres in 1980 and 1981 to 350,000 acres in 1986. These acres do not include resource protection and mitigation achieved through multiple-use coordination and integration efforts that modified timber, range, and mineral management practices to meet wildlife and fishery objectives (USDA Forest Service 1981–1987). Forty percent of such coordination and habitat improvement was associated with timber management activities (USDA Forest Service 1982a). Nearly 85 percent of the direct practices and treatments maintained and improved habitats for wildlife populations with a strong public hunting demand: elk, bear, deer, wild turkey, grouse, waterfowl, squirrel, and other small game species. Prescribed burning, one of the least costly habitat treatments, accounted for the largest amount of acres treated. It improved forage for mule deer and elk in the West and white-tailed deer in the East and South.

Wildlife managers on Lake States, Southwest, and California national forests implemented wetland habitat improvements, including nesting islands and sites, and created and enlarged ponds. In 1984, when Ducks Unlimited, Inc., desired to expand their waterfowl habitat protection and improvement activities to public lands, the USDA entered into a memorandum of understanding to authorize cooperative projects funded by Ducks Unlimited on national forest wetlands. The first three cooperative wetland habitat improvement projects were completed on Minnesota's Chippewa National Forest. In 1985, Ducks Unlimited entered into a cooperative agreement to install 200 artificial islands as nesting habitat for the dusky Canada goose on ponds in the Copper

River Delta on Alaska's Chugach National Forest, where the 1964 earthquake and tidal flooding had destroyed existing natural waterfowl nesting sites (USDA Forest Service 1985).

In 1986, Congress enacted the wildlife and fisheries Challenge Cost-Share program. More than 100 conservation organizations participating in the program's first year, 1986, contributed \$2 for each \$1 of Federal funding, or \$67 million in money, materials, and services. Among the first of the Challenge Cost-Share projects was one improving 4,000 acres of bighorn sheep habitat in the Wyoming and Colorado Rockies. Cooperators included the Foundation for North American Wild Sheep, Martin Marietta Aerospace, the Colorado Division of Wildlife, the Wyoming Game and Fish Department, and the Rocky Mountain Bighorn Sheep Society. Cooperators participated in a wide range of projects that included forest habitat improvements for deer, elk, grouse, turkey, songbirds, and other forest mammals; wetland development; reintroduction of the peregrine falcon; nest-box construction; road closures to protect bald eagle nests; and wild turkey and grouse openings (USDA Forest Service 1987b).

Fisheries Management

National forest fisheries and aquatic resources are located in 42 States and Puerto Rico. They include 200,000 miles of streams and rivers; 2.2 million acres of ponds, lakes, and reservoirs; and 16,500 miles of coasts and shorelines. National forest waters provide habitats for salmon, trout, catfish, pike, muskellunge, bass, walleye, and sunfish, as well as for hundreds of nongame species. In California, Oregon, Washington, and Idaho, for example, national forests provide more than 50 percent of the freshwater spawning and rearing habitat for anadromous fish on 15,000 miles of streams. In Alaska, 27 percent of the freshwater habitat for salmon and steelhead is located in 30,000 miles of national forest streams (USDA Forest Service 1988c).

Fishery habitat improvements annually involve habitat work on 10,000 to 20,000 acres, and installing 3,000 to 5,000 habitat improvement structures. Managers target anadromous, cold-water, and warm-water fish habitats, mainly for salmon and steelhead, trout, and bass. In response to 1980 RPA policy

direction, anadromous fish habitat improvement in Alaska, California, Oregon, Washington, and Idaho received the highest priority. Management practices included stream habitat development, providing for fish passage to upstream habitats, and lake fertilization. In the Columbia River Basin, the Bonneville Power Administration supplemented national forest investments. In the Southern Region, a conservation camp for fishery and wildlife volunteers was established with a cost-share grant. Working with the conservation groups and State fish and game agencies, volunteers restored numerous stream habitats destroyed or damaged by 1985 floods and installed fish attractors in lakes and reservoirs. Fishery management coordination and integration with other resource activities protected fish and wildlife habitat areas from erosion and sedimentation and protected riparian areas and streambanks.

Threatened and Endangered Species

Nationally listed threatened and endangered animal species on national forest lands rose to 141 in 1986 — 30 percent of all U.S. listed species. This growth in the number of listed species was more an outgrowth of the increasing emphasis on endangered species protection and improved wildlife and fisheries inventories than habitat degradation.

By 1986, national forest managers had written 60 ESA-required draft or final recovery plans for these species. Each year, about 10 percent of the habitat improvement work (35,000 acres) was targeted to protect listed species. Management emphasis, however, was concentrated on about 10 priority species. The bald eagle and the peregrine falcon received



Forest workers checking for buffalo berry bushes, essential forage for grizzly bears, Lewis and Clark National Forest, Montana, 1990. The unit was harvested in 1989 to encourage buffalo berry.

national emphasis and the grizzly bear, spotted owl, and Puerto Rican parrot regional emphasis. Other emphasized species were the mountain caribou, California condor, Kirtland's warbler, Lahontan cutthroat trout, and Oregon silver spot butterfly, as well as several plant species (USDA Forest Service 1981–1987).

Bald eagle populations were stabilized or increasing on most national forests due to proper management of their nesting and wintering sites and retention of suitable habitat. Populations of peregrine falcons were also increasing as a captive-breeding and stocking program reintroduced them into unoccupied habitats in California, Colorado, Arizona, New Mexico, Minnesota, and New Hampshire. Declining residual levels of DDT and other persistent chlorinated hydrocarbon pesticides, a result of the U.S. ban on their use, reinforced these efforts. Eggshell thinning attributed to such pesticides was being reduced in many areas.

In the early 1980's, grazing allotment plans on national forests in Idaho were revised to protect grizzly bears and their habitats. In Montana, national forests changed road designs and closed roads to protect both grizzly bear and gray wolf habitats. In 1983, the Northern, Intermountain, and Pacific Northwest Region national forests were emphasizing grizzly bear management with policy support from the Departments of Agriculture and the Interior. The Departments co-signed a memorandum of understanding establishing a national interagency grizzly bear committee to encourage and implement grizzly bear recovery. To protect both backcountry users and grizzlies, national forests undertook an intensive information campaign on proper human conduct in grizzly habitats to reduce conflicts between bears and humans and eliminate unnecessary killing of grizzlies. The mapping of grizzly bear habitat rose to more than 2 million acres per year by 1986. Inter-agency guidelines approved for grizzly bear management were implemented in 1987.

In the Southern Region, census and monitoring techniques for the red-cockaded woodpecker were improved. In California, a combination of land purchases; road, trail, and campground relocations; and public access restrictions protected the California condor and its habitat. In Michigan, 1,000 acres of habitat were improved for the endangered Kirtland's warbler, a songbird which nests only in young Jack pine stands (USDA Forest Service 1981–1987).

Threatened, endangered, and sensitive species staffing increased from 19 to 47 FTE's between 1979 and 1986 (USDA Forest Service 1994f). In addition to implementing special management practices for listed species, regional foresters identified "sensitive species" and coordinated and integrated management to help ensure the continued viability of their populations with an emphasis on avoiding impacts that would cause them to become threatened or endangered.

Wildlife and Fishery Use: 1980–1986

WFUD's, like RVD's, declined from their peak of 34.9 million in 1981 to 32.0 million in 1986 — an 8.3-percent decline — slightly more than the decline for total RVD use. The causes were probably much the same as for RVD's — reduced leisure time, a shift

to shorter vacations and holiday trips to places closer to home, and an increase in households where both parents worked outside the home. The decline occurred in hunting, fishing, and nonconsumptive wildlife and fish uses and was reflected in all sub-sectors: big game, small game, and waterfowl hunting, and in both cold-water and warm-water fishing (Flather and Hoekstra 1989).

Wildlife and Fishery Habitat Relationships: Modeling Efforts

During the 1980's, a considerable effort was directed toward developing new wildlife and fishery habitat relationship models to determine the cumulative effects of wildlife and fishery habitat changes and to evaluate wildlife and fishery population viability standards. This required expanding habitat capability models to include more species and areas. Habitat capability models integrated wildlife and fishery objectives into the management and use of other resources. They also made it possible to quantify wildlife and fishery resource relationships in ways that provided more reliable and consistent information for conserving biodiversity, managing viable populations, managing featured species habitat, and producing wildlife and fish to meet public demand.

