AN INTERVIEW WITH

CARL E. OSTROM

By

Harold K. Steen

Forest History Society

Durham, North Carolina

1994

Table of Contents

Introduction

Carl Ostrom's name comes up frequently when interviewing former chiefs and deputy chiefs of the Forest Service. Thus, it seemed as though I already knew him when we first chatted briefly in the hotel where I was staying in Prescott. The interview was to begin the next morning, and he wanted to break the ice ahead of time. We looked at a few old photos and he inquired about my well being, and that was the substance of our first meeting.

Carl had arranged for a library conference room in the local two-year college, where since retirement he has earned more than seventy credits in art and language. By mail we had developed an interview outline in advance, and we pretty much adhered to it during the two half-day sessions that followed. He promptly and carefully reviewed and corrected the transcript that follows.

At close of the second and final session, I joined Laura and Carl for lunch at their town's edge home where he shares a property line with the Bureau of Land Management. The temperature was 85 degrees and the humidity 8 percent, and we enjoyed viewing the wild BLM lands from a shaded deck. Inside on every wall is the Ostrom Gallery of Art--his own paintings--water colors of Southwestern scenes, and those of Europe and Latin America. Spectacular scenery inside and out, a good lunch, and warm companionship. A most pleasant way to conclude an interview.

Carl Eric Ostrom was born in Philadelphia on May 29, 1912. He earned a bachelor's degree in botany from Penn State College in 1933, a master's in forestry from Yale in 1941 and a Ph.D., also from Yale, in 1944. However, in important ways, it was the earlier education he received at Philadelphia's Girard College High School where he graduated in 1929 that influenced him through the years. The post-retirement credits in art and language stem from values acquired while a teenager.

He began his long Forest Service career in January 1934 with a temporary appointment in the Washington Office. Later that same year he transferred to the Northern Rocky Mountain Forest Experiment Station in Missoula where he was assigned to silvicultural research, the field that would remain the center of his research efforts.

Typical of his Forest Service contemporaries, Carl transferred frequently. In 1936 he left Missoula for Philadelphia and the Northeastern Station and then to Beltsville, Maryland in 1942. In 1944 he moved south to naval stores research in Lake City, Florida. In terms of his career, he made a significant move in 1950 into research administration as director of the Division of Forest Management Research at the Southeastern Station in Asheville, North Carolina. Nineteen fifty-seven would find him in Washington, D.C. as director of Forest Management Research agency-wide. His final promotion did not include packing household goods when in 1974 he was named associate deputy chief for research. Carl Ostrom retired in 1975 and would shortly move to Prescott, Arizona.

Carl sent me a list of his publications--fifty-one in all; the first was in 1937 and the last in 1973. Any of us would be proud of that list, but he added by a note that four "standard reference books on forestry" were produced under his direction: Little's *Checklist of Native and Naturalized Trees of the United States*, Schopmeyer's *Seeds of Woody Plants in the United States*, Fowells' *Silvics of Forest Trees of the United States*, and the multiauthored *Silvicultural Systems for the Major Forest Types of the United States*. The fifty-five titles are reflective of why Carl's name crops up frequently when interviewing others and why he received both the Superior Service Award and Distinguished Service Award.

The interview was made possible through a participating agreement between the Forest History Society and the USDA Forest Service. Special thanks are due to Stan Krugman and Bob Buckman, and of course to Deputy Chief Jerry Sesco who signed off on the project.

Harold K. Steen
Durham, NC

Harold K. Steen: Do you want to start with the photographs?

Carl E. Ostrom: Okay. This is a photograph of the old Atlantic Building on F Street, where I started working for the Forest Service in 1934, before the new agriculture building was constructed. I wrote a letter to Ed Munns, and I had graduated from Penn State. I told him my qualifications, he offered me a job, and I went down to Washington. I got an emergency job in the Atlantic Building.

HKS: Tell me again how you knew Munns. He just happened to be a person that you had met, or?

CEO: No. I had read about him, because I read a lot in the *Journal of Forestry*, and I knew who he was. He was in charge of silvics at the time. In other words, forest management procedures.

HKS: That huge bibliography that he has his name on. Is that a part of what you did? You were a contributor to that?

CEO: No, but I did write the bibliography for his publication on sample plots in silvicultural research. That's one of the jobs I had.

HKS: I see.

CEO: I might have contributed to the big bibliography, but I don't recall that I did.

HKS: Obviously, a lot of people contributed to that, and he compiled it ultimately. We use it a lot. It's a very valuable reference tool.

CEO: I think the Forest Service librarian, Rosalie, did most of that.

HKS: Okay.

CEO: This is the class of '41 at Yale. John McGuire is in there, and I'm in there. Steve Spurr was there concurrently, but he may not have gotten his degree in that year.

Here are a few pictures from the World Forestry Congress. I helped the Information and Education Division with the Peace Grove, in which we established a tree for each country.

HKS: I was at that congress.

CEO: I helped select the trees, the species, to represent each country, some of which were compromises because we couldn't fairly represent tropical countries in Seattle.

This is a photograph of the furrowing and contour planting in Idaho, which later raised such a fuss in Montana.

HKS: I've not seen a photo like this before.

CEO: It makes good biology. It stopped the erosion. It stopped the water in the ditch where the trees were. It provided site preparation for the trees, and it made good sense.

HKS: You didn't have erosion problems when the snow ran off in the spring?

CEO: Not with these trenches, because this contour furrowing prevents the erosion. Erosion stops at the trench.

HKS: Did it turn out to be economic? That's a lot of equipment and time.

CEO: I couldn't answer that.

HKS: Okay.

CEO: This is a diagram that I've used in budget hearings for our genetics research, and I think George Jemison said, as a result of the presentation on genetics, that a congressional committee wanted to give him more money than we could handle.

HKS: [laughing]

CEO: So he had to tell them to make it a little more modest.

That's just an example of preparation for congressional hearings on the budget.

HKS: This is something you did, then?

CEO: Yes, I worked on this naval stores research in Lake City earlier. At this time, I was in Washington. With the help of staff, I got this diagram together for the budget preparation.

HKS: Did you work with, cooperate with Bruce Zobel? Was he involved in this?

CEO: No. His program was with forest industry, completely, under NC State.

Here are two on awards programs, in which I participated. This is the '64. Superior Service Award, so my picture's in there.

HKS: I see that. Do you know how the process works of the nomination and the verification so the committee can make the proper judgments?

CEO: Well, sure. There are proposals made by people, usually in each division, and of course the head of the unit, like Dr. Harper in this case, would probably suggest who should be written up or who should do it, and then these would be submitted to personnel. If there were too many, then they would have to make a selection, in the personnel division as to which ones made the strongest case, and which ones should get the award.

Then they were presented to the department, and I presume the department had further screening, so that they were sure they had good cases.

HKS: I have in my notes, when you were at Lake City, the research center received a superior service award.

CEO: Yes, we received a unit superior service award, and I may have that picture in here.

CEO: This is the only picture I ran across of me while I was on duty in Forest Service.

HKS: That's fine. We'll start with that.

CEO: Then I have some interesting charts here that I prepared for the Forest Service Research Advisory Committee. These are the project locations in my division. If you like, you can leaf through those. That's conifer silviculture. This is hardwood silviculture.

HKS: Oh, yes.

CEO: And this is timber measurement and management planning. This is timber-related crops and environmental tree culture. Environmental tree culture at that time consisted of the shelterbelt. I think every forest experiment station had conifer silviculture, but not every project location.

HKS: I see.

CEO: Now, at this time we were on a project basis, not a research center basis, so if we were on a research center basis, there would be fewer locations on the map. But these are research projects, after Dr. Harper converted us to a research project organization.

HKS: I see. Okay.

CEO: This is a negative--I don't seem to have the prints--of the presentation of the unit service award in Lake City, Florida. There's the state forester, and the personnel man from Washington, and myself. And that's about it for photographs.

Education

HKS: All right. You mentioned last night, when we chatted briefly, you wanted to start with the flu epidemic.

CEO: Yes, I think I should, because it resulted in important influences on my life. My father and I were sick in the flu epidemic in 1918, and my father died and left my mother with five small children and no real insurance. So I went to Girard College, which really is a high school and grammar school for fatherless boys, but since it was established back in 1848, under the will of Stephen Girard, a contemporary of William Penn and Ben Franklin, it was called "College," in the old terminology.

But I went to grammar school and high school there, from 1920 to 1929. I mention that because the will of Stephen Girard said that no minister should enter the gates, because he did not want the young minds confused by the conflicting ideas of different sects. But they did bring in prominent, successful people to talk to us every Sunday. And one thing that stuck in my mind, came out repeatedly, was these successful people said, "I wish now that I had not concentrated so much on business and making money and had carried cultural interests along through my life." They always seemed to regret that very much, so I think that influenced me to take an interest in art and music and philosophy and so on through my life and into retirement. Which was a considerable influence, then, on my retirement. So that's why I mentioned Stephen Girard. Of course, they did teach us the principles of morality. On the whole the boys got very good training and were quite successful.

I entered Penn State the first year they had a forestry freshman program at Mont Alto, Pennsylvania, in which we learned a lot about forestry and worked in woods, studied silviculture and ecology and things like that. And when we got to Penn State it seemed to be more of the same.

My sophomore year I wanted to drop out and get a job and earn some money for a while, and I asked the dean of forestry if he could get me a job, and he said, "I can't even get my graduates a job. How could I get you a job?" So I talked to Professor Harold Lutz, who was later professor at Yale, but then at Penn State, and I knew that I wanted to go into research.

HKS: You knew that as a sophomore?

CEO: Yes. He advised that I change to botany and get a better grounding for graduate study in sciences and botany and chemistry, particularly the language requirements and organic chemistry and all that sort of thing. Which I did, and I graduated in botany.

Then, when I got to Yale, Harold Lutz was a professor there, and his advice turned out to be very sound because I had no trouble with organic chemistry, which some of the forestry students had, and I got through very well in a fairly short time in graduate study. I think it was a good decision on my part earlier.

HKS: It's interesting. I found botany so fascinating, freshman botany, that, had I known at age eighteen that I would eventually go to graduate school, I would have switched from forestry to botany. But at that time I didn't see myself ever going on to graduate school, and I figured a bachelor's degree in botany wouldn't be all that useful to earn a living. Anyway, we have some similarities.

Beginning with the Forest Service

CEO: Yes. I was out of work at the height of the Depression, when I got through in '33, until Roosevelt started the conservation program in late '33, early '34.

When the conservation program opened up, I wrote to Ed Munns in Washington, told him my qualifications and my training in botany and so on, and he told me to come on down to Washington. He gave me a job down there, working just in the Washington office.

HKS: How many people your age were there? Did he hire a lot of people?

CEO: No. I think one or two others. There was one fellow who worked with the library. That's all I remember. Ted Haig was there at that time. He was later director of the Southeastern Forest Experiment Station. But at that time he was at the Northern Rocky Mountain Station, and he invited me to come out and work as a field assistant in Idaho out of the Missoula station. So I did, and I went out there and worked at the Northern Rocky Mountain Station in silviculture from 1934 to '36.

HKS: Just to pick up one point: Back in Washington, when you were working for Munns. You've only said library research. Can you characterize it a little bit more? I mean the sorts of things?

CEO: He would give me assignments, and one I specifically remember is he had written a book on sample plots in silviculture research, a booklet, and he asked me to go and make up the bibliography for the bulletin.

HKS: You mean after he wrote it.

CEO: After he wrote it.

HKS: [laughing]

CEO: Which I did. I did the library research.

HKS: Is that the sort of sequence usually? He would write something and then document it?

CEO: I'm not sure. All I know is that one incident.

HKS: Okay!

CEO: So that was the one job that I recall. But I must have done other jobs of that nature for Ed Munns.

Priest River Experimental Forest

When I got to Montana and Idaho, I worked at Priest River for one summer and also at Deception Creek Experimental Forest and Priest River for another summer or two summers. I worked under Chuck Wellner, who is the real expert on silviculture of western white pine.

I also worked with Mr. Weidman, an old-time silviculturist there. Lyle Watts was the director of the station.

HKS: Is that the only time that you were involved with Lyle Watts?

CEO: Yes. That's right.

HKS: I realize he was quite a ways above you. Did you have any sense of the man? Talk about Watts.

CEO: He was very personable. He always got around to visit people in the field. He would go down at the bottom of the agriculture building and talk with the people in the mailroom. He was just that kind of a guy. He was pretty good at making speeches about the whole controversy on regulation.

HKS: That's right.

CEO: He could make a very good talk on regulation. He was, I think, good, effective--

HKS: Even when he was in research, he was doing that.

CEO: This was later.

HKS: Oh, that's later. Okay.

CEO: But I thought he was a fine station director, and I knew he was on the way up, so he wasn't there too long when I was there.

HKS: I talked to Frank Wadsworth. He mentioned his father-in-law, Gus Pearson, here at Fort Valley. Frank felt that there was competition between the various stations, especially on silviculture. Who was getting the next publication out? Did you have that same sense?

CEO: Not about publications, but of course each one always wanted more money. But that was resolved in the Washington office by the man in charge of research. No, I didn't get that feeling about competition.

HKS: Okay. That's fine.

CEO: The main work I did at Priest River was field work on I.T. Haig's Ph.D. research on seedling establishment and survival in the western white pine type.

HKS: So at the time you were working on it, it was clear that this was for his dissertation.

CEO: Yes. That was his dissertation. It was, I thought, quite a good piece of work on the regeneration of the western white pine type. It included all the associated species.

HKS: And this was published as a Yale bulletin? He got his Ph.D. at Yale?

CEO: Yes. Well, he was assigned to the Northern Rocky Mountain Station.

I was assistant under Chuck Wellner. Because of that degree in botany. I didn't have a degree in forestry, so I couldn't get a junior forestry appointment, but they gave me a field assistant appointment, until I passed junior forestry examination.

HKS: So even those in research had to get the junior forestry exam, to get the civil service appointment.

CEO: Yes. That's the way it appeared.

HKS: That changed, when?

CEO: Pretty soon, with the expanded conservation programs, they got out civil service exams in forest ecology and silviculture.

HKS: Okay.

CEO: And related subjects. I passed the examinations for junior forester, and for junior forest ecologist, and for assistant silviculturist, and for tree physiologist, at different times. I held each of those titles sooner or later.

HKS: The junior forestry exam. From what I've heard, it's almost legendary how difficult it was because it had so much practical application that you didn't study in school.