The Northern Region developed a model to assess the cumulative effects of sediment on fish populations on Montana and Idaho national forests. Alaska's Tongas National Forest developed two types of models to improve Sitka black-tailed deer habitat planning and management. National forest planning and management in Washington and Oregon used a spotted owl assessment model. By 1987, the National Forest System was using 21 habitat capability models to evaluate wildlife and fish habitat relationships (USDA Forest Service 1981–1987).

In the following years, the wildlife and fishery habitat relationship program, housed at Utah State University in Logan, continued to work with national forest wildlife and fisheries managers and Forest Service Research to improve the wildlife and fishery habitat relationship models. In 1992, this program developed new wildlife, fish, and rare plant inventory techniques for habitat evaluation models that provided more accurate habitat capability assessments. It assisted field units in developing databases

and geographic information system applications to monitor and inventory habitat conditions. The wildlife and fishery habitat relationship program also offered entry-level and mid-career professionals continuing education on state-of-the-art information and technical skills. In 1992, they offered courses on basic surveys and their application, program management for biologists, and management of forest structure and composition to 430 Forest Service, BLM, and State biologists (USDA Forest Service 1987–1995).

Wildlife and Fishery Management and Use: 1987–1995

After 1986, wildlife and fishery management shifted toward a more holistic approach to maintaining and managing healthy ecosystems. This approach considered the broader dimensions of ecosystems in project activities and management. It involved more aggressive pursuit of goals for producing wildlife and fish; protecting threatened, endangered, and sensitive species; and providing hunters, anglers, amateur naturalists, photographers, and all other national forest users more attractive opportunities. National forest wildlife and fishery management staffing increased in all activities, rising from 854 FTE's in 1986 to 2,231 in 1994. Funding increased from \$48 million in 1986 to \$121 million in 1994 (in constant 1994 dollars) (USDA Forest Service 1994f).

Specific programmatic titles were introduced for many wildlife and fishery activities and publicized with colorful brochures to encourage public use, participation, and support for national forest wildlife and fisheries. "Rise to the Future" was launched in 1987 to market fishing opportunities, communicate fish habitat improvement opportunities, and elevate fish habitat management awareness, both internally and with fishery cooperators. "Get Wild" achieved similar objectives for wildlife habitat improvement and use. "Every Species Counts" focused internal Forest Service and public interest on maintaining and improving threatened, endangered, and sensitive species habitats.

As public communication and participation and funding improved after 1986, the total acres of annual habitat improvement rose from 355,000 acres to nearly 450,000 acres per year in the early

1990's. WFUD's use rose from 32 million in 1986 to 36.3 million in 1993. The rate of increase in WFUD's was less rapid than that for total RVD use, but still nearly twice as great as national population growth.

Fisheries Management

The "Rise to the Future" program, initiated in 1987, provided for more effective fishery management, encouraged fishing on national forests, and ensured equal consideration of fisheries with other national forest resources. To implement this new emphasis, the number of national forest fish biologists was increased by 34 percent over 2 years (1986 to 1988). By 1995 there were 374, an average of three fishery biologists per national forest (USDA Forest Service 1990a, 1995a). Rise to the Future focused on System-wide use of BMP's, relied on cumulative effects analyses to identify the positive and negative effects of land use and management on fisheries, and resulted in improved aquatic inventory and classification methods and expanded inventory and classification work.

National forest resource managers pursued and strengthened partnerships with States, Federal agencies, tribal governments, conservation groups, and other interested public organizations, all of which expanded their participation and share in funding and implementing habitat improvements. Volunteers also participated in fish habitat improvement. One of the early Rise to the Future projects was a massive effort to restore Canyon Creek on Arizona's Tonto National Forest — an effort that involved working with ranchers on livestock control, riparian fencing, willow and cottonwood plantings, and many stream habitat structures built with large logs and bolts of wood. Several hundred volunteers and partners worked on this project. In 1987, on Idaho's Boise National Forest, the concerned participation of Gem State Fly Fishers and Idaho Salmon and Steelhead Unlimited members halted erosion along 200 feet of Johnson Creek, which was delivering sediment into the South Fork of the Salmon River's prime spawning and rearing habitat for summer Chinook salmon (USDA Forest Service 1988b).

In 1964 and 1965, large storms caused massive landslides that dumped approximately 240,000 tons

of sediment into the South Fork of the Salmon River, causing catastrophic damage to Chinook salmon spawning and rearing habitat. By 1990, an average of 78 percent of the accumulated sediment storage (since 1965) over the entire river system had been reduced. There were even greater reductions in such key spawning areas as the Poverty Reach, where sediment deposits were reduced by 89 percent (Lee et al. 1993). Comparisons of the long-term trends in the number of redds (spawning nests) in the South Fork with those on the less-disturbed Middle Fork of the Salmon River and Johnson Creek, a major tributary of the South Fork, revealed that stresses from downriver sources were the probable dominant causes of the long-term decline in returning spawning salmon and redd counts in all three streams and the entire Salmon River system — regardless of landslide activities in the associated watersheds. (The Middle Fork is located largely within the Frank Church – River of No Return Wilderness and its watershed had not been roaded or logged; Johnson Creek’s watershed had fewer roads and much less logging than the upper South Fork). All three streams showed similar long-term trends in the decline of redd counts between 1957 and 1991. Except for the catastrophic decline on the South Fork after 1964, they also had similar levels of redd counts in the latter years of the 1957 to 1991 study period. The Idaho Department of Fish and Game maintained records of the number of redds constructed each year for all three streams (Lee et al. 1993).

In 1988, efforts with the New Mexico Department of Game and Fish, New Mexico State University, and the Fish and Wildlife Service on New Mexico’s Gila National Forest improved the endangered Gila trout’s recovery process by introducing it into the waters of the Trail Canyon area. This cooperative effort nearly doubled the Big Thompson River’s fish productivity by installing 45 habitat structures in seven stream sections and accelerating natural vegetation by planting willow shoots on streambanks (USDA Forest Service 1989c). In 1989, the Mississippi Department of Wildlife, Fisheries, and Parks; the Chickasaw Bass Club; and Lunkers Unlimited Bass Club installed fish cover and spawning gravel structures made of concrete blocks, tires, and treetops, which increased the catch of larger fish and doubled the catch per angler on Davis Lake (200 acres) and Brentes Lake

(50 acres) on the Mississippi national forests (USDA Forest Service 1990b). The average annual level of fish habitat improvements during the first half of the 1990’s rose to 23,000 acres per year and 10,000 structures — about double the average annual achievements in the 1980’s of 12,000 acres per year and 5,000 structures (USDA Forest Service 1981–1986, 1987–1995).

Every Species Counts

“Every Species Counts” was introduced in 1990 to intensify the management of national forest habitats for threatened, endangered, and sensitive species by bringing the resources, energy, and commitment of the Forest Service, other Federal agencies, State resource departments, private organizations, and individuals together. This initiative implemented a 1989 task force plan to match the management effort for improving the recovery and conservation of threatened, endangered, and sensitive species with the urgency of the challenge. In that year, listed species with habitats on national forests rose to 171 — 30 percent of the total U.S. listed species. By then, regional foresters had designated more than 900 sensitive species that needed special management coordination to avoid their listing as threatened or endangered. This high proportion of listed and sensitive species with national forest habitats often reflects the better survival of such species in, or their retreat to, the undeveloped and less fragmented habitats found on many national forests. In 1994, the number of listed species with national forest habitats rose to 283 — 31 percent of the 919 U.S. listed species: 110 plants; 52 fishes; 40 snails, mussels, and crustaceans; 31 birds; 27 mammals; 14 reptiles and amphibians; and 9 insects. By 1993, regional foresters had designated more than 2,300 sensitive species (USDA Forest Service 1987–1995, 1993a).

Staffing for threatened, endangered, and sensitive species management increased enormously from 47 FTE’s in 1986 to 590 FTE’s in 1994 -- more than 12 times the 1986 staffing. Funding increased similarly from \$3 million in 1986 to nearly \$39 million in 1994 (constant 1994 dollars) (USDA Forest Service 1994f). The average annual habitat improvement for listed and sensitive species rose from 35,000 acres per year in the mid-1980’s to nearly 100,000 acres per year in the mid-1990’s (USDA



Mt. Hood National Forest, Oregon, wildlife biologists examining feathers from a nestbox during a survey to determine which species used the nestbox.