CEO: But the schools knew how to prepare the students.

HKS: So you were ready for it.

CEO: Yes. I was the second in the country. The guy ahead of me, his name was Lord, so I didn't feel too bad.

HKS: [laughing]

CEO: But anyway, that was the main thing I worked on, I.T. Haig's thesis project. I also worked some with Mr. Weidman on a historic seed-source study on ponderosa pine. He must have started that right away, at the start of the Priest River Experimental Forest, because when I worked out there in '35, the trees were twenty-two years old. It showed that the best growth came from the seed sources from California, but a cold winter knocked them out.

HKS: The station was working on ponderosa pine? What was the coordinating program that you were aware of, maybe at the Washington office, to make sure that you weren't doing the same thing?

CEO: Oh, yes. And there was no question that we needed plantations from different seed sources for the northern Rocky Mountain area, regardless of what they needed in the Southwest.

HKS: Okay.

CEO: That was pretty obvious. I did the sectioning of the leaves to show the differences in anatomy of the trees from the different parts of the whole ponderosa pine region.

HKS: Was there a theory or hypothesis that you were testing? Or just descriptive?

CEO: It was to determine from what areas it was best to pick seed for planting in the northern Rocky Mountain area. Most of these seed-source studies show that local seed is best, but there can be exceptions, and at that time they didn't know whether there would be exceptions or not.

HKS: What were you measuring to determine if the offspring was good or not?

CEO: Survival and growth.

HKS: Survival and growth.

CEO: And the growth for the California seed source was by far the best, but they were not frost-resistant. And the growth from some of the dry, interior parts of the West weren't as good as from the northern Rocky Mountain area itself. So it substantiated the general thesis that usually local seed source is best. But you have to know how far you can go with local seeds. So I worked on that study. That's essentially what happened on my first assignment there, at the Northern Rocky Mountain Station.

HKS: You didn't have any projects of your own at that time? You were an assistant to someone.

CEO: That's right. Interestingly, I did my soil analyses in a little woodshed. That brings back George Jemison's talk for Senator Stennis.

HKS: I often wondered why he used that.

CEO: I think he probably did some of his lab work in the woodshed.

HKS: [laughing] How 'bout that?

CEO: George was in fire research at that time with Harry Gisborne.

HKS: Okay.

Kane Experimental Forest

CEO: Then I wanted to go east. I had passed the junior forester exam, and I was offered a job by the Northeastern Station as a junior forester. That was my home area. I decided to accept that, and I went to Kane, Pennsylvania, with about five other junior foresters. They had some sort of emergency money to hire a group of junior foresters for research.

Gradually, with increases in costs or reductions in budget, they lost most of those, but they kept me on, and I was at Kane for five years. I worked on various things there, hardwood clear-cutting, volume tables, prescribed burning over in New Jersey, on which I published an article, but I didn't really do the research. Also, on conversion costs for cutting different size trees in northern hardwoods, forest planning, and animal damage.

HKS: I'm still trying to get a sense of what research was like in the '30s. Was it was largely descriptive because there wasn't the body of knowledge yet. Like in hardwood silviculture. What did we know about hardwoods?

CEO: The work had been going on in Kane, Pennsylvania, for a little while before that, maybe five years before I went there. So they were getting a start, and it was pretty clear roughly how to handle the northern hardwoods because you have quite a few options. You have shade-tolerant species so you can use the selection system. Most of that area had been cut clean and came up to very nice second-growth stands, so there was an obvious need for stand improvement. In other words, thinning and stand improvement cutting.

We didn't have much old-growth left in which to use selection system, but we put in some plots on selection cutting. That was much more thoroughly handled in the northern hardwoods up in the lakes states by F. H. Eyre. They had real, long-time experiments in selection management, and I think they still have.

We were mainly dealing with second-growth cherry-maple stands, and also planting. The areas which had been clear-cut earlier in northern Pennsylvania that were in conifers, burned over. They were badly in need of planting because they came up to just brush and aspen. We did quite a little research on planting, but particularly managing second-growth northern hardwood stands.

HKS: I'm impressed by the range of topics you published under. That wouldn't happen today. I mean, you'd be more specialized today.

CEO: Probably.

HKS: Of course, you had five appointments.

CEO: Most of the research money at that time was in silvics and silviculture, so in order to get some of the other work done, they often used silviculture money to bring in work on animal damage, which could be considered silviculture, and even on watershed effects. Some of the Alaska work on silviculture related to the effects on salmon streams, for example.

HKS: Sure.

CEO: So you were correct. Silviculture kind of spread out then, because there was very little money for other functions at that time. That covers the main things we did in Kane, Pennsylvania.

Yale School of Forestry

I went up to Yale for a master's degree, and one interesting thing: I told Professor Graves, who was the dean, that I didn't think I had room in my schedule for another economics course, and he said, "Well, just come in and see me. We'll have a one-on-one course for one credit." I got one credit, and I did twice as much work! Because he had me read a book every week.

HKS: Tell me about Henry Graves as a person.

CEO: He was reserved and quiet and perceptive and very helpful. I mean, in this one-on-one course, he'd spend an hour with me a week. I couldn't see how he could afford the time, but he did. I appreciated it very much. He had a feel of the importance of forest to the local community. I thought that I was very fortunate that I had that opportunity to have that one-on-one course from Dean Graves.

HKS: Here's a former chief of the Forest Service, one of the profession's most historic figures, talking about the importance of forestry to the local community. You'd think he'd be talking on a grand stage, world forestry, or something, but he--

CEO: Yes, he gave me that slant. Among others. He had me read, well, as I said, a book a week, unfortunately. [chuckling] But it was a nice opportunity to know Dean Graves.

I got the silviculture prize. It might have been unfair, because I had already worked on western white pine silviculture for two years and had the benefit of all that fine work that was done out there at Priest River by my predecessors. My examination was to tell all you know about the silviculture of one timber type.

HKS: What other courses? You obviously took silviculture and economics.

CEO: Yes, and I took ecology and climatology and physiology. I was quite interested in ecology and physiology. I had one harrowing experience. I had Dr. Sinnott, who was a famous geneticist. One of my assignments for the next period was to take a seventy-page article in German on a very abstruse plant physiological study, and my German wasn't too proficient. Fortunately for me, I guess, I got yellow jaundice. I was in the hospital for four or five days, and I spent all that time translating this seventy-page German article on abstruse plant physiology, and reported on it. [chuckling] I don't think I could have done it otherwise.

HKS: This translating from German, or French. Was that relatively common then? It would be less common today.

CEO: Yes, less common today, but it was more common then. And one of my earliest publications was a review of half a dozen articles in French, dealing on exotic species. So I guess I could read French all right at that time, but German--

HKS: This goes back to the special high school you went to, where you learned languages.

CEO: We had French there, but then, transferring to botany, I had to include more languages in my college program, too, to graduate in botany, so I had more German and French in college than I would have in forestry. That was another benefit of Professor Lutz's advice to change to botany.

Wartime Research

CEO: Then, as the war came along, the Forest Service had a project at Beltsville, Maryland, financed by the Defense Department, on camouflage planting and the treatment of vegetation, especially trees, around military installations, particularly wound healing and making up for the damage done in the construction of military establishments.

We did some pretty intensive work on the use of plant-growth regulators. The idea was to control the growth of trees so that we could hold it back in the spring and plant them any time in the year as needed around military installations for camouflage purposes.

We did some of the pioneering work on use of plant-growth-regulating substances on tree growth, and that resulted in that *Botanical Gazette* publication, which as my Ph.D. thesis.

HKS: Tell me about wound healing.

CEO: A lot of the things people slap on are injurious to the cambium, like tarry compounds. So we tried different things, and we found that a good, safe thing to use, and protective, was lanolin, which is sheep fat. Lanolin gives protection against moisture loss but doesn't damage the cambium. So that's part of what that amounted to.

But the much more important work was the use of these plant-growth-regulating chemicals to try to control the seasonal growth of trees. The result was that it killed the conifers. That is, the effective dose was so nearly lethal that usually it killed the conifers. But it helped the inception of root growth in hardwoods. It later led to much greater use of these plant-growth-regulating compounds to stimulate root growth in trees. That was one of the positive results of the work.

But, at the same time, at Fort Dietrich nearby, the Army was doing pioneering work with plant-growth regulators, strictly from the standpoint of herbicidal use, to kill vegetation. That turned out to be by far their major use, in the future.

HKS: What kind of personnel did the Army have? Civilians working for the Army?

CEO: As far as I know, they were civilians. They hired plant physiologists. But in this work on plant-growth regulators was done in close cooperation with the Agricultural Research Service, because ARS had started the work on plant-growth regulators, and they had the plant physiologists who really got this work underway. Then they gave us the chemicals to use on the tree seedling materials, and helped us interpreting results and that sort of thing, so it was a very nice partnership with ARS at Beltsville.

HKS: At Beltsville.

CEO: Yes. All this work was done at Beltsville.

HKS: I didn't know ARS existed by that name at that time.

CEO: Well, it was Bureau of Plant Industry. In fact, Bureau of Plant Industry, Soils and Agricultural Engineering.

HKS: [chuckling] I could see why they changed the name!

CEO: Yes.

HKS: Plant industry. Yes, that's a bureaucratic name. I mean, it has no apparent meaning. Plant industry. But that's the government for you.

CEO: Yes. You might be interested in that conscientious objector group that assisted us.

HKS: I went to the annual reports of the chief, and they mentioned that. Maybe they mentioned it because it was politically correct. I didn't know if it was important or not.

CEO: It was important to the research, because we had a camp of perhaps fifteen men. I think they were all college-trained people, and they were very helpful. One had a doctor's degree, and did very fine work on all

our photography, and several were foresters. Most of them were very sincere, religious people. And very good workers.

HKS: They were Quakers or Seventh Day Adventists or?

CEO: Yes, and Mennonites. I think many Mennonites and Brethren. They were very good people. They gave us a great hand in the conduct of their research in the field, and we got much more done with their help.

This thirty-four-page thesis article in the *Botanical Gazette* listed a whole lot of research results that we got with their help. We couldn't have done it without them, with anywhere near that scale. On the whole, they were able, sincere people and did very good work, with very minor exceptions.

HKS: What's it like going to school during World War II? You got your Ph.D. from Yale in '44. It must have been a pretty small class.

CEO: Yes, it was a fairly small class. But I didn't get the Ph.D. until after I completed the thesis work at Beltsville and wrote it up. The final publication I wrote in Lake City, Florida, after I was transferred there. And that was '44. But I finished the course work earlier, probably in '42.

HKS: In terms of a research career in 1944, did you feel that the Ph.D. was essential? Or was that sort of coincidental with the training you needed to do your research?

CEO: Oh, it was essential. Furthermore, I felt that to progress in research, I needed it.

HKS: So at that time, even then, the degree looked good on your resume, in that sense.

CEO: Oh, yes. Certainly. And that amount of training was obvious when a man went to work. If you had a Ph.D. in tree physiology or whatever, it was obvious that you could do that work, or that you couldn't.

HKS: But most of the people in the field doing research didn't have Ph.D.s.

CEO: No.

HKS: But you were the younger group. You could see that you were going to need a Ph.D.

CEO: Oh, yes. I had been, at one time, working under a man who had no advanced training, and I felt that I better get out and get a graduate degree to get ahead. I liked to study, and I liked the biological side of forestry, and the physiology, the ecology, and so on, and that was my real interest. So getting a Ph.D. came naturally. But I was proud that, having come out of essentially an orphanage, that I got a Ph.D. from Yale University.

HKS: Sure. Very good.

CEO: Then, while I was at Beltsville, I thought that I would try to get in service. And an announcement came out calling for candidates for officer training in the Navy. I wanted to get in, and you had to list your obvious physical defects, and I was deaf in one ear, so I mentioned that. Then I went in, and I went through all the tests, and they told me, "You're too light. You have to gain nine pounds."

HKS: Nine pounds.

CEO: So I went back, and I stopped working late, and I took it easy. I got vitamin B shots in the hip and ate a lot of bananas. I gained nine pounds, and I came back. They tested me, and they said, "You can't hear."

HKS: [laughing]

CEO: So I accepted another deferment to go on naval stores research in Florida, because I figured if I were not qualified for officer candidate training, then I could never be an officer anyway, so better accept a deferment in naval stores research, which, again, was a defense activity.

HKS: Okay. So you got a deferment from the draft.

CEO: Yes. I had a deferment working on the camouflage work there at Beltsville, and then that work was scaling down, but they did have defense work on naval stores research in Florida.

HKS: So you could have been drafted, and your hearing would have been okay to be in infantry.

CEO: Maybe so.

HKS: Maybe so.

CEO: I figured if they weren't going to take me in officer training, if they wouldn't do it now, they wouldn't do it later.

HKS: That's right.

Lake City and Naval Stores

CEO: I went to Lake City, Florida. As you probably know, there was a considerable effort out of Lake City and the Southeastern and the Southern stations for a system of research centers for the South, which was very strongly supported by the Forest Farmers Association.

What happened: Bill Ottmeier was working with, I think it was Southern Pine Products or some such outfit. He was a forester from Penn State. He went up to the appropriation committees and asked for money for forestry research in the South, and they said, "Whom do you represent?" He said, "I represent myself." He didn't get anywhere. So he came back, and he organized the Forest Farmers Association. Now they're working out of Valdosta, Georgia. He lived in southern Georgia.

At first, the Lake City station was under the Southern Forest Experiment Station. Charlie Connaughton was the director. We admired Charlie Connaughton very much. He seemed to be very efficient. He would get the secretary in there first thing in the morning and get to all of the mail, and he would go on to other things. I enjoyed working very much with Charlie Connaughton.

HKS: I don't know how many people I've interviewed, but every one of them manages to bring Charlie into the interview somewhere. People remember Charlie.

CEO: Oh, yes.

HKS: For all the skills he had.

CEO: He was station director in his early 30s, I think. Then he went on from there.

The American Turpentine Farmers Association helped us, too, in trying to build a suitable series of research centers for the South. Of course, they helped us for naval stores research. But the Forest Farmers Association was very helpful in supporting the system of research centers all through the Southeastern and the Southern station territories.

HKS: This is federal research that you were talking about.

CEO: Yes.

HKS: Were the universities doing anything? Were the companies doing anything?

CEO: Well, the pulp companies were starting. The naval stores companies did not. Of course, they were very much old-line companies. But the pulp companies were starting to do research in forestry. It built and built as they acquired more and more of the South in their holdings.

HKS: What was the nature of naval stores that got you a deferment? What was the war priority there?

CEO: The turpentine and rosin were important elements in materials for war production.

HKS: Were you studying production in naval stores?

CEO: Yes, the production. Particularly, two things: One was the application of chemical stimulants to stimulate the flow of gum from southern pine. That was initiated in Russia and picked up there at Lake City, and it provided much more flow of gum for the same amount of labor.

HKS: That's putting sulfuric acid on the wound?

CEO: Yes, just a little sulfuric acid on the wound. I did a study of how that operated. It appeared to kill the cells which otherwise would have occluded the duct and stopped the flow. It could kill those cells right near the incision and kept the flow running for, say, two weeks instead of one, so that a laborer could come around every two weeks instead of one week. It would continue flowing for two weeks, and that made the work much more efficient.

HKS: What was the concentration of the acid? I have this vision of people wearing protective equipment.

CEO: They did. I think it was 50 percent.

HKS: Wow!

CEO: Yes. Cliff Schopmeyer and I got a patent on the use of 2-4-D as a chemical stimulant also. Unfortunately it worked on slash pine, but it killed longleaf pine. There were often mixtures in the stands, so that wouldn't do. They stuck to sulfuric acid. But they had protective clothing. First there was a blow-gun, but that was sort of awkward, and Dr. Schopmeyer invented a plastic squeeze bottle for the application of the sulfuric acid.

HKS: Did I read that the acid has some negative effect on the trees? It makes them a little more susceptible to insects? Something about--

CEO: No, we didn't find anything like that. In fact, I was detailed to work under George Hepting, whom you might know, a pathologist, in the laboratory at Asheville, to analyze the carbohydrate reserves in the trees treated with acid and not treated with acid. There was no diminution in the carbohydrate reserves, and there was no increase in mortality of the trees, at least with sulfuric acid. I had an article in *Forest Science* covering some of that work, the effects of the chemical stimulants on the trees. So there was no harmful effect there.

But there was quite a resistance of some people to use it. I had one turpentine farmer in the office one time, and I told him the advantages of using the sulfuric acid treatment. I asked him if he would go down and get the equipment. He said, "No." He said, "I believe in making gum the way God intended."

HKS: Yes.

CEO: When you're in research and have a new method, this is what you run into.

Another fellow, I told him, "You could make more money." He said, "Oh, I just want enough to do me."

HKS: [laughing] That's kind of a healthy outlook.

CEO: Yes. So that's what you're up against in research when you try to sell the results.

HKS: There's the Herty cup. I suppose they were hard to sell, too, as they came along.

CEO: Yes, probably so. That was interesting work. We got out a lot of publications.

HKS: I was surprised you moved to Lake City in '44, and in '45 you published a history of the naval gum industries. Was this directly related to the research you were doing? That's why you got the publication out?

CEO: I think we were invited by the *Chemurgic Digest* to prepare a history. There's a subsequent article about our research, and this was a preamble, a history of the naval stores industry.

Particularly in the *Naval Stores Review*, we had a very good outlet for all publications on the naval stores research there at Olustee.

HKS: This is in '46. A different outlet.

CEO: Yes. Harold Mitchell was the research center leader when I went down there. He was very effective in working with our support for the system of forest research centers in the South. Then he was promoted to director of the Central States Forest Experiment Station, and I was appointed research center leader, after he left.

So that's when I wrote this article about all of the research here. I think I was research center leader in '45. This was '46. Then I had direction of the silviculture research and the genetics research, as well as naval stores.

The genetics studies there--Harold Mitchell pushed them very hard. Even before I came, they had been doing research in the breeding of high-yielding trees for turpentine, for naval stores production. I'd like to follow up on that sometime to see how far they've gone, but that chart I showed you showed how promising it appeared at that time because selected high-yielders did produce much more gum than average trees.

HKS: But somewhere in the '50s, the production of gum from the trees couldn't compete with the paper industry's byproduct from paper production.

CEO: That may be true.

HKS: But you were off on other things, then, so you really aren't able to comment on that.

CEO: No, I don't know the fate of the gum naval stores industry after that. I just didn't keep up with it.

HKS: I interviewed the three Langdale brothers. They told the story a little differently. I can't remember which said which now--but it was you couldn't compete with the paper industry, cleaning up this liquor and making naval stores that way. The other said it was things like workman's compensation and other federal laws that increased labor costs so high. That's what made it not competitive with the other sources.

CEO: It could be, but if that's true, the obverse is true, that perhaps they were not properly providing these services to labor before.

HKS: That's correct. Sure. It was a very labor-intensive thing, the type of thing that generally lost out to mechanized and chemical industry. So that may have been very true.

HKS: I've never actually seen the collection of naval stores, but the number of steps involved, the number of times per year you'd walk to the same tree.

CEO: Yes. We were able to cut that down from weekly to bi-weekly anyways, that helped.

HKS: Yes. Another issue that Langdale said was fire protection because the scar was so flammable.

CEO: Yes. And they have to rake litter away from the base of the trees. They called it "weeding the boxes." Even then, going back to the fact that originally they chopped a hole in the base of the tree, called a "box."

HKS: Right.

CEO: Well, they still talked, even then, when the cups were on the tree, about who weeds the boxes. That was the answer to this fire problem, apparently. For naval stores production, they needed to thin properly and give trees room to grow or they wouldn't get a gum yield for the labor you put into one tree.

HKS: Would running cattle through, would that help you keep fuel down?

CEO: No. I don't think that would do it. You just had to provide enough growing space for the trees to provide a good gum yield. I know one time I put some little punch wound experiments in a rather tight stand of trees, and the naval stores people who came to see it said, "This isn't the kind of trees we would work. We would expect to have trees with a lot more room to produce more gum per tree."

HKS: Harley went through forestry school, got out about '37. He was talking about the difference between naval stores and silviculture, and sawlog silviculture. I never did really understand all the significant differences. If you keep fire out, was that one of the differences? You wouldn't want fire in a naval stores stand.

CEO: It depended on the understory situation. Ordinarily, in the slash pine you have saw palmetto and gallberry undergrowth. And then, every year, some of the needles die, and they fall down, and you get a draped litter on top of the brush, the gallberry and the palmetto. It's a very dangerous situation, because a flame could go right up through that draped litter into the crowns. So you need prescribed burning, where you have this understory of saw palmetto and gallberry. If you don't, you'd probably lose the whole stand sooner or later. So you need prescribed burning, and you need to rake the litter away from the turpentine trees.

So that means, also, that you cannot use a selection system of silviculture, because that depends on having regeneration coming in constantly under the old stand. With prescribed burning you would just wipe that out. So you're forced to even-age management.

HKS: So that would be one of the fundamental differences.

CEO: Well, for either naval stores or saw timber production. Where you have this gallberry-palmetto understory and the draped litter, you're forced to even-age management because you'd have to use prescribed burning to control the fires. But for either one, you'd want to use proper thinning so that the trees would grow rapidly to saw timber size or have great vigor for production of naval stores. However, if they grow too fast, then you'll have more of this core of juvenile wood, which is light and weak. So for ideal saw timber production, you wouldn't want to grow the trees too fast or the trees would have too much juvenile wood in them, in the middle of the tree.

HKS: Yes.

CEO: I would say, for naval stores production, you would want a more open stand than you would for saw timber production, if you want to control the wood density. But you don't want to get the stand overcrowded or it would grow so slowly that it would take too long to grow saw timber.

But in this clear-cutting controversy, you have to remember that you're up against constraints, like the need for prescribed burning in the gallberry and saw palmetto type in slash pine. So that forces you into even-age management, and for all the beauty you would want, you could never use a selection system in that situation.

HKS: I was impressed that Franklin B. Hough, in 1882 or something, proposed in Florida the development of the station. I don't know that he said Lake City. Do you know how that site was selected? Was that land available on the national forest?

CEO: Yes, the land was available on the national forest. But I don't know. I suspect that perhaps the Agricultural Research Service might have had a laboratory there at Lake City, possibly before the Forest Service.

I should add, concerning the prescribed fire, when the pulp companies came down, then they got big equipment out there and tore up the gallberry and palmetto in many places to reduce the site competition, so that they wouldn't have to use fire, so that element has been removed from the pulp company lands where they have enough money to eradicate all that saw palmetto and gallberry.

HKS: When you were involved in research on naval stores production, to your knowledge, is that coordinated directly with someone studying the end product itself or quality, like the Forest Products Lab is involved--

CEO: Originally, the Forest Products Laboratory assigned people down to Florida to work naval stores research. But then, when the naval stores research unit was established in Florida, they were no longer involved directly in that. But we worked with the Bureau of Plant Industry, who had distillation research right there at Olustee. In fact, we worked in their laboratory building on many of our problems. So we were directly tied in with the distillation studies of the Bureau of Plant Industry.

They would analyze the gum from trees treated with the sulfuric acid to determine whether there were any ill effects on the products. We had constant cooperation with them on problems like that. So that worked out quite well.

HKS: I see.

CEO: At least the naval stores part of the research was in their laboratory building. I had constant contact with them.

HKS: We talked about the silvicultural conflict between naval stores and lumber, and prescribed burns? Naval stores versus lumber?

CEO: Yes. But there wasn't too much conflict that I saw. Then, of course, they had to cut off the butt section, which was resin-impregnated, because of the naval stores. But that could be used as "lightwood," as they call it, meaning it was resin-impregnated wood, which had a market for kindling and that sort of thing.

Or sometimes those resin butts went into the wood naval stores industry, which was a related industry where they would take pitch-soaked wood and stumps, sometimes called the stumpwood industry. They'd dig up resin-impregnated stumps and distill out the resin in a chemical plant. So a lot of these pitch-soaked butts could go to the wood naval stores industry, which recovered oleoresin from the wood by distillation.

HKS: It's hard for me to visualize the amount of labor. How that could pay, to deal with the stumps.

CEO: Of course, that took equipment. They had great big equipment to pull the stumps out.

HKS: Was there some site damage? Was that a concern?

CEO: No, I don't think so. It's all flat land and lower coastal plain. There was no erosion to speak of. And if you mixed up the soil, there was no real problem. But eventually they ran out of these resin-impregnated stumps, and there weren't enough of these pitch-soaked butts to carry the industry, and they dropped out.

HKS: Okay.

CEO: An interesting side to that was that there was a wood naval stores industry also in California, and they were operating on ponderosa pine.

HKS: I didn't know that.

CEO: But when they got up to higher elevations, they got more and more Jeffrey pine, and that turpentine is explosive. I heard a story that when they got enough Jeffrey pine in there, the still blew up. But I'm not sure that's true.

HKS: You mean it had a low flashpoint or something.

CEO: It's more explosive. Yes, low flashpoint, I guess. But the wood naval stores industry had died out during the period.

HKS: I had never heard that there was serious work on ponderosa pine--or anything outside the South.

CEO: Nick Mirov, a Russian Forest Service tree physiologist, knew all about that. He worked extensively on the chemistry of the turpentines of the pines, and he published a lot on it, too.

HKS: He was at Placerville at the Institute of Forest Genetics.

CEO: Yes.

HKS: That's where I recall the name.

CEO: He was detailed for a while in Florida, because of his knowledge of the chemistry of turpentine and resin, to assist in the naval stores research there in Florida. He went in a gas station with his Russian accent, and the gas station attendant said, "Hey, where are you from?" He said, "I'm from Russia." He said, "Oh, that's all right. I thought you was a damn Yankee."

HKS: [laughing]

Southern Silviculture

CEO: But at that time, too, we worked quite a bit on the silviculture of slash pine. Bob McCulley, who was in charge of silviculture, got out a definitive USDA bulletin on the silviculture of slash pine.

HKS: There was a goal at that time to have a bulletin on each major species, right? There's a bulletin for Douglas-fir, a bulletin for ponderosa pine. Each tree would have its own bulletin.

CEO: Yes. There was a real attempt, all through my career, to have summary bulletins such as that, on silviculture of a timber type or species. In our inspections, we followed up on plans for summary publications and accomplishments on summary publications, particularly on the silviculture of each timber type.

HKS: Was there a basic, for lack of terminology, recipe for such a bulletin? Like you wanted to discuss the seeds, the roots, the foliage?

CEO: No. This type of information was consolidated later into the Silvics Manual, which described silvical characteristics of each species. I think you're acquainted with Harry Fowells. He edited the USDA handbook on the *Silvics of American Forest Trees*, and then that was followed by the USDA handbook on *Silvicultural Systems for the Major Forest Types of the United States*, which depended on the silvical characteristics, summarized in the silvical manual. So those two handbooks were the final result, bringing it all together nationally. But there was, of course, a bulletin on the silviculture of each major species or forest type, and that was an obvious need right along.

HKS: Are the southern pines at all uniform? I mean, there are four species of southern pine.

CEO: No, they're quite different.

HKS: Do the ranges overlap? I mean, are they intermixed?

CEO: To some extent, yes. Shortleaf and loblobby are intermixed in some places, and the longleaf and slash are intermixed. Longleaf and slash are generally separated from loblobby and shortleaf, in a general way.

There are maps, of course, of the distribution of the forest trees in the United States, and that shows it exactly. The lower coastal plain, in general, is the longleaf/slash pine belt, and the upper coastal plain and the piedmont are the shortleaf/loblolly pine area.

Lake City Advisory Committee

HKS: Discuss the advisory committee at Lake City.

CEO: We had a fine advisory committee. Harley Langdale, Jr., was one. Bill Ottmeier was on it, and various other people interested in timber or naval stores or both. They came in every year, went over our program, and said what they thought the emphasis should be in the work in the future. They helped to some extent in support for the program, although we did not intentionally use them for that purpose. It was up to them, you know. We wanted the advisory committee to really be a technical advisory committee to program. But they were very effective in helping us in all different ways.

And in cooperation on operations in the field, too. For example, there was a man who represented the pulp company, who had land adjacent to the national forest. We wanted a site prepared, and he wanted a ditch dug. He had the site preparation equipment. The Forest Service had the dragline to dig his ditch. So we made a cooperative agreement, and we just swapped equipment there. He prepared our site with his equipment, and the Forest Service dug his ditch.

HKS: Was it common to have an advisory committee? Did all stations have that?

CEO: I don't know about the other parts of the country, but in the southern forest research centers, it was very common to have a research advisory committee. From about '57 to well into the '60s, we had a national Forestry Research Advisor Committee.