Forest Service 1981–1995). The number of structures installed to improve listed and sensitive species habitats rose from a few hundred per year in 1986 to more than 2,800 per year in 1994. The number of threatened and endangered species recovery plans rose from 80 in 1987 to more than 150 in 1993. Recovery strategies were developed for listed species where specific ESA recovery plans were not required.

Protecting Endangered Species After Natural Disasters

The Puerto Rican parrot, found only on Puerto Rico's Caribbean National Forest, is the last native parrot in the United States and its territories. In 1972, this species had been reduced to a single population of 14 birds. Most of the parrot's old-growth tropical forest habitat had been destroyed by the island's development activities. Predators, low numbers, and lack of nesting sites hampered the reproduction of the remaining birds. Forest Service research scientists and Fish and Wildlife Service and Forest Service biologists have worked together to provide suitable

parrot nesting sites and reduce predation and competition from the pearly eyed thrasher by modifying natural cavities and installing artificial nest structures. Cavities are closed during the summer months to prevent honeybee swarms from using them. Captive birds have been bred to produce young parrots that have been substituted for wild chicks in the nest (cross-fostering) to improve genetic diversity. In 1989, when this endangered species population had grown to 47 birds, it was suddenly and drastically reduced to 23 by Hurricane Hugo — which severely altered half of the parrots' prime habitat (USDA Forest Service 1993a, 1994a). Since Hugo, researchers and national forest managers and biologists

have attempted to rehabilitate the species' damaged habitat, and the number of wild birds has increased to the pre-hurricane level. Six wild breeding pairs have nested successfully. Half of the breeding population has used the improved or artificial nesting structures (USDA Forest Service 1993a).

Hurricane Hugo also damaged South Carolina's Francis Marion National Forest, where it devastated the habitat of the second largest population of the endangered red-cockaded woodpecker — the only population growing in numbers. In some colonies, hurricane winds snapped nearly 90 percent of the trees that held woodpecker cavities. In 1990, the year after the hurricane, about 70 percent of the total red-cockaded woodpecker population had disappeared. The Francis Marion immediately undertook a crash effort, using creative substitutes, to provide the birds with new nesting and roosting cavities. Techniques ranged from drilling completed cavities and start holes that the birds could enlarge to cavity size, to installing cedar blocks with predrilled cavities into

holes cut into standing trees. In 1994, 66 percent of all red-cockaded woodpecker nests were in these artificial cavities. The number of adult birds increased from the post-hurricane level of 579 in 1990 to 775 in 1992 (USDA Forest Service 1993c, 1994a).

Habitat Management for Endangered Species Reintroduction and Recovery

In 1992, the Nebraska National Forest completed a survey to determine the presence of black-footed ferrets on national forest lands. Reintroducing them was assessed in an EIS. Although once found throughout the Great Plains of North America, the black-footed ferret by 1991 existed only in captivity and in one group that had been released to the wild in that same year. Black-footed ferret colonies depend on prairie dogs for 80 percent of their food supply and rely entirely on empty prairie dog burrows for shelter and to rear their young. The Nebraska National Forest evaluated four units suitable for ferret reintroduction and conducted a public forum on the reintroduction process. (USDA Forest Service 1993a, 1993c).

PACFISH Strategy for Endangered Salmon Emerges in the Pacific Northwest

In 1991, the American Fisheries Society assessed the viability of more than 400 Pacific salmon and steelhead stocks dependent upon spawning habitats in Washington, Oregon, California, and Idaho (Nehlsen et al. 1991). (A stock is defined as a group of fish that spawn on a particular river system or segment during a particular season and that do not interbreed to any substantial degree with any other group of fish.) This study reported that 24 percent of the stocks had become extinct; 23 percent were at high risk of extinction; 13 percent were at moderate risk; 12 percent were of special concern — not presently at risk, but probably in decline from known threats; and 27 percent secure — stable or increasing stocks not subject to any known threats. The report found that about 170 of the high risk, moderate risk, and special concern stocks were associated with national forest streams and lands. Of those, four stocks were listed as endangered. National forest managers had identified other stocks as sensitive.

The 76 stocks found on national forests and rated as high risk for extinction, but not federally listed, occurred in 51 stream systems on 16 national forests.

The causes of these declines varied by species and location, but generally reflected some combination of hydroelectric development and operation, over-fishing, hatchery influences on disease and genetic fitness, and habitat conditions. In 1992, the importance of this issue to a wide diversity of interests led the Forest Service to develop a coordinated, comprehensive strategy for managing Pacific salmon and steelhead habitats on national forests throughout the Pacific Northwest and Alaska. National forest managers manage half of the freshwater anadromous fish spawning and rearing habitat in the lower 48 States and more than a quarter of such habitat in Alaska. For stocks threatened by factors other than habitat, the quality of national forest habitats would play an important role in moderating their rate of decline and provide time to resolve the primary problems associated with hydroelectric operations, hatcheries, and fish harvests (Pacific Salmon Work Group and Field Team 1992).

After 1992, as more salmon were federally listed as threatened or endangered, the Forest Service joined with BLM to develop the PACFISH strategy. Using available science, PACFISH took a proactive ecosystem approach to managing anadromous fish habitats in the Columbia and Snake River systems of eastern Oregon and Washington, Idaho, and parts of California. Riparian corridors along sensitive streams were managed under interim conservation guidelines while researchers identified ways to restore and sustain the ecological processes that gave rise to the once-thriving salmon habitats and populations (USDA Forest 1994e).

It is clear that threatened, endangered, and sensitive species management has become an important component in implementing an ecosystem approach to managing multiple uses on national forests. The conservation of species is central to sustaining ecosystems. Accommodation of multiple uses makes this an extremely complex task. With the current limitations of available ecosystem management science, resource management, and recovery strategies for threatened, endangered, and sensitive species, conservation almost always involves exploring still-unknown aspects of

species, habitat, and ecological relationships. It also calls for creativity in discovering new ways to manage multiple uses while sustaining healthy air, land, water, and related biological resources and their unique expressions of biodiversity.

Get Wild

"Get Wild" was introduced in 1988, with the overall objective to protect and improve habitats for national forest wildlife and to attract the public's broad participation in projects benefitting game and nongame wildlife and wildlife-related national forest recreation opportunities. It expanded cooperative partnerships with Federal and State agencies, wildlife organizations, and other groups and individuals to help inventory and improve habitats, survey and monitor wildlife populations, provide education and instruction programs for forest users, and protect special habitats such as snags and riparian areas.

"Get Wild" was divided into 11 national special emphasis areas that focused cooperator interests on particular species or species groups (USDA Forest Service 1993d). "Eyes on Wildlife" focuses on projects to enhance wildlife viewing and appreciation. In 1990, for example, New Mexico's Cibola National Forest cooperated with the Western Foundation for Raptor Conservation and the Central Rio Grande Chapter of the Audubon Society to construct a 1.5-mile trail to improve public access to the Sandia Mountain Hawk Watching Area, where the public and wildlife biologists could view and record raptor migrations. The Western Foundation for Raptor Conservation provided a brochure describing the role of raptors in the ecosystem. In 1991, a self-guided bird tour was

developed on northeastern Colorado's Pawnee National Grassland, an area annually visited by thousands of birding enthusiasts to observe the more than 200 bird species that pass through or nest on the grasslands. Cooperators, including the Greeley Chapter of the Audubon Society, the Colorado Audubon Council, and the Colorado Division of Wildlife, published a tour brochure covering 13 tour route stops and installed interpretive signs at each stop. By 1992, "Eyes on Wildlife" included 114 projects (USDA Forest Service 1991-1993).

"Taking Wing" focuses on waterfowl and wetland habitat projects in cooperation with other Federal agencies, State wildlife and fish agencies, and national, regional, and local conservation groups. Its objective is to improve some 12 million acres of waterfowl habitat found on national forests and grasslands in support of the North American Waterfowl Plan — a cooperative program between the U.S. and Canada to improve waterfowl habitats and



District wildlife biologist examining a yellow-breasted chat captured by a mist net used to inventory neotropical migratory birds (mainly songbirds) on the Sam Houston National Forest, 1992.

prevent declines in waterfowl populations (Ducks Unlimited, no date). In 1989, Alaska's Chugach National Forest, in partnership with the Fish and Wildlife Service and the University of Minnesota, inventoried and described the habitat needs, nesting success, and population trends for trumpeter swans on Alaska's Copper River Delta. This was the first step in identifying management opportunities to reduce the downward trend in trumpeter swan numbers. In the same year, the Kadoka Lake project on South Dakota's Buffalo Gap National Grassland reconstructed a dam to restore a 230-acre lake — the second largest wetland on Federal lands in western South Dakota. Cooperators were the City of Kadoka; Jackson County; the Jackson County Conservation District; the South Dakota Department of Game, Fish, and Parks; and Ducks Unlimited, Inc. The restored lake was projected to produce 2,000 ducks and 250 geese annually and provide habitat for the endangered trumpeter swan. Pheasants and grouse have also benefitted from the improved upland habitat around the lake. (USDA Forest Service 1990b). In 1992, "Taking Wing" had 92 projects under way on the national forests (USDA Forest Service 1993d).

The "Animal Inn" emphasis area, an education and information program, was initiated nationally in 1988 to communicate the importance of managing dead standing snags and fallen trees for wildlife habitat. Some 1,200 animal species need these habitats for their life cycles.

"Partners in Flight," a neotropical migratory bird initiative, was introduced in 1991 and by 1992 had 56 cooperative projects under way on national forests and other lands. Numerous State, Federal, and



Elk on summer range, Big Horn National Forest, Wyoming, 1993.

international agencies and more than 20 conservation groups cooperate with the Forest Service to assist in population management, habitat monitoring and improvement, training resource professionals, and providing public educational activities about neotropical migrant bird species nesting in North America and wintering in the Caribbean or Central and South America (USDA Forest Service 1993d). In 1991, for example, Colorado's White River National Forest, through the Forest Service's International Forestry branch, sponsored a biologist employed by the Mexican government in a 6-week program to exchange information about neotropical bird habitat and wildlife management in the United States and Mexico (USDA Forest Service 1992b). The objective is to help reverse the declines that have emerged in many migratory bird populations due, in part, to fragmentation of their breeding grounds in North America and loss of wintering habitat in their southern abodes. In 1992, New York State's Finger Lakes National Forest, in cooperation with Cornell University, established two permanent breeding bird survey plots as a part of 10-State network for monitoring neotropical migratory bird productivity. Six of International Forestry's sister forest programs with national

forests and parks in Central and South America have been developed around managing neotropical migrant bird habitats (USDA Forest Service 1993c).

The "Ecosystem Management/Restoration and Special Habitats" theme emphasizes unique species groups and communities. In 1992, the Sitka Ranger District on Alaska's Tongas National Forest undertook thinning at various intensities to restore biological diversity and emulate more mature, unlogged forest conditions. They incorporated gaps, thickets, animal travel corridors, and varied tree spacings to provide year-round habitat for the Sitka black-tailed deer and many other wildlife species. Trees were widely spaced in riparian areas to provide large, woody debris to improve stream habitat. In 1992, almost 1,400 acres were so treated (USDA Forest Service 1993c).

Other theme initiatives focused on particular species. "Making Tracks" focused on projects to improve turkey habitat. Partnership projects for turkey included the designation and management of walk-in turkey hunting areas (80,000 acres proposed) to provide the public an opportunity to hunt turkeys in areas relatively undisturbed by vehicle traffic. South Dakota's Black Hills National Forest undertook turkey habitat improvements to increase burr oak mast production by reducing ponderosa pine competition, releasing larger oak trees, and installing guzzlers. In 1992, there were 127 projects. "Answer the Call" addressed quail habitat needs. "Dancers in the Forest" was the theme of an initiative for grouse and woodcock projects. "A Million Bucks" targeted deer habitat improvement.

"Full Curl" projects focused on habitat for wild Rocky Mountain and desert bighorn sheep. Through this initiative, Colorado's White River National Forest reintroduced bighorn sheep into their historic range, improved their winter range habitats, and improved the basis for their future management by studying existing herds to determine their habitat use and limiting factors. "Elk Country" focused on elk habitat. In Colorado, the San Juan National Forest used prescribed burns to improve elk forage production to reduce elk damage on private lands and maintain the existing elk population. Oregon's Malheur National Forest improved elk summer range

habitat by closing more than 63 miles of road and obliterating 29 miles. (USDA Forest Service 1987–1995). Elk habitat projects numbered 144 in 1992.

The total area of habitat improved for wildlife, fisheries, and threatened and endangered species increased on an average of 100,000 acres per year during the early 1990's, with the "Get Wild" initiative producing a third of that increase. By 1995, more than 1,200 national forest wildlife and fishery biologists and 145 botanists, working with thousands of institutional partners and individual volunteers, were providing a creative link to land stewardship for the future. In addition to completing habitat improvement projects each year, they were involved in planning and reviewing thousands of timber sales, range allotment management plans, and mineral cases to ensure that these activities were carried out in ways compatible with wildlife and fishery objectives and conservation of rare plants (USDA Forest Service 1993c, 1995a).

The Growth of Partners in Habitat Management

The number of partners in national forest habitat improvement and management increased from 57 in 1986 and 867 in 1989 to more than 3,000 in 1993. This enormous growth in cooperative, voluntary participation came largely from the incentive provided by the Challenge Cost-Share program and the aggressive thematic initiatives. The traditional partnerships, including the forest cooperative agreements with 44 State fish and game departments and 49 other Federal agencies and conservation groups, increased similarly. The vast majority of new partnerships were with hundreds of sporting organizations, local governments, other State and local agencies, a variety of civic groups, many corporations, and scout troops — who collectively provided the services of thousands of people — and many individual volunteers. These cooperators completed thousands of habitat improvement projects on the national forests. The value of their assistance, materials, and services is summarized in table 11.

Cooperators contributed more than \$1.42 to wildlife partnership initiatives for every Federal dollar of appropriated funds (USDA Forest Service 1987–1995).

Table 11. Wildlife Challenge Cost-Share assistance

Year	Appropriated Funds	Forest Service Cooperator Share	Total
1986	\$900,000	\$1,700,000	\$2,600,000
1987	1,700,000	3,100,000	4,800,000
1988	2,900,000	5,200,000	8,100,000
1989	6,900,000	10,200,000	17,100,000
1990	10,300,000	12,800,000	23,100,000
1991	11,100,000	16,900,000	28,000,000
1992	11,500,000	15,200,000	26,700,000
1993	14,300,000	19,800,000	34,100,000
Total	\$59,600,000	\$84,900,000	\$144,500,000

Source: USDA Forest Service 1993c.

1980 to 1995: A Period of Accelerating Transition and Transformation in Managing Multiple Uses on National Forest System Lands

For national forest managers, the years between 1980 and 1995 were a period of continuing confrontation and challenge. Special interest groups and individuals continued to take issue with national forest management plans, decisions, and resource management projects through an unrelenting level of appeals and court suits focused heavily on timber management, but not neglecting issues in other resource areas. New resource challenges also emerged as the continuing buildup of forest biomass and related fuel hazards combined with serious drought raised national questions about forest health and the increased risk of catastrophic wildfires. Growing concerns for endangered, threatened, and sensitive species raised new questions about the maintenance of biodiversity and the sustainability of forest and rangeland ecosystems.

National forest managers, responding to these discomfiting challenges and confrontations, sought wider and more open and orderly communication and participation with national forest interest groups and users. They also pursued more rigorous interdisciplinary integration of the management of multiple uses and resources and in the protection of the

environment. The staffing and funding for wildlife and fisheries management and soil and watershed protection increased, while timber staffing and funding decreased as harvests sharply declined. Cooperative projects and partnerships in implementing wildlife, fisheries, recreation, and cultural heritage management projects saw an unprecedented increase.

In this general way, the transition and transformation of the traditional integrated approach in national forest management for multiple uses accelerated toward a broader and more holistic ecosystem approach. Here, the ecosystem approach and national forest management are mutually seen as the fitting of multiple uses into forest ecosystems according to their ability to support them and their compatibility with each other, in ways that will ensure the sustainability of the ecosystems as well as the multiple uses and benefits for future generations. Implicit in this approach is the understanding and context provided by existing state-of-the-art forest resource management and its underlying science and by the established societal goals and processes for resources management decisionmaking. Chapter 7 describes the 1990's adoption and early implementation of the ecosystem approach in managing multiple uses and multiple benefits on national forests.