At this time, I was also silviculture editor of the *Journal of Forestry*. That gave me about fifty articles a year to review. Most of the articles in the journal, perhaps a third to a half were silviculture. That was quite a job, which I did mainly on my own time.

Then, when I got to Asheville, I had about fifty manuscripts a year from my own division and fifty from the *Journal of Forestry*, so that made about a hundred manuscripts a year that I had to review technically.

HKS: There's something like two hundred workdays a year, so that's a manuscript every other day!

CEO: It was quite a load.

HKS: Maybe that was your preference to do it yourself.

CEO: Well, I did. I had to use some official time for it, especially related to my work, but I did a lot of it on my own time. Of course, the Forest Service manuscripts I did in the office. *Journal of Forestry* manuscripts I did more on my own time. But that gave me a lot of experience in manuscript review.

HKS: I was intrigued. I wrote to all the station directors a couple of years ago. The Forest Service has asked me to write a short book on the history of Forest Service research, and I wanted to touch base with the

stations. I asked them a series of questions, and the Asheville station wrote back that its best research has come out of Lake City. That was just two years ago. So Lake City is still a going concern.

CEO: That's good.

HKS: I guess that unit superior service award you received down there validates that at that early stage, good work was coming out of the station.

CEO: Yes, Harold Mitchell was a fine research center leader, and he was able to get good people to come there. I recruited Francois Mergen for Lake City, and he became dean of the School of Forestry at Yale. I recruited Phil Larsen for the research at Lake City. He became a pioneer researcher later. I recruited them after I got to Asheville when I was in charge of the forest management research in the Southeast.

HKS: Where was Les Harper now, at this time?

CEO: He was in Washington. He was for a time head of timber management research.

HKS: But he came out of the South.

CEO: Oh, yes. He worked at Lake City.

HKS: He preceded you at Lake City then.

CEO: Yes. He preceded me by a good deal. I think he got his Ph.D. with a naval stores study which he did when Lake City was under the Southern Station.

Succeeding George Jemison at Asheville

HKS: Now we're moving to Asheville.

CEO: Yes.

HKS: You went from a rather specific field, like silviculture and naval stores, to forest management research, which includes all these other subjects.

CEO: Yes.

HKS: How did you feel about that?

CEO: I liked it. I had a very good predecessor, George Jemison, and he taught me a lot of things. He was sort of a role model. He mentioned, "When you pick up a piece of paper in the office, don't put it down till you've done something about it." That's a key thought.

He also did an inspection of our work at Lake City, and he stayed there, wrote it up over the weekend, and showed us a draft of it, and discussed with us whether it was fair and objective and whether the facts were correct. That was a real lesson. I later used that procedure for seventeen years, in Washington, in making inspections in the field.

I knew of one person who would come back in from an inspection, and then it would be several months before he had time to do the report. That's not right. So I would plan a little extra time in the field, maybe two or three days, to write the report, get it typed, and discuss it with the division director and perhaps the station director as to factual accuracy and fairness. That I learned from Jemison.

So when I stepped into Jemison's shoes, I felt that things were in very good order, and I had a very good role model to follow. It worked out fine.

Scientific Method

HKS: This is 1950. You're moving to Asheville. Was what we call the scientific method standard for all research proposals? You had to have an hypothesis and statistical models? I'm trying to trace the transition from the empirical, descriptive research to what I'll call "modern research," which is probably not a fair term but, where you have to have a statistical plan and hypothesis.

CEO: The Forest Service early on got into statistical methods. They paid for A.J. Fisher to come over from England and help give instruction in statistical methods to Forest Service people. When I was at Kane, Pennsylvania, I went to a statistical seminar in Washington, which was given for research people in the Forest Service, and then they were sent back to the stations.

Even when I worked at the Northern Rocky Mountain Station, George Jemison had been acquiring statistical knowledge, and he gave us a little seminar in statistical methods back there in the '30s. So the Forest Service was into design of experiments and hypotheses and so on, way back.

In fact, Harold Lutz sold us on the idea of multiple hypotheses. You know, if you have one hypothesis, then you may subconsciously try to prove that hypothesis. Or maybe select evidence. But if you have multiple hypotheses, then you will say, "Which hypothesis does this evidence support?" That was way back in graduate school. There wasn't any sudden change to appreciation of the scientific method or statistical procedures. It occurred way back in forestry.

HKS: This is a single example, so it may not be relevant, or may not apply to you, but I'll offer it. It was at the Pacific Northwest Station, and you were in the South at the time. But about 1948, in that time period, a project was set up to measure the effects of slash burning in Douglas-fir clear-cuts, on the vegetation that came in afterward. Bill Morris set up sixty-four permanent plots, paired plots, treatment and control plots, from southern Oregon up the Cascades to Mt. Rainier and a few out on the Oregon coast.

I was hired in 1960 to do the sixth or seventh re-measurements of all those plots. So I read the whole history of the project, what was proposed. Since it was a major project, it was approved at the Washington office level. All the critiques and so forth. But there was no theory, no hypothesis, no predictions. I'll go out and I'll set up treatment and control plots, and I'll measure them, and I'll photograph them. That's it. And when I get all through, I'll look at see what I have.

My reaction, fresh out of grad school, that didn't conform with the scientific method. There was no prediction that species that germinate better with heat, like Ceanothus, would dominate. There was none of that.

CEO: I think a single-hypothesis approach is too dangerous. It's very apt to slant the interpretation of the results, and I think the multiple-hypothesis approach, and that's been described in literature and way back in graduate school, Harold Lutz drilled that into us. That that's the way to look at it. In fact, you don't have to have any hypothesis if you don't want to. You can see what the data tell you.

HKS: That's what this project did. Fresh out of grad school, we'd been trained the scientific method, and I went out in the real world, and we didn't have a hypothesis.

CEO: It's okay.

HKS: It's okay.

CEO: If you're objective, you let the data tell you what they tell you. One time, one of the people in New Orleans, at the Southern Station, set up an hypothesis that pine gum was produced in the phloem. So then he was going to do some research, and I'm afraid if it were that hypothesis he would have been biased, and his selection of data might have been. He should have had a multiple hypothesis. It's produced in the wood, or it's produced in the phloem, or it's produced in both. That's a very important concept, I think, in dealing with research. It's the multiple hypothesis, and that's been in my entire career, I'd say.

HKS: How do you establish a statistical model with a multiple hypothesis? I've not heard that term before. Maybe it's a Forest Service term.

CEO: No, it's not a Forest Service--I learned it from graduate school.

HKS: Okay.

CEO: To me, it's the only way to look at it and not fall into a trap of selecting evidence, even subconsciously.

HKS: I understand that.

CEO: It just seems to me it's the obvious way to go about it. Or if you don't have any hypothesis, you can say, "What do the data show?" Which is all right.

HKS: In the case of prescribed burning, the assumption is that there must be some impact, but you're not going to predict what it is.

CEO: You can make that assumption. But one hypothesis can be there's no ill effect. Or it might be a beneficial effect. Or, a better way to look at it would be, what are the adverse effects? What are the beneficial effects? So in the absence of a single hypothesis, there's no fault whatsoever, and it may be a danger.

Forest Management Research

HKS: Now you're responsible for specialists in a broad area of forest management, and also at a wider range. Actually, the naval stores research must have gone as far north as Virginia.

CEO: No. The naval stores production was mainly Georgia, Florida, Alabama, and Louisiana, a wee bit in Texas. It had gone out in North Carolina, and not much in South Carolina. But the earlier stumpwood industry was more widespread. Any of the resinous stumps were taken out. In North Carolina there are still some rosin deposits that were run off into the streams from the earlier distillation of turpentine out of the stumps.

HKS: So it's not at all unsettling to manage a mensuration specialist. Now mensurationists are reporting to you, and you judge their work.

CEO: Well, not particularly, except the demanding time came in pioneering research units, when the division director had the responsibility of writing a review of the annual progress in each pioneering research unit. To review the work of a man like Grosenbaugh in very difficult mensuration problems, that was a real challenge. So I had to rely mainly on him.

HKS: Grosenbaugh would have been one of your people, then.

CEO: Yes, he was, after I moved to Washington. And also Phil Larsen, who did pioneering research on how trees make wood. That was real pioneering research. I had to review that. But the ordinary research projects of more applied research were no particular challenge.

Of course, I was no real expert in genetics. I had to rely on more expert people on things like genetics. We had one man, in fact he was at NC State. He was doing fairly abstruse work in genetic theory, and those things were a challenge. But the ordinary silviculture research I didn't feel was a challenge.

HKS: You mentioned Phil Larsen and Lou Grosenbaugh. What other people who became prominent worked for you at that time?

CEO: Phil Larsen worked for me at that time. Grosenbaugh was at that time director of timber management research in New Orleans. He would coordinate with me. He was timber management chief of the Southern Station.

Let's see. I mentioned Francois Mergen, who became dean at Yale. I recruited him for work at Lake City. I kept in touch with the Yale Forestry School when I got to Asheville for recruitment of promising people in research, and they were very helpful in telling me about people like Larsen and Francois Mergen.

HKS: You use the term "pioneering," but in the '50s, were there pioneer units set up officially? Or was that later?

CEO: Much later. Late '60s, probably. There was no advisory committee at the station level, but the National Forest Research Advisory Committee came to the Southeastern Station, among other stations, on their trips to the field when I was at Asheville.

HKS: We have a photograph of that committee, and you're in it, along with a lot of people.

CEO: They did visit us, but that comes later. The National Forest Research Advisory Committee. I was more concerned with that when I got to Washington.

HKS: Okay.

CEO: During my time in Asheville, Len Barrett, who was director of timber management research, went to the World Forestry Congress in Finland, and he was impressed by progress in Europe on forest genetics and tree improvement. So he came back, and stimulated us to get something started in the Southeast on forest genetics and tree improvement.

So the station directors set up a Southern Forest Tree Improvement Committee, and I was the first chairman of that committee. We took people who were working in related fields and got them onto the Forest Tree Improvement Committee for the South, including some people from forest industry.

One thing: We organized a big seed-source study for southern pines, having stations and others collect seed from all over the South. It might have included all four southern pines. I'm not sure. Certainly several of the southern pine species. That was a very widespread, region-wide, cooperative thing. They had plantations then at critical points throughout the southern pine region. That was a major cooperative undertaking and has led to a lot of nice results on how far you can move southern pines in collecting seed. It showed generally that local seed sources are usually best. But there are some exceptions.

So that was the start of the Southern Forest Tree Improvement Committee. Then, it turned out that, although I was chairman, I was in the Southeastern Station, and the genetics research leader from the Southeastern Station was on the committee, too. Some of them felt that maybe the Southeastern Station shouldn't have dual representation, so I resigned that committee and did more of my regular work.

But that was the start of some of the genetics, particularly cooperative genetics research in the South. Bruce Zobel worked extensively at that time with the pulpwood industry, and he did a whole lot of cooperative work with them, particularly in selection of high-yielding trees for growth and establishing seed orchards.

The work at Lake City was mainly directed to gum yield. I think they changed and got more growth and quality into it later, I hope, because the naval stores industry was going down. So that's the Southern Forest Tree Improvement Committee story.

HKS: How long did a tree have to grow in one of these genetics tests before you could determine which one was superior? Five years? Ten years?

CEO: There was a pretty good correlation of early performance with later performance. But in general they would go through even-age stands of maybe twenty, thirty, forty years, because either they get to seed-

bearing age or you can get a whole bunch of cuttings. You start too soon, and you don't have enough material to work with in the way of cuttings or seed. But I think studies have shown a pretty good correlation of the early performance to later performance.

HKS: You didn't worry that at age twenty-five there's some blight hit them or something? You were fairly confident that if it did well, it was going to keep on doing well.

CEO: I think so. Yes.

HKS: Okay. You mentioned that you were silviculture editor for the *Journal of Forestry*. You certainly had a lot of influence on the course of silviculture. Not that you were playing God or something, but you were selecting or rejecting.

CEO: To some extent. But mainly it was a source of knowledge on what was going on around the country. Because the majority of manuscripts were accepted, even if they had to be changed.

I had George Jemison's manuscript on a new statistical technique he used in forestry research, but the result came out entirely negative. That is, the experiment showed a very negative result. I felt that I had to recommend that this manuscript not be published in the journal but rather in *Forest Science*, because it was a matter of technique, but had limits for application. That was a touchy decision, but that was what I decided.

HKS: You had this huge volume of articles anyway. Did you recruit? In other words, you hadn't had something from the Southwest for a while, would you write to them--

CEO: No, the editor just sent me the silviculture articles. I reviewed them, and sent them back. I did not try to stimulate articles. There was no need; silviculture was so much of the literature at that time.

HKS: That's true. It wouldn't have surprised me that they would have had a western silviculture and an eastern silviculture editor or something. So you did hardwoods? Conifers?

CEO: Yes.

HKS: East, west, the whole works.

CEO: Yes. But I had worked in conifers. I had worked in hardwoods.

HKS: Okay. You've published on tree improvement.

CEO: Yes. I published an article on the work initiated by the Southern Forest Tree Improvement Committee group. I had a hand in some of the publications coming out of Lake City regarding the tree breeding work there, in Lake City.

HKS: The term "tree improvement." We co-published Zobel's autobiography. Have you seen that?

CEO: No.

HKS: It's a small book. Came out last year. Called something like *Forestry Revolution: Tree Improvement in the South*. The term "tree improvement" doesn't tell anyone what that is, except to the specialist. Was that ever debated, what label to put on that bottle?

CEO: No, it wasn't. I believe that the idea at first was this is what you're accomplishing. You're going to improve trees. You use the science of forest genetics to do it, but in the application phase, you've got to improve trees. Maybe that's why we called in the Committee on Southern Forest Tree Improvement. Because for the user, that's what he gets. He doesn't care much about the science of forest genetics. So I think it was appropriate.

During my time in the Southeastern Forest Experiment Station, one of our directors was Joe Pehanic, who later became director of the Intermountain Station and has since retired. He had an interesting system of performance review, which I admired. Every month he would sit down with the people under his direct control and have them list the tasks they would accomplish in the next month. Then, the next month, he would sit down again, and they would account for the performance and accomplishment on those specific tasks that were set up the month before, then, in cooperation with him, establish a list of tasks for next month. I thought that was a very effective way to do performance review.

HKS: But a task for a director of forest management would be that Larsen's study got completed. I mean, most of these tasks weren't your direct tasks anymore. You were describing what your people were doing.