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Chapter 6

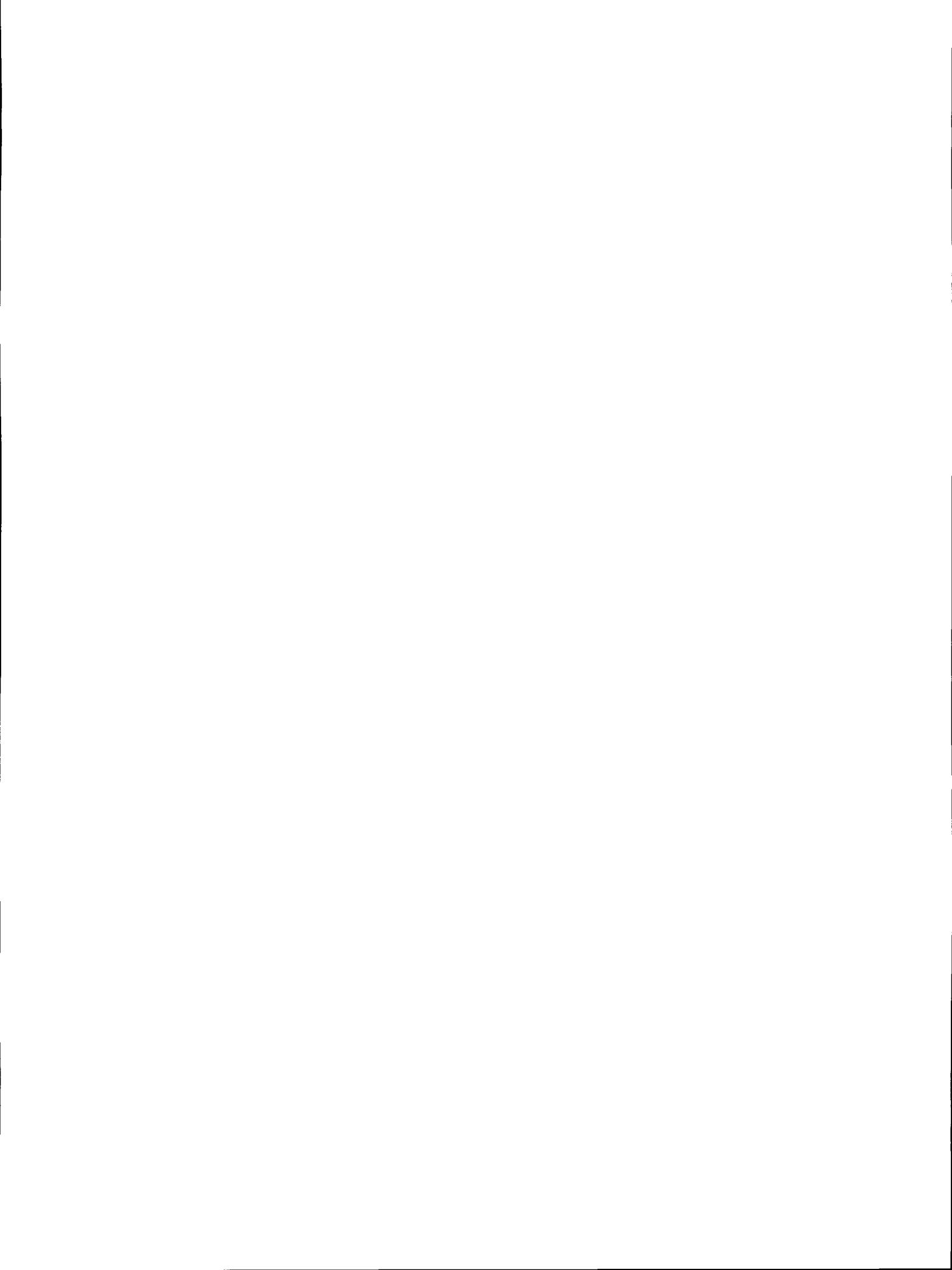
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Chapter 6

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Chapter 7

Policy Commitment to Ecosystem Approach to Managing Multiple Uses

The early 1990's were marked by the Forest Service's commitment to adopt an ecosystem approach to managing multiple uses on national forest lands. This commitment emerged on June 4, 1992, when the 12th Chief of the Forest Service, F. Dale Robertson announced that:

An ecological approach will be used to achieve the multiple-use management of the national forests and grasslands. It means that we must blend the needs of people and environmental values in such a way that national forests and grasslands represent diverse, healthy, productive, and sustainable ecosystems. (USDA Forest Service 1994b)

The commitment was announced to coincide with the United Nations Conference on Environment and Development (UNCED) (the Earth Summit), held in Rio de Janeiro, Brazil, in July 1992. The Administration hoped that the timing of this announcement would add a constructive note to the international view of American forestry which, at that time, had become somewhat critical of U.S. forestry practices, including clearcutting (Sirmon 1995).

The 1992 commitment to implement an ecosystem approach throughout the National Forest System echoed Chief Ed Cliff's:

I am convinced that, with an ecosystem approach to multiple-use management, our national forests and rangelands can contribute to a better living for present and future generations.... (USDA Forest Service 1970)

Chief Robertson activated his announcement with a directive to each of the regional foresters and station directors that they develop an ecosystem management plan (Robertson 1994):

I am asking each regional forester and station director to work together in evaluating their regional situation and within 90 days develop a strategy for implementing the above policy, principles, and guidelines. We need to make good progress at a reasonably rapid pace without disrupting programs, recycling project decisions, or redoing project field work. Also, you will need to take advantage of the flexibility within existing forest plans to practice ecosystem management. As forest plans need to be amended or revised they should reflect the above policy on ecosystem management.

Chief Robertson's announcement followed the 2-year "New Perspectives" initiative that evaluated ecological approaches to management. But the roots of ecosystem management go far deeper. They draw strongly upon the 90-year learning experience of managing multiple uses on national forests. They are also strongly shaped by the policy influences of the Organic Act, the Multiple-Use Sustained-Yield Act, the National Environment Policy Act, the National Forest Management Act, the Endangered Species Act, and other laws. They are strengthened by advances in science and influenced by the changing values and preferences of the American people. Ecosystem management with today's state of knowledge and ecological science nevertheless remains as much a learning experience as it is an approach to managing multiple uses on national forests.

In November 1993, the Acting Chief of the Forest Service, Dave Unger, directed regional foresters, station directors, and area directors to begin using the national hierarchical framework of ecological units in land management planning and related assessment work, research programs, and cooperative efforts with other agencies and partners. In 1993, nationwide ecoregion-scale maps were readily available and work was being completed on maps at the subregional scale (Unger 1993).

In February 1994, Chief Jack Ward Thomas issued a national action plan, *Implementation of Ecosystem Management*. Its goals were to:

- Adopt an ecosystem approach to management throughout the Forest Service.
- Integrate ecosystem management in all activities.
- Strengthen collaboration and innovation.
- Ensure that management actions are ecologically responsible, economically viable, and socially acceptable.

This action plan shifted the ecosystem approach to management of national forests from a testing and demonstration approach toward full implementation. In taking this step, Chief Thomas recognized that

ecosystems were complex systems and that our knowledge of them was far from complete or adequate. Nevertheless, there was “no option but to continue to move forward in natural resource management on the basis of what we know or think we know” (Thomas 1994).

The new action plan calls for protecting ecosystems, affording people multiple-use benefits within the capabilities of those ecosystems, and ensuring organizational responsiveness. The plan’s successful implementation will be evidenced by three primary outcomes:

- Healthy ecosystems.
- Vital communities.
- An effective multidisciplinary, multicultural organization (USDA Forest Service 1994a).

Forest Service Ethics and Course to the Future

The Forest Service commitment to the future management of National Forest System lands was expressed in its brochure “The Forest Service Ethics and Course to the Future.” It was endorsed by Chief Thomas in these words:

Together we will strive to make the Forest Service the world’s foremost conservation leader for the 21st century. Together we will raise the Forest Service’s already high standards (USDA Forest Service 1996).

The “ethic” was expressed on two dimensions:

Our land ethic is to promote the sustainability of ecosystems by ensuring their health, diversity, and productivity ...

Our service ethic is to: Tell the truth, obey the law, work collaboratively, and use appropriate scientific information in caring for the land and serving people ... (USDA Forest Service 1996).