CEO: Yes, but it might have been to hold a conference on large-scale experiments in silviculture research, or get out a summary publication involving several different research centers in loblolly pine, or some regional job like that. Or initiate a new program at a new location. There were plenty of regional jobs.

HKS: So there's a lot activity. I mean, to sit down twelve times a year, one must have to have something to say, because some research is long-term. One might work twenty years on a project.

CEO: Well, that's true in certain kinds of research. But I think for everybody there are certain things you ought to do this month, and you should list them and account for that.

Selecting Research Projects

HKS: I'm intrigued by how new research is selected. You're working on something. You always move into the middle of something that's already ongoing. But you have to decide on new things.

CEO: Yes.

HKS: Pick a project, and walk me through it. Something that you remember deciding, "We need to do this." Then you gathered the resources, and you get it done, and this publication comes out of it. Does something come to mind?

CEO: Yes. It might be shelterbelt research, for example, although that wasn't under Asheville. That came in later. But you might decide that you need to have a shelterbelt studies in the northern part of the shelterbelt zone, and so we'd select a location, try to get cooperation, preferably from a university, and then let's see. We'd have to make a proposal to the advisory committee, usually. Either regionally or nationally.

HKS: Now, the advisory committee. Are they being a sounding board, or do they come in with ideas?

CEO: Both.

HKS: Both.

CEO: Sure. Maybe that's too national an example. But the regional examples are the same thing, if you need to start a new phase of research. Tree improvement was one of those. We had to have a new project, where you had to set up a new unit in Georgia for forest tree improvement in loblolly and shortleaf pine. So it was a matter of getting cooperation at the University of Georgia, and particularly from the Georgia Forestry Commission. The Georgia Forestry Commission was very helpful in cooperating with the Forest Service research, in providing some support for research and helping to decide location, and that worked out very well, working with the Georgia Forestry Commission and the university.

HKS: At what point would you bring up a new idea with Pehanic? How much homework did you feel you had to do before you said, "Joe, I think we have to do this study."?

CEO: Well, I wouldn't take it up with him. A new program, but not a new study. A new study would usually be initiated in a project. They would make a proposal. At that time we had what we called project analyses. The

project leader was supposed to make an analysis of the problems, the needs for research, and recommendations for research studies. Then that would be approved at the regional level, and he was supposed to go ahead and initiate those things.

But when I was at Asheville, we had a pretty good regional setup. There weren't too many new areas of work coming in. There was more need in other divisions for new work, in wildlife habitat and economics and other fields rather than silviculture.

HKS: Maybe it's just the way that the curriculum is structured, but silviculture intellectually was sort of the center of forestry. You talked about wildlife. At some point, obviously silvicultural research and wildlife research have to be coordinated.

CEO: Oh, yes. Absolutely.

HKS: Is that ever a difficulty, maybe because of personalities or differences in priorities or funding?

CEO: It's a problem in that it's hard to get appropriations through Congress for things other than timber production. Timber production they can understand. It's jobs. It was very hard to get support for recreation research, wildlife research. It's not so difficult for watershed, because that's fairly obvious, the need for water supply, particularly in drought years.

I was reading the first section in my review of all the research centers in the country that had timber management research, which I wrote in 1957 and 19958. Timber management research money was being used for salmon stream studies, although they needed more research and more money for wildlife, and watershed needed more money for watershed, and silvicultural research was helping in the wildlife aspects and in the watershed aspects. So that's the way it was then, until more funding was gotten for other things, other functions than timber.

There was a problem later. Harper went to a strictly functional organization, and research projects were then functions. So the question arose, "Who is going to do the multiple-use research?" There wasn't any direct answer at that time. That I think led perhaps to some difficulties later, in the multiple use problems. That is, the functional approach tended to get people thinking functionally because that's where the money came from.

HKS: Sure. A lot of very prominent people went through as station director, at Asheville.

CEO: Yes.

HKS: Was that seen as one of the primary stations?

CEO: I think it was, compared to a few others that were smaller. But it was convenient to Washington, and I think if they assigned a man there, they could be calling on him as needed.

HKS: I see.

CEO: Out of Washington. But that's speculation. But McArdle and Haig and others went through there. That's true.

I should mention that when I was at Asheville I had a very fine secretary, who helped me a lot. I would be able to just dictate a letter, and she would come up with a finished letter which I could sign and send out. You can't often say that. Camille Bryant was an outstanding secretary, and I know it was one thing that helped me.

HKS: That position has just about been abolished. With the computers today everyone is their own secretary. I suppose at some higher levels the chief doesn't write his own letters, but most things I see, the individuals themselves are writing their own.

CEO: Is that right? Joe Pehanic used to type his own stuff on a typewriter.

HKS: Is that right?

CEO: But I don't know if he did the final draft.

HKS: Yes.

CEO: Oh, another person I recruited at that time was John Barber, who became president of SAF. He became also a deputy chief in the Forest Service.

Another thing I learned from George Jemison: He would get all the research center leaders in the Southeast on the telephone. He would warn them ahead of time, "Be on the telephone at a certain time." From Asheville he would have a telephone conference, way back then, say in the 1950s. It's another example of Jemison's efficiency, the way he worked.

Director, Forest Management Research

CEO: I moved to the Washington office in 1957, as director of forest management research. At that time it was called forest management research, which title I liked, because it was a fairly broad topic, and it was a good share of forestry research.

HKS: I don't know if they even have forest management research any more. By that name.

CEO: It's back to forest management research now.

HKS: It is?

CEO: Yes. Dr. Harper changed it to timber management research along about in the '60s, in order that he would have better logic to build up the other functions, you see.

HKS: I see.

CEO: And not to imply that this was all forest management, because economics had the financial aspects of forestry, and there was wildlife and water and recreation and insect and disease protection and fire protection. He changed the name to timber management research, which I did not favor, but which I had to accept. Now it has been renamed forest management research, I think because there was more recognition of the fact that silviculture is the way in which you do a whole lot of forestry. You affect game management. You affect watershed management. You affect esthetics, recreation, and so on. So now it is again forest management research, I'm told.
HKS: That will probably be changed to ecosystem management research pretty soon.

CEO: [chuckling] Could be.

HKS: You were in the Washington office during very historic times.

CEO: Yes. And it was a very favorable time for forestry research. Dr. Harper had a program, and if the Congress asked him, they wanted a project, he would say, "That's in our program" or "It's out of our program." He did not get projects he didn't want, and he did get projects that were in the program. He looked ahead very far, and he could tell what was a good course in the long run and what was not.

HKS: So this was in part to protect himself from Congress having pet projects?

CEO: I wouldn't say it so strongly, but I know another agency that had several projects presented by Congress, because they didn't have a program and didn't say, "That's not what we want." But it was the

other way with the Forest Service. Dr. Harper was in close touch with the appropriations committee. He knew what he wanted in the future, and he could tell them what should be out.

HKS: You referred to him twice now as Dr. Harper. You must have called him Les. Or did you? I'm asking a question.

CEO: I don't recall. [chuckling]

HKS: You remember him as Dr. Harper rather than Les.

CEO: Yes.

HKS: Because you talk about George Jemison. George must have been a more engaging person.

CEO: Yes, absolutely. Oh, yes. Les Harper was more reserved, and he was more formal. He was in his own shell, but he knew what he was doing. And he looked ahead more than most of us. He could see politically what was the thing to do now and what was not. I accepted that.

HKS: Sure.

But you worked for Bob Buckman. You were his associate, right?

CEO: No. He was on my staff. I brought him into Washington.

HKS: Okay.

CEO: He was in charge of mensuration and management planning research, and then I made him assistant director, and he was extremely effective. He had great outreach. He worked on the federal natural areas committee, and he worked so well with all the people in Interior who also had researched natural areas in the parks and other areas, and he was extremely effective in working across divisions and with other branches of the Forest Service and with other agencies. He just had that facility. When he got into IUFRO, he spread it worldwide. I often thought if you had foresters on the moon, he might have brought those in, too.

HKS: I'm interested in knowing what difference it makes who the deputy chief is. You went from Harper to Jemison to Arnold to Dickerman. You were in a good position to watch the changes. I know that times, conditions change, too, and there are different personalities. All of the people I've talked to about research said, "It really took off under Harper. It just skyrocketed."

CEO: Yes.

HKS: Yet, you look at the budget, the budget has gone far, far beyond anything that he ever imagined.

CEO: After he left.

HKS: After he left. But he got it started.

CEO: Oh, yes. His contacts with the Congress and the appropriations committees, with whom he met constantly, he kept them well-informed of what the ten-year program was, but the fact that he had a ten-year program was most important. That he knew where he wanted to go, he could share it with them, and they knew where he wanted to go, and there was constant agreement on what was needed. And through the Forestry Research Advisory Committee.

There is a procedure whereby the divisions would recommend what they thought was needed to the Forestry Research Advisory Committee. Then the Forestry Research Advisory Committee would agree with or amend that, and there would then be a report from the Forestry Research Advisory Committee on

research needs. Then Dr. Harper and others could use those recommendations with the budget committees: The Forestry Research Advisory Committee recommends that we shift or increase programs in this way. That went on into the budget procedure, starting with the recommendations of the division directors, and the meeting with the Forestry Research Advisory Committee. Of course, Dr. Harper was in on all of this, on every step of this. It was quite an orderly procedure.

HKS: You're director of forest management research under Les Harper, and he has a ten-year agenda. Is there room for you to be creative?

CEO: Oh, yes.

HKS: Or is it pretty well laid out, what you're going to do?

CEO: He would say, "We're going to have a meeting. I want you division directors to write out your proposals for increases in funding." One time he actually said, "Come in with three stages, three levels of increased funding." Fortunately, I had prepared three, and I had those three ready. But that's the way it was done. We would meet with him and recommend where we thought increases in our function were needed, or even shifts.

In fact, when silviculture was prospering quite well and some of the other functions were harder to sell, Dr. Arnold asked me, "What could you give up? What is the weakest part of your program where some funds could be shifted to functions that are needed more?" So I had to do that and tell him where such a change could be made, at the expense of forest management research. Which was all right. Because timber culture just had that much easier a job with Congress at that time.

HKS: So Harper's ten-year plan he held in front of Congress each year was--

CEO: Very helpful.

HKS: Very helpful. There was a lot of room inside that for you to move around. You didn't ever feel constrained.

CEO: No, not particularly, no. Except that sometimes if there was a proposal to shift forest management research to another function, I might agree or might not agree. But of course the research administration would do what had to be done.

HKS: Who were the other subject directors? You were in forest management research. I'd still like to know a little bit more about the chemistry. You're describing that Harper would ask you to come in with certain kinds of proposals. But you weren't the only one. There were other directors, too.

CEO: Oh, sure. He'd have a meeting of all the research division directors, and each one would have to submit their proposals for increases in funding, and then they would be discussed. Then Harper would take all those and integrate them, and make up the proposals to go to the appropriation committees. We would have the input of the advisory committee, too.

HKS: Forest management research at that time, other than forest products, was large. Did you have the lion's share of research?

CEO: Yes. It was certainly the largest function. I think it was even bigger than forest products research when I left. When I went in in 1958, it was $3,672,000 in the forest management research program. By 1967, nine years later, it was $8,240,000. And I think when I left in 1975 it was around $10,000,000.

HKS: Did you feel, from the standpoint of being able to administer a big program, that forest management should have been split up.

CEO: No, I did not feel that way, because we had branch chiefs in charge of the major programs. We'd have a branch chief in genetics, a branch chief in silviculture, a branch chief in mensuration and timber management planning, and sometimes we had a branch chief in timber-related crops, but not always. Those branch chiefs gave the technical direction, and then the division director gave the overall direction, but not specifically technical direction.

If we had competent experts as branch chiefs, that took care of the technical direction. The division director was largely a coordinator.

HKS: Administratively, did people in experiment stations in forest management research report to you, or report to the station director, or both?

CEO: To the station director, administratively, of course. We ordinarily provided technical review, mainly through inspections. The Forest Service had at that time a very good inspection system, I thought. We would get out to each station I think every five years. This [demonstrating] is the whole collection of informal reports that I made to Dr. Harper on my initial review of all the timber management research projects in the country.

HKS: Your style was to write the basic report there before you left.

CEO: For formal inspections, that's right, and have it typed and go over it with the division director and the station director for factual accuracy and fairness. They couldn't change the conclusions I made, but they could point out inaccuracies in fact or their opinions.

HKS: I'm assuming that by and large the inspection process was very positive and favorable. The person was doing good work, and you reinforced it, and you were able to help in certain ways. What kind of negative things would come up? What were the problems?

CEO: I would interview the people about their work, and you learn a great deal from how the man could answer questions and defend his program and his studies and his plans and his publications record, especially.

HKS: So this was a personnel evaluation as well as the actual substance of the research.

CEO: Well, in a way. But the direct personnel administration was the function of the station, and the performance rating. But I was concerned very much about career development for people, and getting them opportunities to come to Washington to work as a branch chief or on the staff as a career move and for career training. For that reason I wanted to get fairly well acquainted with the competence of the people, the staff in the field. You can do that sitting down with them or going out in the field and asking a lot of questions about their work and their ideas and their plans. I found that way I could evaluate people pretty well.

HKS: If you saw somebody who had a lot of promise, you could be influential in their promotion?

CEO: Oh, yes. Not so much in the station, but later in selecting them for a training assignment in Washington, or possibly some other training assignment.

HKS: Was training in Washington important for career advancement?

CEO: Yes, I think so. I think most of the men thought so, too. Because they got much more exposure to what we were up against in trying to get funding and preparing accomplishment statements and recommendations to Congress, and reviewing research, to know what our plans were and planning and so on. They got that slant by working as, say, an assistant branch chief or a branch chief in the Washington office.

HKS: I'm a project leader and you've come out twice on your five-year cycles. I don't get invited to go to Washington, do I feel, "Uh-oh, I'm not going to move ahead in this outfit."? I mean, was it that clear that you needed a tour in Washington?

Man-in-Job

CEO: No, because, with a dual career ladder, there was no need for a man on strictly the research career ladder to go through that training in Washington. He could progress right there, with the man-in-job concept. He was evaluated on his research performance, and lots of the best researchers wanted to stay in research. But those who showed administrative ability and inclination, they were the ones who should be brought to Washington, get a broader national perspective.

HKS: People like Bob Buckman.

CEO: Bob Buckman was obviously very much of an outgoing person who could work with many, many people and obviously had a fine career ahead of him in forest research administration. He was the kind of person we looked for to bring in for training to go up the administration ladder, that is research administration. But other scientists were better qualified to do what they were doing, like Dr. Little. He never would have made an administrator, but he needed support in his research, and some of the people in the field were the same way.