The “Course to the Future” expresses the Forest Service’s work commitment to ensure ecosystem health, diversity, and productivity while it responds

to the forest resource needs and uses of the American people:

- It includes understanding the role of fire, insects and disease, and drought cycles in shaping ecosystems and bringing that understanding to bear in national forest management decisions and actions.
- It requires developing and using measures of ecosystem sustainability while supporting the quality of life in those ecosystems (in rural, suburban, and urban settings). The effects of human use and habitation on ecosystem sustainability must be evaluated.
- It manages ecosystems to provide the uses, values, products, and services sought by the American people from national forest and grassland resources, including water, recreation opportunities, timber, minerals, fish, wildlife, forage, wilderness, cultural heritage, and aesthetics, while maintaining ecosystem health and diversity.
- Its workforce reflects the cultural and disciplinary diversity needed to provide the skills and abilities as well as the public partnerships and collaboration required for the effective interdisciplinary application of the ecosystem approach to managing multiple uses. The workforce is empowered to carry out the mission of the national forests and grasslands with accountability for achieving negotiated objectives (USDA Forest Service 1994b).

In 1994, the “Course to the Future” was strongly evidenced in the implementation of the Northwest Forest Plan and in the PACFISH initiative in eastern Oregon and Washington, Idaho, and parts of California.

For national forests and other Federal lands in the Pacific Northwest, the Northwest Forest Plan provided resolution to the longstanding impasse between timber harvesting activities and the need to protect noncommodity resources. The Northwest Forest Plan during 1994 took transitional steps necessary to move the Forest Service toward the ecosystem approach. It scheduled a billion board feet of timber sales for 1994, but due to increased

stream protection requirements, only 333 million board feet were actually prepared for sale. It emphasized the economic adjustment assistance to 147 communities affected by the Plan's reduced timber harvest levels. Watershed analyses were completed on 23 out of 59 watersheds to identify restoration needs and begin to implement the "Jobs in the Woods" program to assist communities. Adaptive management areas (AMA's) were defined and public participation plans were completed for eight AMA's. (AMA's are quasi-experimental or demonstration areas for evaluating resource management results and effectiveness). These areas are suitable for timber harvesting and other resource activities for which best management practices have been developed and are applied, monitored, and modified (adapted) as needed to meet each area's management objectives (USDA Forest Service 1995a).

In 1994, under PACFISH, the Forest Service and BLM prepared an EA that developed interim watershed management strategies to improve anadromous fish production on the Federal lands and waters of eastern Oregon and Washington, Idaho, and parts of California. It evaluated the ecological conditions of the upper Columbia River Basin. The Interior Columbia Basin Ecosystem Management Project (ICBEMP) was designed to amend existing forest plans, goals, objectives, standards, and guidelines for anadromous fish habitat. The decision notice and decision record, signed by the BLM Director and the Forest Service Chief in February 1995, implemented interim strategies, while long-term strategies were being developed. The interim strategic objective was to avoid the extinction and any further endangerment of anadromous fish stocks or to otherwise limit the consideration of options to those ensuring their long-term viability. PACFISH did not consider areas within the northern spotted owl's range because the Northwest Forest Plan provided its own comprehensive aquatic conservation strategy (USDA Forest Service 1995a; USDA Forest Service and USDI Bureau of Land Management 1995).

Breaking New Ground Once More

Thus, national forest managers once more are "breaking new ground" — managing multiple uses on national forest lands, fitting multiple uses and

their benefits into ecosystems according to the ecosystems' capability to support them. "For the greatest good for the greatest number" in the Gifford Pinchot tradition continues to be a national forest management commitment. But it is being pursued within the new framework of the ecosystem approach to resource management. In this framework, the beneficial uses and services that national forest ecosystems provide are balanced with sustaining the long-term health, biodiversity, and productivity of the ecosystem.

The current state-of-the-art in resource management — the existing science, knowledge, and experience — will have much to contribute to this approach. However, more specific management standards, guidelines, and practices will be needed for sustaining ecosystem health and biodiversity. Obtaining decisions on mutually compatible management goals and objectives across the multiple ownerships, public and private interests, and multiple government jurisdictions and across the wide scope of ecosystem regions and their components will be a much broadened and more complex challenge. Thus, the ecosystem approach to resource use and management will continue to be as much a learning experience as a management experience. National forest managers will continue to learn from the responses of nature, the successes and shortfalls of management, and scientific research and to adapt management to their new knowledge, the evolving ecosystem conditions, and the diverse and evolving public preferences for resource use and management.

Scientific research can do much to enlighten the dimensions and solutions of resource management challenges, but it cannot offer holistic solutions for the social, political, and biological aspects of ecosystem decisionmaking. Scientific research can define the biological and physical decision space for ecosystem decisionmaking, but it cannot determine the management decisions that must also reflect the values of society, its interest groups, landowners, and managers.

Thus, the ecosystem approach in many ways is like a riddle wrapped in an enigma — it will require effective societal and human processes as well as biological and the technical processes, informed

with the best available science and experience from the ecosystem approach to management to achieve sound, sustainable solutions. Indeed, the national forest managers commitment to the ecosystem approach is once again "breaking new ground."

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Epilogue

A 90-Year Learning Experience— And It Isn't Finished Yet

It is difficult to find a more expressive way to summarize the 90 years of managing national forest multiple uses from 1905 to 1995 than that expressed in the title of the book: "A 90-Year Learning Experience and It Isn't Finished Yet." In 1905, the basic technical knowledge and underlying science of America's forests and forest managers was, at best, extremely limited. There was much to be learned from research, experience, and resource responses to use and management practices. At that time, and in the following decades, management was largely driven by the demand for the use of national forest resources.

Resource use, however, was balanced by an equal or greater concern for protecting the resources from destructive forces — fire, insects, disease, and wind — and for their continued viability and production as natural cover types with a strong emphasis on watershed protection and maintenance of favorable waterflows. The coordination between watershed protection and the management of other resource uses was basic to all national forest management from the beginning, and it remains so to this day. Only the scale of this effort and its methods have changed as uses have expanded and watershed management technology has improved. Watershed protection and maintenance of waterflows have remained the primary and dominant concern of national forest management throughout its first nine decades. Where wildfire or other natural events or shortfalls in use or management caused impairments, early stabilization and rehabilitation were a top priority. Except for the South Fork of the Salmon River event, there have been few, if any, major watershed and waterflow disasters on National Forest System lands.

There have been many changes in management policies and practices. In the early decades, using predator control to help build up big game herds was an accepted and desirable wildlife management practice. In time, however, it became evident in many places that such herds were exceeding their habitat capacity and impairing their own living

environments. Thus, a new management principle for reducing or limiting game herds to the capacity of their habitats emerged — a 180-degree shift away from predator control as a primary game management measure.

For many decades, timber harvesting on national forests, particularly clearcutting, was seen as beneficial to elk and other wildlife populations. Clearcuts increased the horizontal diversity of forests, improved wildlife food and forage supplies, and expanded edge effects and related habitats. In the 1960's, however, elk interests observed behavioral disturbances among some of their favorite herds in the Rocky Mountains. They raised questions about the adequacy of the current management direction for elk habitat. Major research studies were undertaken in timbered elk habitat areas over a 15-year period to evaluate timber sale layouts, logging, and road construction with other factors that needed to be taken into account in integrating elk herd habitat requirements with timber management activities. The findings and recommendations from these studies led to a revised elk management strategy.

Selection harvesting was the early recommended silvicultural practice for managing and regenerating old-growth Douglas-fir stands on national forests. But national forest managers, in time, learned that the practice made selectively harvested stands subject to windthrow and timber losses. Thus, they shifted to harvesting and regenerating with clearcuts. In doing so, they also quickly learned that clearcutting was more economically efficient than other silvicultural systems. Over the years, clearcut sizes were reduced to improve the success of natural regeneration and to reduce landscape disturbance. Landscape architects were employed to develop design and location techniques to blend clearcut boundaries into the landscape to simulate natural openings. In the last two decades, alternatives to clearcutting have been increasingly used to reduce the total area clearcut in all forest types.

The idea of setting aside large areas of pristine forest lands as wilderness preserves emerged on national forests in the 1920's, and by the 1950's, 15 million acres were being planned for such designation. Wilderness interests supported this national forest initia-

Epilogue

tive but took issue with the National Forest System's approach to wilderness identification and location when they perceived that it as biased toward maximizing commercial forest area available for timber harvest. These interests influenced Congress to withdraw the Forest Service's authority to designate wilderness in 1964 and to give it to Congress — a step that ultimately led to a relaxation of the pristine standard for national forest wilderness designation. National forest managers, nevertheless, have continued to manage wilderness areas to pristine standards without objection from wilderness interests. During the 1980's, congressional designation of national forest wilderness increased the total area of wilderness to more than 30 million acres — more than double the area that national forest managers had originally planned to designate.