There's one fellow who worked in hardwood research, and I would have liked to have him come in for career development, but he preferred to stay in research in the field, and that was fine.

With the dual career ladder, that was very helpful. Before that, if a man wanted a top grade he almost had to go into research administration, and maybe he wasn't suited for that. So the dual career ladder, which came in, with the man-in-job concept, that was a great, great benefit.

HKS: Maybe you want to talk about that right now. We've been leading up to it. That was one of Harper's ideas, right?

CEO: ARS initiated the man-in-job concept in the department, and it was a department-wide concept then, and the Forest Service went in with it. It was an obvious way to avoid having to put excellent individual researchers into an administrative career to give them a promotion. So it was a very fine thing, and the Forest Service got right in with it and went along with it. I assume that that's still what they're doing. I think it was very fine that people could work in one area of research and become a national authority and not have to depend on shuffling paper or something to get a job promotion.

HKS: Yes. That was useful.

CEO: Lou Grosenbaugh was GS-16, and I think probably Phil Larsen was probably GS-16 also.

HKS: What's the highest?

CEO: At the time I was in the field, that was the highest that a person doing research or--Even a division director couldn't go higher than -16. So the outstanding researchers had a salary equivalent to a Washington office division director, which was very good.

University Research

HKS: McIntire Stennis must have had a lot of impact on forest management research, because you had access to collegial cooperation in universities.

CEO: Yes, we did. And we did have a number of cooperative research projects. We entertained proposals from universities, and then one of our staff, usually a branch chief who knew that technical field would go to the university and review proposals. If a proposal was approved by Dr. Harper or whoever was chief of

Forest Service research, then it was funded. Then we had some follow-up, of course, with the universities on progress.

HKS: Well, before '62, before the law was passed, do you recall was there a significant amount of cooperative research with universities?

CEO: There was cooperation in that we tried to get as many research projects as possible at universities, preferably where they had a forestry school. The McIntire Stennis program brought it together more with actual funding, but before that there was quite a little cooperation going on, in a less formal way.

But the Forest Service had to be fully responsible for its own studies, and they were. We just couldn't assign responsibility over to people that were not paid by the Forest Service.

HKS: Dickerman made an observation that I hadn't thought through, that the nature of academic life is such and reliance on graduate students is such for research that you tended to have short-term projects with universities, because of the recycling of the students. Is this true?

CEO: Yes. And you had to have pretty good control of quality because of the difference in graduate students.

HKS: Was that ever an issue for you, that the professor wanted money to support a graduate student more than he cared about the quality of the research?

CEO: No, I don't think so. I think that would have been revealed and would have been a factor in a decision. But Dr. Harry Fowells did a great deal of the work. He was at that time branch chief of silviculture on my staff, and he did a good deal of the work in McIntire Stennis cooperation with the universities. He visited many of the universities and initiated many of the projects. He largely carried that McIntire Stennis program in forest management research.

HKS: Were you involved in any way in the law itself? Getting it passed? Doing research or testifying?

CEO: No, I was not. Dr. Harper had a small staff of people in his office working entirely with him on research administration. He and they handled the appropriation presentations and appropriations work. He had to control that.

Criticism of Forest Service Research

HKS: I went to work at the experiment station in Portland in 1962, and I had been there a couple of weeks. There had been a study by, if it wasn't the National Academy of Sciences, it was something of that prestige, of federal research. It characterized Forest Service research--and this is harsh now--as second-rate and pedestrian. This was about 1962.

We were called together in a big auditorium, and the station director read us the report and started laying out the response to it. How our lives would change because of it. The main thing was we changed our titles. I was a research forester one day; the next day I was a forest fuel specialist. We had to have more precise descriptions of what it is we worked on.

This was right in the early part of your tenure in Washington. Do you recall that?

CEO: I've forgotten that. But it's one thing to have an academic scientist judging and another thing to have the users judging it. If it's practical research, a lot of it that gets into use, you could call it pedestrian. But of course you need a component of basic research to develop new knowledge.

We used to have a dual format for presenting our research results to the appropriation committee. We would have to say what was the problem, what were the results, and what were their significance for either improving forestry practice or advancing basic knowledge. Now, for some of these science bodies, if all your

research were advancing basic knowledge, they would say it was wonderful. But you know that you've got to go to Congress and say that you are advancing the practice of forestry through this research and getting it into practice. That's my reaction to it.

HKS: So when Harper goes to Congress he says, "We've been told our work is pedestrian." And the Congress says, "Right on. That's exactly what we give you money for." In a sense.

CEO: "Are you developing your new knowledge?" Well, we hope so. But I think that's the answer to it. There's the dual object of research: get it into practice or develop your new knowledge. Which eventually gets into research. And you have to keep those two channels going.

HKS: So in effect the description could well have been accurate, although there was a little twinge.

CEO: Now, if they would say, "The quality of your scientists is not good," I would be concerned. But they didn't say that.

HKS: Is that an issue? I don't know at what level you stop recruiting new talent, new Ph.D.'s. Maybe throughout your entire career you're always looking for new talent.

CEO: Yes. They were advancing in the whole period I was in the Forest Service.

HKS: So to continue this pedestrian versus basic, or applied versus basic research, when you go to the University of Minnesota, you go to Berkeley, one of those schools, and the dean introduces you to the top graduate students. What do you look for? How do the theorists, the Phil Larsens, become the pioneering scientists? How do the people get their expectations of what they're going to do when they go to work. Is there room in the Forest Service research at this time for very much basic research?

CEO: I don't know about now, but at that time there was. The old saying is, "Many are called, but few are chosen." There isn't too high a proportion of people who are really qualified to do basic research, develop new knowledge. There are many more people who are qualified to do applied research and help get it into practice. So we've never been flooded with people who have the ability to do basic research to develop new knowledge. It's the Forest Service obligation to try to get those people when they're available, like Francois Mergen and Phil Larsen and so on.

HKS: Buckman used the term that I hadn't heard before, "upstream research." But that's not limited to basic research. You have to look ahead, so the information is there when you need it.

CEO: Yes, that's very true. Certainly, research has to be thinking well ahead of practice.

One of the forest management staff members when I went into Washington was Bert Lexen. He was famous for developing sample scaling for the national forest, because he was quite an expert in statistics. He had developed this format for presenting research results, where you say, "What is the problem? What were the research results? And what was their significance for advancing forest practice or developing new knowledge?" I give him credit for that. We use that format, I think, successfully in presenting research results to Congress. They don't care how many plots you had and how many years it took and all this, but they wanted to know what did you find out, and what's the significance?

There were kinks in presenting material properly. This sentence came out in the press, "The airplane was too close to the ground, crash experts say." [chuckling] That's a very poor presentation of an obvious problem. And if you're not careful, you can state something so that the appropriation committees are negatively impressed. I think that's one reason in the recreation area you have to be a little careful that you're stating something that's important, you know, and not frivolous.

Dr. Harper was quite sensitive about that. One time, before the appropriation committee, he showed a beautiful picture of the different harvest cutting systems and Fort Collins Experimental Forest, where they got the long-term effects on watershed management and water yields. One of the committee members said,

"Well, this is nothing new." He said, "I have this photograph in my office. It's been there for years." At least he didn't appreciate that Dr. Harper was giving the long-term results. This picture wasn't the story; it was the long-term results, years later. So he had to be very careful in many different ways.

HKS: Sure. In his interview, Harper talked a lot about the state of Congress's mind in 1952, when he came in. Because Ed Kotok did not get along well with those committees. Harper had a lot of fences to mend.

CEO: Yes. Kotok didn't have the right personality. But Dr. Harper certainly mended the fences.

But Dr. Harper and others following him really tried hard to get the Congress to go along with funding for the fields other than timber management research. It was hard to do and probably led to some of the criticism later of the Forest Service, for not having more answers on esthetics, on ecosystem aspects, on endangered species, and those other things that are not in the front line of timber management.

One thing we did while I was in the Washington office, the chief initiated a silvicultural practices review on the National Forests. I was on that team. I had to look out pretty much for the silvicultural aspects of it. And we came out with a report, "Timber Management in a Quality Environment."

I was talking with a timber management man in the South at that time, and I explained to him the concept that silviculture was the manipulation of a forest for multiple use, that you could accomplish thereby wildlife objectives, watershed objectives, recreation objectives, and so on. And he said, "No." He said, "Our money comes for timber management. It's a timber management function. Our silviculture is for timber."

You see, there was that attitude because of functional funding. "That's where our money comes from." That functional funding has been a handicap, and I assume as things evolve it will be broken down so that is doesn't proscribe the work.

But Chuck Wellner, who is called Mr. White Pine, a silviculturist in the intermountain area, now retired, published an article on the idea of multiple use silviculture. That is, silviculture for multiple use. I also pushed that idea. He specifically did so in an article in the journal. There's even a IUFRO segment or project in multiple use silviculture for not only timber production but for all forest aspects, and I think that's a concept that we had then and needs to be pushed. It's almost like it's related to ecosystem management, too. Because it concerns people, animals, and trees.

HKS: Yes.

CEO: So that multiple use silviculture was a key thought back then, and it's a sort of a predecessor of ecosystem management.

HKS: Were there abrupt changes in priorities.

CEO: No. Not that I detected.

HKS: The shifts were gradual, through time.

CEO: Yes. Gradual. Yes. As I mentioned, we had a research natural area system way back maybe forty years ago, which was really an ecosystem approach, and that has gradually gotten prominent.

HKS: The question I was going to ask, if your answer had been the other way, was how you deal with that. In an administrative management point of view, you've got a project going, you've got a scientist there, and you have to shut it down and do something else, but this didn't happen.

CEO: Not so much. Well, there were a few things like that. President Johnson emphasized natural beauty along with quality of environment. So I was named chairman of a committee to get out a publication on forest management and the quality of the environment, and we did it. This was "The American Outdoors: Management for Beauty and Use." Secretary Freeman presented that to President Johnson because

President Johnson was pushing this idea of natural beauty. So we did at that time have to be aware of including natural beauty in our research program recommendations.

HKS: I see that this is hardbound. There were some other decisions, I'll call them political decisions, made that there was going to be a presentation from the secretary to the president, and they wanted a nice copy. Were all of them hardbound like this?

CEO: I don't recall.

HKS: Presentation copies.

CEO: So that was a little change in emphasis. But Dr. Harper was a little cautious about natural beauty. He didn't think he could sell too much of that to Congress.

HKS: I remember Lady Bird was beautifying roadsides.

CEO: That's right, and that may be one reason why President Johnson was pushing natural beauty, so we had to be aware of that.

Then, another situation was I had been in Alaska just before statehood, and I was aware that there was considerable apprehension in Alaska as to whether Congress would do enough to help Alaska to make them better off. I was aware, too, that in Congress they were aware of this and would want to help Alaska when it came in.

So I recommended a considerable increase in my research program for Alaska, to Dr. Harper. I got some increase, but when he came back from the appropriations committee, he said, "Gee, I could have had anything I wanted for Alaska."

HKS: [chuckling]

CEO: So there were influences like that.

HKS: Probably for the first year or two. Then Congress forgot about Alaska.

CEO: Yes. So those were our few exceptions. Then things went along, gradually increasing, on the whole.

HKS: Let's say Congress is going to give Harper ten million dollars. I can't remember what the research budget was. Ten million dollars in total. And they say, "Boy, Alaska is good." Would they add money to the ten million? He had to balance what he was doing, obviously.

CEO: Yes.

HKS: Why didn't he take more for Alaska then?

CEO: He had presented his program without much for Alaska, and they approved it. But he could tell that--

HKS: They would have given him more.

CEO: Sure. If he had requested more, there would have been no problem to get it. But the natural beauty and Alaska were just two exceptions to the gradual progress of programs.

HKS: You've sort of answered this question already. Rachel Carson's *Silent Spring* came out in 1962, and it received a lot of publicity. President Kennedy was involved directly in ceremonies and so forth. One would suspect that in 1963, when Harper--or maybe it was Jemison by then--went to Congress, they would say, "We want you to do more work on pesticides" or whatever. But that apparently didn't happen.

CEO: But there was a steady push to get more money for insect and disease research by all of the chiefs of research, and they did build that up until finally they got the 3-Bug Program.

HKS: Yes. When Alaska comes into the union, Congress is very sensitive to Alaska needs. One would assume that following *Silent Spring*, at least the first few years, Congress would have been very tender to proposals to do more research.

CEO: Well, perhaps they were, and perhaps I was not informed of the prospects for insect and disease research, because that wasn't my responsibility, but agricultural industry at that time resisted the criticism of pesticides.

HKS: But basically the environmental movement did not have any immediate impact on research.

CEO: No. Till 1970, when the Environmental Quality Act was passed. Then there was a definite impact, and then the Endangered Species Act. That gradually came in as a real constraint.

Minority Hiring

HKS: Minority hiring was becoming important. A lot of things happened in the '60s.

CEO: Yes.

HKS: Everyone was under pressure to hire more blacks and eventually more women and Hispanics.

CEO: Yes.

HKS: Did that impact on what you were doing?

CEO: Well, everybody was in on the effort to see if we could bring more blacks into forestry, and it was expected that each person would be aware of this and alert to it. We did try to and research did bring in some blacks, specialists, pathologists, or people like that.

But the biggest practical effect was that at the Southern Station, going into the black colleges and encouraging training in forestry in the black colleges, to get people coming in at the bottom, because there were no really experienced black foresters, because they hadn't been feeding in earlier. So the Southern Station, particularly Director Tom Nelson, who was earlier in my division, got with the southern black colleges and had a program to bring forestry teaching and forestry interest into the black colleges. I think it provided some funding, too, some financial assistance. So that was the most effective thing that we did.

But some divisions were able to find other specialists and black scientists, and bring them in. But there were problems. I think it was in a town in the north where a black scientist was told to be out of town by nightfall.

HKS: By the local people.

CEO: Yes. And I don't want to say too much about that, but there were things like that.

HKS: I'm at the University of Georgia and I'm applying for McIntire Stennis support. Assuming that the basic skill was there, if I had a black graduate student as my research assistant, would that help me get that proposal?

CEO: I would think so. That is to have an acceptable proportion of black scientists represented, not to have just favored those uniformly, but to have a reasonable proportion considering the talent available. But there was a black person in our personnel division, and he made it clear to us in the Washington office, he said, "If you have black employees and if they do not perform, you treat them as you would other employees and get them up to standard or else." He made clear, that once we had black employees, we were accountable to make them perform, or they were accountable to perform.