An early policy objective on national forests was the prompt suppression of forest fires. The national forest goal was to reduce the threat of commercial timber losses; the risk of loss of regenerating and immature forests; the threat of damages to soil, streamflows, and community water supplies; and the threat of wildfire to community citizens, residences, property, and other developments.

When it became evident in the 1960's that effective wildfire suppression was contributing to major fuel buildups on many forests, the management objectives shifted to forest fuel and fire management. Under these objectives, where wilderness guidelines prescribed minimum or no human intervention, natural wildfires in wilderness were allowed to burn themselves out naturally. Elsewhere, wildfires were allowed to consume accumulating fuels where the potential damage was limited and expected to be less than the costs of suppressing a wildfire or where a wildfire could accomplish a planned management objective for improving wildlife habitat or some other resource objective.

Prescribed burns were introduced as a management tool to reduce excessive forest fuel loadings that were becoming "difficult-to-control" wildfire hazards and to meet other forest management objectives for wildlife habitat, range improvement, or favorable ground conditions for forest regeneration and growth

of forest stands. Today, on certain forests, periodic burns or wildfires are seen as essential in sustaining fire-dependent forest ecosystems.

The 1969 Douglas-fir study examined the feasibility of increasing national forest timber supplies from high-value old-growth Douglas-fir timber stands in the Pacific Northwest. It evaluated different harvest levels and timber management intensities for both the first and second rotations. Unexpectedly, the study found that the current harvests could not be sustained into the next rotation with the current management intensity. This led to a new policy for nondeclining timber harvests. The nondeclining timber harvest policy altered sustainable harvest calculations from a timber inventory plus growth method during the first rotation to the calculated growth potential that the current management would support in the next rotation. The direct implication of this new policy was a need to reduce national forest timber harvests to the level that the current management intensity could sustain into the next rotation. Congress, however, opted to turn this implication inside out and instead raise the intensity of management to a level that would sustain current harvest into the next rotation — a decision that led to major increases in reforestation and timber stand improvement investments. Today, national forest timber management planning determines long-term sustained timber yield capacity for fully managed long-term forest conditions jointly with established management objectives for other multiple uses and existing timber management intensity. The allowable sale quantity is equal to, or more generally less than, the long-term sustained yield because current trend conditions are often less than those for a fully managed future forest.

The rapid growth of wildlife, fishery, recreation, and aesthetic uses on national forests in the 1950's, 1960's, and 1970's greatly increased the need for better national forest planning and management integration and coordination of these uses with commodity production. This rapid growth also expanded the need for specialized expertise and staffing for these resources — a development that steadily and greatly broadened the disciplinary skills and management capabilities on national forests.

Other, more specific, environmental legislation such as the Clean Water, Clean Air, and Endangered Species Acts and other acts passed during the 1970's and 1980's similarly called for new criteria and standards. The Endangered Species Act of 1973, for example, required a stronger emphasis on managing national forests for endangered, threatened, and sensitive animal and plant species — an emphasis that grew rapidly as the list of threatened and endangered species rapidly expanded in the 1980's. The environmental laws also required that Federal land and resource managers inform and involve the public in resource planning and decisionmaking processes.

The National Environmental Policy Act of 1970 (NEPA) and the National Forest Management Act of 1976 (NFMA) established new criteria and standards for planning and managing multiple uses on national forests which called for management changes, innovations, and adaptations to ensure higher environmental quality on national forests. This was a massive challenge — national forests constitute almost one-twelfth of the Nation's lands and waters and fully one-eighth of its forests and rangelands. The new science, knowledge, technology, and technical skills required to implement the new criteria and standards were to come much more slowly. The actual implementation of this new management technology, as it becomes available, will come even more slowly because management activities in any one year touch only a small percentage of the 191 million acres of national forest lands and waters.

Public participation in national forest planning and implementation of management projects, on the other hand, expanded very rapidly and led to accelerated appeals and litigation. Such appeals raised issues that led to new National Forest System guidelines on how to inform and involve the public in national forest activities, how to respond to the expanded public's interest and input, and how to reach better decisions — leading to better quality national forest management plans and plan implementation and more effective decisions for managing multiple uses (USDA Forest Service 1981–1992). National forest managers have also worked to develop more effective two-way communication with the public,

interest groups, and individuals and more responsive adaptive management decisions. Nevertheless, conflicts among various interest groups about the proper use and management of the national forests have not been eliminated, nor have Federal appropriation and budget limitations on implementing national forest programs.

The Ecosystem Connection

The adoption of the ecosystem approach to national forest management in 1992 expands the need for new science, knowledge, technology, and technical skills, even more — opening the door for a new 90-year learning experience in effectively implementing the ecosystem approach. Its first requirement is that national forest lands, waters, and resources be reclassified according to the national hierarchical framework of ecological units, which in itself will be an important basic learning experience. Fortunately, after two decades of research and analysis, the Forest Service will be ready with the hierarchy of ecoregions and ecosystem units for the United States (USDA Forest Service 1995) and the principles for defining and mapping ecosystem boundaries at their various geographic scales (Bailey 1996). Defining and establishing the boundaries of ecosystem units within national forests is the first, basic step for an effective System-wide approach in managing and sustaining ecosystems, their resources, and their habitats. It will also require new resource inventories reflecting the on-the-ground ecosystem structure and classification — not only for National Forest System lands, but for other ownerships as well. This will take time. It will be several years before a System-wide ecosystem approach can be uniformly and effectively implemented on the ground among the wide variety of ecological units that range in scale from broad ecoregions measured in tens of thousands of square miles, their smaller subregions, landscape zones of similar land types measured in thousands and hundreds of acres, and local land units such as cliff and cave sites, riparian areas, small marshes, and other specific site conditions that are measured by a few hundred to less than ten acres.

Understanding the biological and physical working relationships within ecosystems, the interactions

among their subunits, and their response to fitting many uses within them are a new learning challenge as well as a management challenge. Such learning and management is underway in the Pacific Northwest and northern California under the Northwest Forest Plan and the interim strategy (PACFISH) for anadromous fisheries in the Interior Columbia Basin Cooperative Management Project and elsewhere in more local national forest situations. This approach requires managers to consider the effects of use and management on local ecosystem units and their interactions with each other over time within the framework of the structure and functions of the broader ecoregions and landscapes within which the local units occur. Such coordination and integration appear to involve much judgment as well as much uncertainty.

The need to consider resource management and its ecosystem effects on other public and private ownerships adds another complex dimension. The current state-of-the-art (the existing knowledge, science, and experience) of resource management will contribute much to implementing this ecosystem approach, but national forest managers will still need to learn by doing, observing, evaluating, researching, and adapting to changes in ecosystem conditions and new ecosystem knowledge and understanding as they emerge over time.

Adaptive management — the adjustment of management practices to the changing conditions and uses of ecosystems over time — is a corollary of the learning process and will become the path to the future just as it was the path from the beginning of national forest management to the present. National forest management has been and is the fitting of multiple uses into ecosystems according to their capability to support each use, compatibly with existing uses, in ways that sustain ecosystem benefits and their supporting physical and biological resources for future generations. It is necessarily based on the existing state of knowledge and science, management technology, and established policies and values. This has been the underlying goal and nature of national forest management of uses and resources over its history and it remains so today and into the future.

The ecosystem approach to national forest management has always been reflected in the national forests' primary emphasis on protecting and maintaining watersheds and waterflows in the management of all other multiple uses. The wide array of research natural areas, initially established in the 1920's in cooperation with the Ecological Society of America, now represents the tremendous natural heritage and diversity of ecosystems found on National Forest System lands. They reflect a genuine concern for comparing the performance of managed forests with natural ecosystems.

The strong focus on rehabilitating the acquired, badly beaten, and often burned Eastern national forest lands from 1911 to the present has been a deliberate and successful effort to restore the degraded ecosystems they once constituted. The work of Jack Ward Thomas in integrating wildlife habitat management with timber management on four national forests totaling nearly 4 million acres in the Blue Mountains of Oregon and Washington in many ways was an early practical and successful demonstration of the applicability of the ecosystem management principles and approach to National Forest System management (Thomas 1979).