HKS: Yes.

CEO: That was a good idea to have that black person in the personnel department.

HKS: So the goal at the time was hiring blacks. The cultural diversity we have currently, that was way in the future. It was a goal to hire more blacks as opposed to Hispanics or Asians, women, or handicapped.

CEO: Yes, at first, but it was broadened later.

Now, in regard to females, in 1957, when I first went to Washington, a female ecologist came into my office, and she wanted a job in the Forest Service in research. At that time, looking back, the mood was such that we would not have felt it wise to send a female out into a field party with males. It was just the way it was at the time. Now that's changed completely. But at that time, we were apprehensive about our accountability for sending a girl out with men in the field. At that time we did not see a lot of specific need for ecologists, although a silviculturist is an ecologist.

HKS: But she had the proper skills.

CEO: Yes. She probably had skills, but I'm saying honestly that we were apprehensive in the spirit of the times to put a girl out in the field.

HKS: Oh, I can understand that.

CEO: We've gotten over that.

HKS: Yes. I graduated from forestry school in 1957, and having a girl in our class was such an exotic experience we could comment, "I'm taking a class, and there's a girl in it."

CEO: There was the example of Miss Stuart. She was a girl forester in the 1930s, and oh, there was a girl, Mrs. Buell. She was married to a forester who worked in the Southeastern Station, way back, before I even came into the Forest Service.

HKS: And there was Eloise Gerry at the Forest Products Lab.

CEO: Yes. And she was the one who did the naval stores work out of the Forest Products Laboratory down in Florida, working out of Madison.

Agricultural Research Service

HKS: Let's talk about the Agricultural Research Service and the need to better coordinate Forest Service research.

CEO: Harper was very much concerned about close relations between Forest Service research and the department, specifically the Agriculture Research Service. He made sure that we appreciated that, too, that we needed to maintain good relationships with the ARS. Of course, there were occasional overlaps of responsibility that had to be resolved. In urban forestry, there was a question of how much of that is ARS, because they felt, with treating injured shade trees, shade tree maintenance was their field. The stand-wise aspects of urban forestry, it seemed to me, were forest management research. We had a little meeting with the man in ARS in charge of their shade tree work to resolve areas of conflict.

There was also a common interest in shelterbelt research, but there was never any conflict over that. Forest Service had good relationships with the ARS, were consulted about research, and we did mainly the tree culture part of it. They were more concerned with the effects on crops and all that sort of thing.

HKS: Within the USDA, ARS does research for all the other agencies, right? I mean, the Soil Conservation Service doesn't have its own research?

CEO: They did not at that time.

HKS: So the Forest Service was truly unique. It had its own research arm.

CEO: As far as I know, yes. Also we did quite a little research for the Interior agencies, because at that time they didn't have a formal research program. They had studies underway here and there. We had an annual research conference with the Interior agencies involved: the Park Service, Fish and Wildlife Service, especially the Park Service, and the Bureau of Land Management. The coordination was done there by an annual program conference, in which they expressed their needs and we presented our results and tried to respond to their needs for research in the areas which we performed.

HKS: Give me an example where you were influenced or you were responsive to the Park Service.

CEO: Well, just one small example was one of their concerns was why aren't we getting understory coming in up at Grand Canyon in ponderosa pine? That's a silvicultural question, and the obvious answer is ponderosa pine needs an opening in which to come up, and if you're not willing to make an opening, you're not going to get generation of ponderosa pine. But if they wanted to make an opening, which is probably against their rules [chuckling]--

HKS: So I understand [chuckling]

CEO: But that's a small example of a problem they presented to us, and our silvicultural research in ponderosa pine could give them a pretty good answer, that you just can't regenerate ponderosa pine under an existing beautiful stand of yellowbark trees, which was what they wanted primarily. You can't have one and not the other.

HKS: I would assume that the Bureau of Land Management would overlap a lot with Forest Service range studies.

CEO: I'm not qualified to speak about that. But they certainly must have had a big interest in ARS and Forest Service range research. That was, of course, an area of give and take in range research between Forest Service and ARS, but I'm not up on the details of it.

Government Employee Training Act

HKS: I asked you a little bit earlier about employees, young employees, and I'm assuming that the Government Employee Training Act was utilized primarily by fairly new hires, as opposed to senior people.

CEO: That's right. The philosophy was that you would give this training to people who had enough career ahead of them to really profit by it for the agency. If a guy was near retirement, obviously it wouldn't be profitable to the agency to pay for it. So it was mainly for promising younger people who needed financial assistance to get training. And it had to be training required for their performance in the Forest Service. It couldn't just be a generality.

HKS: It wasn't used just to support Ph.D. work. A person may need a couple of semesters of organic chemistry or something.

CEO: Sure. It didn't necessarily have to lead to a degree, although if it did, that was a certification of the completion of the work. You see what I mean? Not just an indefinite string of studies.

HKS: I was offered, under that act, a chance to go to Yale and do fire meteorology under Bill Reifsnyder. Do you know him?

CEO: Yes, I know who he is.

HKS: It was all set up to do that, but I resigned and went back to school and studied history instead. So my perception until this moment has been it's to help people get their Ph.D.s, but obviously there would be a lot of other rationale for it.

CEO: Oh, sure. That was considered a certification in a way, but it had to be training that would benefit the Forest Service through his work in his assignment. Not just to get him a Ph.D. But if he could wrap it up in the form of a Ph.D., that was more to his credit and to the benefit of forestry research. If he just went there and never finished his thesis, that wasn't as good.

HKS: Yes. So once you got on that track, you were under a lot of pressure to complete.

CEO: I would think so, yes. We tried to pick people who had excellent promise to do that, not people who couldn't bring things to a conclusion.

HKS: Okay. People like Max Peterson went back to school before they had that act, and they didn't get any money for it.

CEO: And I did, too.

HKS: Yes.

CEO: All my graduate work was after I started with the Forest Service, at my own expense. One time I had saved enough leave so that they paid me into November for unused leave.

HKS: [laughing]

CEO: But all that really was my own expense. Except for scholarships.

Pioneer Units

HKS: We've discussed this a little bit, but I'd like to know more about pioneer units, because they intrigue me, I don't know if they still exist. You were there when the idea came up.

CEO: Yes, and I was very much in favor of them because I thought that people like Grosenbaugh and Phil Larsen and a few others should be in a unit like that, where they were expected to develop new knowledge, not to be under pressure to improve forestry practice right away through applied research. Furthermore I felt that applied research eventually runs into a dry hole, unless you have basic research developing your knowledge, on which applied research depends.

So I was very much in favor of pioneering units, and I had at least three, maybe four, in my division. I thought they were a very good thing. Now, I read in the accounts of Buckman and others that there was a problem at the termination of the pioneering scientist's career, what to do with the unit. I never had to face that because we never got to that end point when I was in Forest Service. But I should think that administrative procedures could take care of that.

HKS: Dickerman didn't think that was a problem. Buckman did. Bob probably had a specific experience in mind when he said that, but he didn't say what it was.

CEO: But it's no worse than what do you do with a 3-Bug Program. A big crash program with a whole lot of people moved to another location, and you solve the problem in two or three years; then you've got a much worse problem.

HKS: Yes. To your knowledge, did Congress think these units were a good idea? You certainly aren't helping people out in the field very much.

CEO: I have no idea. I have no input on that. But we certainly had no negative feedback of any kind that I ever saw. I think they understood the idea of developing your knowledge, so you don't run out of knowledge in your applied research. I think they accepted that. I'm not sure that they ever really got into the question of whether pioneering research should be funded. I don't think that came up to them, unless Dr. Harper discussed it with them. I think he could have sold it to them. That's one way we kept very promising men in the Forest Service.

HKS: Where would they have gone? To a university?

CEO: To universities, sure.

HKS: By that time, universities had enough--maybe because of McIntire Stennis--they could actually hire people. Was there a flow of personnel to the universities from the Forest Service?

CEO: Some. Yes. Some good scientists went to universities, like Jerry Franklin went to the University of Washington. George Staebler went to Weyerhaeuser, in that case to industry because they had a good research setup. I think we could expect that.

HKS: But that's not necessarily a problem.

CEO: No, it's a minor problem. When a good man goes to another outfit and we work with that outfit, that's still good for forestry. George Staebler has been very good for forestry in the northwest, working for Weyerhaeuser. And Jerry Franklin has been a great asset to getting new concepts into forestry.

HKS: Yes, I knew Jerry when I was at the station. He seemed to favor high alpine ecology when I knew him.

CEO: He did very good research for the Forest Service, and I think he's doing well now. But, of course, there's a fringe that disagree with him very much and use his name adversely every so often in the journal. You probably see adverse references to Jerry's ideas.

HKS: Yes.

CEO: On the part of certain practical foresters.

HKS: Was there enough prestige involved with having a pioneer unit that every director wanted one? So if there's one in the Lake States, Berkeley's got to have one?

CEO: I don't think there was any demand, but I don't think there was any negative reaction. I think a progressive director like McGuire was very glad to have a man like Grosenbaugh assigned there, and I think it was all positive.

HKS: I did my master's degree on variable plot cruising, so I'm very familiar with what Grosenbaugh was doing at that time. He was sort of like my role model. I never have met him.

CEO: He developed the mathematical theory of that method, which was a real advance. Not only that, but he got into computer applications for inventory, which were very helpful to Forest Service and to industry, in particular. He's still doing some of that. I see he gave a talk at a conference in Canada within the last year.

Top Scientists

HKS: I'm trying to come up with a list of people, and I don't know who's active, who's still living, who would be a good subject for an interview. Grosenbaugh is always on my list.

CEO: Oh, yes.

HKS: Peter Koch in New Orleans turned out a tremendous amount of stuff.

CEO: Oh, yes.

HKS: He was a pioneer, right?

CEO: It might have been a pioneering research unit, but I didn't know. I knew he did a great deal of work down there. Phil Larsen--he's retired now, but he was a fine scientist, and he would be a good one to interview, I think, about real scientific research in the Forest Service.

HKS: Who's Metz?

CEO: Dr. Lou Metz. He was a soils scientist at the Southeastern Station. He had a pioneering research unit in the mechanisms of humus formation in forest stands, which was a continuation of some old pioneering research way back in the Southeastern Station by a man named Burleigh. He started research on the organisms and processes involved in the forest humus formation. That work was taken up by Metz. He was stationed either at Durham or Raleigh. He's probably retired now. He didn't publish as much as Larsen or Grosenbaugh, but he was involved for a shorter time period.

Another one would be Dave Marquis. He was an outstanding silviculturist in Allegheny northern hardwoods. He worked in the Northeast completely. I wanted to get him to come into Washington, but he wanted to stay in research. I honored that, and he did some very fine work in northern hardwood silviculture. He's retired now. I think he would be a good, real scientist whom you could talk with, especially in silviculture.

HKS: So we have Marquis in silviculture, Larsen in physiology, Grosenbaugh in mensuration, Metz in soils.

CEO: Yes.

HKS: That would make a pretty good package.

CEO: Yes.

HKS: What other fields haven't we discussed? Wildlife?

CEO: Of course, that was not in my division, and I'm not acquainted too well with the individuals and their performance.

HKS: Then there's the field of forest protection, fire.

CEO: There was Hawksworth, who was an outstanding forest pathologist, who retired. He wrote the books on mistletoe. I think he was an outstanding scientist. Of course you might want to talk to the division directors. Ray Hansborough had forest disease research for a long time. And Jim Beal had Forest Inset Research. He was at Duke for quite a while.

HKS: There is Elbert Little.

CEO: I encouraged the Forest Service, after I retired, to get a shelf of Dr. Little's books and take his picture beside the books that he's contributed to forestry literature, and publish the photo in a journal. I didn't do it myself when I had time. But he's published more since then, of course. I think that would make a good story. But he's an individual. Somebody said, "A real scientist. If he had a traffic ticket that he didn't deserve, he'd take it to the Supreme Court."

HKS: [laughing] So that's the sort of thing he would do.

CEO: [chuckling] Yes.

Early Research

HKS: Carl, we've been talking about Weidman's publication on ponderosa pine, and you were explaining how you had to use a microtome to make the slides.

CEO: Yes. The University of Montana let me work in the laboratory of the botany department to make cross-sections, to study the needle anatomy of ponderosa pine from different geographic origins. Conventionally, one uses a great big microtome knife to cut sections of biological material, and that knife has to be sharpened occasionally, at great expense in time. So I designed and had built a little device to hold razor blades in the microtome machinery so that I could section with razor blades and throw them away as soon as they got dull. That was a fun thing to do.

HKS: How many of your samples were good?

CEO: Oh, practically all with razor blades, and if you kept the microtome knives sharp, they were all good. If they were dull, they would tear. But that was one of my first jobs as an assistant technician in the Northern Rocky Mountain Station.

HKS: You learn a lot of things in school, but when you get out there's always something else that they hadn't taught you.

CEO: Yes.

These are publications are current revisions of handbooks that we published earlier.

HKS: Okay. You have a couple of other publications here. *Silvicultural Systems*.

CEO: This is a much enlarged and enhanced version that came out, later. Same with this *Silvics*, much enlarged and refined. These are being followed up, you see, and updated. I think for judicial reasons, they brought in national forest authors and authors from private industry, to the original silvicultural systems publication, which at first was written by the Forest Service research scientists, with outside review.

HKS: As a practical matter, is there much disagreement between the public sector and the private sector over issues of science?

CEO: No, I don't think so.

HKS: About how a tree grows or--

CEO: I don't think over issues of science. No, I wouldn't say. But over just administrative policy and managing forests.

HKS: Absolutely. I understand that.

CEO: There would be.

HKS: You collaborated with the George Staeblers of the world all the time, right? So it wasn't unusual for you to deal with industry scientists.

CEO: *Silvicultural Systems* revision was also reviewed by the solicitor, which seems to say to me that the solicitor--in other words, the department lawyers--were interested in this publication as a defense of Forest Service silvicultural policies. It was revised with much more cooperation from national forest and industry authors.

HKS: For example, if the Sierra Club were to file suit about clear-cutting, then this document would be evidence that would explain the Forest Service's position?

CEO: It would, and it would defend its use in biological situations where it would be necessary.

HKS: I hadn't thought it about it that way. The person bringing the suit could use this same document and go on the ground and allege that the Forest Service was not following standard procedures.