Thus, the concern about ecosystem performance and productivity on national forests is not new. What has changed is the knowledge and science of ecosystem structures and functions and their importance in maintaining the diversity, health, productivity, and sustainability of ecosystems. The enormous growth in the level and diversity of uses and the changing balance among national forest ecosystem uses have also raised questions and even national debates about the quality of the national forest environment for many uses, particularly those associated with recreation activities, wildlife habitats, landscape perspectives, and forest solitude.

Changing public values and the public's concerns about the quality of recreation and wildlife experiences, landscape aesthetics, and wilderness conditions have also contributed to issues being raised by the public about the direction of natural resource management on national forests.

The Endangered Species Act has given top priority to restoring the viability of plant and animal species populations that are officially listed as in danger of or threatened by extinction.

The Clean Water and Clean Air Acts have raised concerns about water and air quality.

The National Environmental Policy Act similarly has elevated the general concern about environmental quality. The National Forest Management Act has raised standards for managing all national forest resources. These changes have largely emerged independently and incrementally. They constitute sharp shifts in resource values and management standards and, in a sense, they have come on the fast track.

The new ecosystem knowledge, science, and management technology to implement these new values and standards have come more slowly. In many ways, their development comes on a slow track. Research for new technology takes time. Training or retraining of thousands of natural resource managers cannot be accomplished overnight. Change in natural resource use on national forests is difficult to bring about without direct commitments from Congress to change the management and production goals as well as the level of appropriations and their balance for national forest use and management. National forests remain resilient and responsive to management. They will respond to new management guidelines and standards that will emerge from new ecosystem management knowledge, science, technology, and learning experiences.

National forest management will likewise respond to growing demands for multiple uses according to the capabilities of ecosystems to produce them. As the learning and management experience continues, national forest ecosystems will also improve in their diversity, health, productivity, and sustainability in some form of dynamic growing stability.

The commitment to an ecosystem approach for managing multiple uses on national forests is a massive one. It is even more challenging than the area of national forests implies because ecosystem

management involves consideration of ecosystem conditions beyond the borders of national forests and collaboration with other government land-managing agencies and private landowners as well.

This challenge is not new, but it is more complex. National forest managers from the beginning have been accustomed to coordinating the management of wildlife habitats with State game commissions and wildlife agencies. National forest range management has similarly fitted the needs and management of permittees' rangelands and grazing enterprises with maintaining and improving the range resource. The national forest concern for protecting and maintaining watersheds and waterflows has reflected the water needs and uses, and often the stream conditions, of downstream communities, ownerships, and users. Insect, disease, and wildfire control likewise involved broader ecosystem consideration and coordination than national forests alone because insects, disease, and wildfires are not respecters of ownership or jurisdictional boundaries.

The ecosystem approach calls for a holistic view of the ecological and socioeconomic aspects of entire ecosystem landscapes and their associated rural and urban communities. This is a formidable challenge because the ecological knowledge, its science base, and the management technology for implementing an ecosystem approach holistically on a broad scale over the long term are yet very limited and will develop slowly. Our experience and administrative and political capabilities for integrating management goals and objectives, let alone specific management actions across multiple public land jurisdictions and a multitude of private ownerships, is likewise very limited. We lack established institutional arrangements for doing so.

The historical evolution of management of multiple uses on national forests offers strong evidence of an incremental pathway to a holistic ecosystem approach to resource management (fig. 28). We now seem to be about midway along this pathway. The path, however, is very long and will involve considerable learning and long management experience before we arrive at a fully holistic approach to ecosystem management.

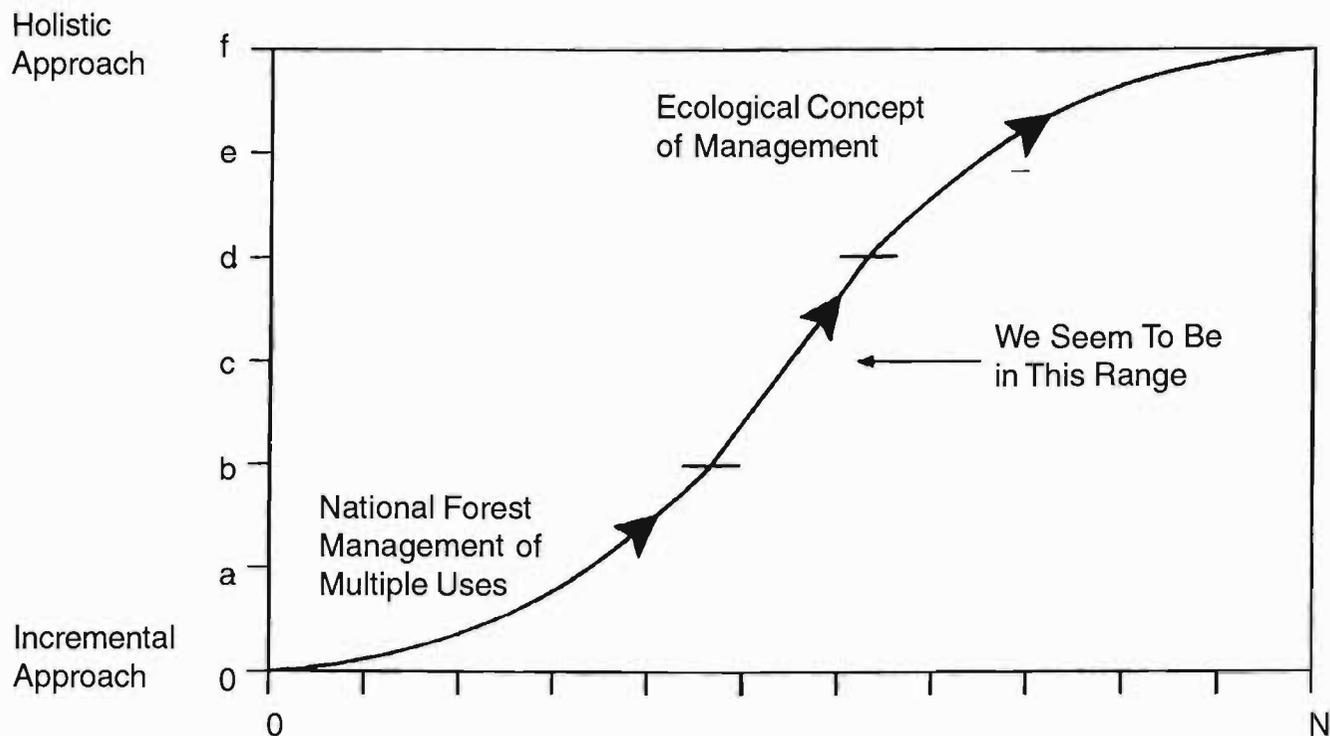


Figure 28. The Pathway Hypothesis: over time, the pathway of traditional national forest management leads to a fully holistic approach to resource management.

The merger of the traditional, largely bottom-up incremental approach of managing multiple uses with the holistic, primarily top-down ecological approach to management will be complex and will develop slowly. Although planning and decision-making will become more holistic, implementation will necessarily remain incremental — use by use, area by area, year by year, decade by decade. Management will remain adaptive, requiring much judgment, until we have a credible theory, science, and technology for holistic management that are widely accepted by multiple jurisdictions and multiple ownerships that make up ecosystems.

Thus, implementing the ecosystem approach in managing multiple uses on national forests will continue to be as much a learning experience as national forest management has been in the past. It will move forward adaptively as national forest managers continue to learn from experience as well as adapt to

new knowledge and technology and as public goals and objectives for resource management and uses change over time.

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From 1946 to 1959, Dr. Fedkiw served with the teaching faculty of the State University of New York College of Environmental Science and Forestry in Syracuse, where he taught in forest economics, statistics, and forest management. He also served as a consultant with several major forest industry firms and has published more than 75 technical articles, papers and booklets.

Dr. Fedkiw is a recipient of the U.S. Department of Agriculture Distinguished Service Award and the President's Meritorious Executive Award. He earned his Ph.D. in agricultural economics at Cornell University in 1953. He has a masters degree (1948) from the Maxwell School of Public Administration at Syracuse University and a bachelor of science (1941) in forest management from the State University of New York College of Environmental Science and Forestry in Syracuse. He is presently serving as a volunteer with the USDA Forest Service in Washington, D.C.