CEO: Yes, it could. It's possible.

HKS: It could work both ways. Can you think of cases where this actually was used in court?

CEO: No, I don't. But I see no other reason for the solicitor to have been involved with it and actually to review the manuscript. I see no other reason to bring in people from administration and industry, whereas the forest researchers were the ones who really dug out most of the scientific information.

Visits and Inspections

HKS: You gave me earlier your personal copy of a report you made in 1957, when you were just newly appointed director of forest management research in the Washington office. You toured the various stations. Who received copies of this other than the station that you had inspected?

CEO: I'm not sure that the stations did, but I know that the initial copy went to Dr. Harper, to research administration.

HKS: I was struck by the informality of the language. You said, "Bob Buckman," rather than Robert E. Buckman. You used the common names. So this was clearly an in-house document.

CEO: Yes, entirely.

HKS: Was it considered confidential?

CEO: No, it was not considered confidential. If I had something confidential, I would write a separate memorandum, a confidential memorandum, to the Forest Service head of research.

HKS: I was just browsing through this, and from time to time you had a little hand-written note stuck in here. And this is one on the Lake States Station. You wrote, "Does Larsen"--that's Phil Larsen--"really have the facilities and right research environment for the projects given here? Conditions look primitive to me." Why wasn't the sense of that not in the report itself? Was that an afterthought?

CEO: I don't recall. I didn't even remember that I had done it. It may have been too derogatory to put in there, even though it was put on record.

HKS: That's an interesting comment. Certainly, when you inspect--

CEO: But these weren't inspections, you see. These were informal visits.

HKS: Oh, I see.

CEO: I had made one inspection, and the station director criticized the report on factual grounds, said the facts were not correct, which cut the feet off the inspection report. So I decided to go around and make a preliminary visit to every station, which I did, so that when I wrote future inspection reports I would be able to defend what I had written and I would know what I was talking about.

HKS: Okay.

CEO: These were preliminary visits.

HKS: But had this been an official inspection report, you could put critical matters in it.

CEO: Oh, sure. Certainly, that would have been one of the objectives.

HKS: Okay. We're in the Lake States--"Somebody missed the boat when the space for the nursery was not transferred to the station." I mean, "somebody missed the boat." This is very informal language. I think that's a note to yourself.

CEO: Yes.

HKS: So this is something that you kept and you referred to when you went out on inspection tours.

CEO: Yes. I would re-read this and have background so that I could avoid errors of fact, particularly in an inspection report, and not be criticized right off by the station director for not having the facts.

HKS: Here's a case where you're saying that some staffer has not found himself in his assignment. You're assessing him.

CEO: Yes.

HKS: And it says, perhaps he should be transferred to an area that he knows. Also, it's clear from this study of yours, that you really admired Lou Grosenbaugh.

CEO: Oh, yes.

HKS: The language of this last report is much--well, not dramatic--but it's fuller. You really admired almost everything you saw there, except maybe he could have had some more help.

CEO: That was the Southern Station.

HKS: The Southern Station.

CEO: Yes. I had been a member of the Southern Station before. The work in Lake City in 1944 was under the Southern Station then. A little later it was transferred to the Southeastern. So I was acquainted with the work, and I knew Grosenbaugh. I knew he was a very capable guy.

HKS: Let's talk a little bit more about inspections. The Forest Service has been doing inspections since 1905, and when the regions were created, they were called inspection districts. I mean, inspection is really the core of how decentralization works.

CEO: Our practice in timber management research was to make up a yearly travel schedule, including the inspections, and then to send to the stations a notice that we wanted to visit at a certain time, and what we wanted to cover.

For example, we would say that we wanted to cover progress on summary bulletins since the last inspection, and we wanted to cover progress on recommendations of the last inspection, which we would take along and check progress. Then, during the inspection, I was particularly interested in assessing the personnel, because I realized that the division director was responsible for helping to develop promising people, particularly through assignments to Washington. He had to know the people in his division and know which individuals needed opportunities for career development. I thought that was a considerable part of the inspection.

The branch chief was technically responsible, but as a division director I went along with the branch chief or, if we couldn't afford two people, I might go myself. I thought they were a very valuable part of keeping the work up to snuff, assessing the program, particularly assessing program needs, which is one of the major points of the inspection, so that we could recommend increases in budget. We also said that we would get

their impression of the adequacy of services from the Washington office. I felt that that helped to improve the tone of the inspection so that the people in the field felt it was a two-way process.

HKS: What services might you provide?

CEO: Various personnel services, particularly budget. Technical direction, adequacy of technical direction. Coordination, helping to coordinate efforts between stations and eliminating duplication. Letting one station know when we knew some other stations were doing research in the same line. And sometimes favoring studies, major studies, that involved coordination among stations.

An example of that was a big South-wide study of the geographic races of southern pines, which involved several stations; maybe perhaps three stations were involved in that. That was one of the functions of the division and the inspections, to help coordinate inter-station activity.

HKS: I see. I asked Bob Buckman, "What does a scientist do in the Washington office. You're not carrying out your own research anymore."

CEO: No.

HKS: It's obvious from reading this report of yours, you have to know a lot of science in order to understand the significance and the quality of the research that you see.

CEO: Yes, to give technical direction. There's certain technical coordination involved sometimes, so that people in different stations aren't working against each other, which would be rare.

HKS: Did you find that the inspections were generally welcomed by the field?

CEO: Yes, I did. I did. I was pleased. Keith Arnold told me that after I made an inspection of his timber management research program, the man in charge of timber management research at the station said he felt that I knew more about his program than he did. Which, if true, indicates that the inspection procedure was working.

HKS: Yes.

CEO: But he had only been there maybe two or three years. I had the time advantage on him. But through editing silviculture manuscripts for the *Journal of Forestry*, I had known a lot about what his people had been writing.

HKS: That's true.

CEO: But that's a tribute to the inspection system.

HKS: As far as you're aware, the inspections that you conducted were relatively typical for the pathologists and the products people. There wasn't anything unique about what you did.

CEO: As far as I know. I do not know whether in other divisions they stayed in the field, wrote the inspection report, discussed the factual accuracy and the fairness of the conclusions with the station. I don't know whether they did that on the ground. But they were responsible for coming up with a report, which they had to do.

I thought the inspection system was very effective, and I hope that's been continued. With present reverses in budget and so on, I'm a little concerned about whether it is continued.

HKS: So the inspection cycle was typically every five years?

CEO: I think that was correct. It might have been four, but I think--I'm not sure whether it was five.

HKS: If you found a problem area, maybe you'd go back to a particular station, just to look at that one area after a year or something, to see if it had been resolved?

CEO: Oh, yes. Quite possible. We made additional field trips as needed, to stations.

HKS: You traveled quite a bit, then.

CEO: Yes, I was out three out of four weeks all during the first two field seasons I was in Washington. Not so much later. But Dr. Harper complained that they had to do my work for me.

HKS: [laughing] So you only traveled during the summer, then, to the field.

CEO: Well, the field season. Which in Puerto Rico included the winter and in the southern area included spring and fall. So nationally, it was quite a long field season.

HKS: Yes. Is there anything else to say about inspections?

CEO: No. I think that wraps it up. I just hope that there was as good a support for the inspection system as I felt it justified.

HKS: If someone were to do an in-depth study of, a history of a particular station, reading the inspection reports over the life of the station would tell an awful lot.

CEO: Oh, yes.

HKS: Because it was summarized so much. I suppose all the inspection reports are at the National Archives. They're safe somewhere, one would assume.

CEO: I don't know. There's an effort in the business offices to clean out files every so many years, which is not a good policy in general, especially for research records. But research has to fight this tendency just to throw away old files.

Computers and Other Technology

HKS: Reading through this 1957 report and your discussion about Grosenbaugh, he was just beginning to take advantage of what you referred to as a "computing machine."

CEO: [chuckling]

HKS: The Tennessee Valley Authority. Clearly this was something rather mysterious, and Grosenbaugh was pushing for it, and was proposing a computing center in Chattanooga, that this was a logical place for it.

CEO: I've forgotten.

HKS: During your tenure in Washington, D.C., computers became a fact of life, for analyzing data. Now they are used for everything, even transmitting messages. Was it difficult to get the scientists to use the new technology, or are scientists generally advocates of new technology?

CEO: No. I didn't think that there was any real difficulty there. But there were problems. I recall asking a fellow at the Southern Station about the efficiency of using a computer, and he said, "By the time we get our data in exact form required and wait our turn on the computer, it took as much time as we could have done it by older methods." But I think that was overcome as people got more used to using computers.

HKS: And the computers are faster.

CEO: Yes. But I was aware that a fellow at Duke University was doing a particular research study that I was interested in, and he was going to give a report at the AAAS meeting in New York. I used to attend these meetings as a delegate of the Society of American Foresters. So I went to New York to the AAAS meeting to hear his report on his forestry study. He came, and he said, "Well, we have all our measurements. We have all the data. We saw the results in the field." And so on. "But the university computer is down. We don't know what we found out. We'll come back next year and report."

HKS: [laughing]

CEO: So those were some of the early problems with the computers.

HKS: Yes. I worked in research in the early '60s with Dave Bruce. Dave was an advocate of this sort of technology, but even then most of the time it was much faster to do your computations by hand. You got the results a lot sooner. Because we had to send everything to New Orleans; that's where the computer was at that time.

CEO: But it was interesting that the scientist had seen his results. He had measured them. But he didn't know what he had found out.

HKS: Sure.

CEO: Until he found the computer.

HKS: The computer, as I see it, made it possible, we'll say by 1970, to do certain kinds of research that we wouldn't have been contemplating before. Because you could handle large volumes of numbers.

CEO: Absolutely.

HKS: So the nature of research itself, the kinds of questions that were being asked, was directly affected by computers as they became more and more efficient.

CEO: Absolutely. And there's no question now about how essential they are.

HKS: As someone who started quite a few years before there were computers, did you have a general feeling that the quality of research was improved by computers, or just the nature of the questions?

CEO: You can ask much more sophisticated questions, I think, with the aid of computers than you could before. You have more confidence in the results, and you can do more sophisticated things.

HKS: What other technology? Computers get all the headlines, but there must have been other advances, certainly in analytical techniques, in laboratories. Were there other technical breakthroughs in terms of equipment that you think are significant?

CEO: I think the steady advances in chemical analysis methods was one of the most useful things, but it was just a gradual step procedure into more and more sophisticated, and faster, chemical analyses and analyses to determine very minor concentrations. One of the big promises, of course, is in science involving gene patterns and mapping of the genes, finding out how to use the genetic information to improve plants and animals. That's a tremendous field, and I assume that Forest Service is well into it.

HKS: So when you were doing genetics research, it was empirical? You planted seeds from known parents, and then you watched them grow.

CEO: Yes, it was.

HKS: But now they analyze the DNA in some way and make predictions.

CEO: Yes. And can actually put DNA material from one organism into another. That's a wonderful field for future study.

Research Design

HKS: You talked earlier about Harper's ten-year plan, the planning priorities and budget. Clearly, those are major responsibilities that you had.

CEO: Yes, I think so.

HKS: You were the scientist who went out in the field and watched what was going on.

CEO: Well, science administrator.

HKS: Science administrator.

CEO: The branch chiefs were responsible for the scientific, the technical direction.

HKS: How difficult is it, generally, to design a research project and then predict how many years it's going to take to have useful results and develop a budget? If I want to cruise fifty acres of timber, I know how long it takes to cruise fifty acres of timber. If it's rugged country, if it's flat country, whatever. But science, just by its very nature, is a little hazy on the horizon.

CEO: Yes, and things may change in the meantime. An example of that is that when I started research at the Northern Rocky Mountain Station, at Priest River. We put in weeding studies in which we eliminated the so-called at that time "inferior species," hemlock, white fir. We favored western white pine, because the others are not marketable. With the passage of time, the so-called "inferior species" became marketable, and they're considered to have ecological value, perhaps. By the time eventual results came through with the stand of largely white pine, we were well into problems with the pole blight of white pine, and we had just as soon have western larch or some hemlock, maybe even white fir. So changes can effect the long-term results of silvicultural research.

HKS: You used the term here, and we'll probably come back to it many times now, but the idea of ecosystem.

CEO: Yes.

HKS: That's not a new concept, but it has become important in terms of management requirements. What did you think about when you were pulling up weed species, looking back? This is just the way it was?

CEO: At that time, the city people were not going out looking at what was being done in the forest. They didn't have the transportation. We were working out there alone. We knew that western white pine was, we thought, the only thing you could sell, perhaps maybe western larch, too. We were directing stand composition toward the kinds of trees that would be salable in the future, not realizing that perhaps, with increased transportation and the utilization and scarcity, all these species would be marketable. And maybe ecologically useful.

However, the Forest Service has always set aside wilderness areas and research natural areas in which we know the germ plasm will be continued; there won't be any elimination of yew, which was later found to be of medicinal value, or other valuable germ plasm. I guess there are now over ninety million acres of wilderness areas, and a whole national system of research natural areas. So the Forest Service was aware of this need to study ecosystem processes and to preserve germ plasm. But not on every acre.

HKS: I want to follow up on this. I'm not quite sure how to do that. You mentioned earlier multiple use research as the overarching, how to pull it together, ecosystem science. Was there much discussion of that? Talk about that a little bit. Since you've retired, this sort of thing has become very important.

CEO: Yes. Well, particularly when only certain species were marketable, we were content to accept a certain seral stage in succession. It didn't have to be a climax forest, or it didn't have to be every stage in the whole ecological succession. For example, in the South we favored southern pine, even though some hardwoods would grow on those soils, but they had practically no commercial value at that time except for cordwood.

So it was I think necessary and wise to favor certain seral stages in succession and not the whole, entire ecosystem. I think this is still true, if you have dedicated areas, as proposed by George Staebler of Weyerhaeuser. That is, in southern pine, you know that the public is not going to be out there using extensive, miles and miles of southern pine, with rattlesnakes and redbugs and mosquitoes. It's just not like the Northwest, and you can dedicate that to a certain stage in succession. And that's the only economically feasible way to go, say, in the extensive areas of the lower coastal plain, where you can maybe drive for fifty miles on a road and just a southern pine stand and a ditch and a swamp on each side.

It's quite different out in the magnificent old-growth stands in the Northwest, where the public has now gotten used to seeing them and wanting them preserved. It's just a completely different situation geographically.

HKS: Just before I came here for this interview, I was in Portland with a group of people, and they were talking about how the loggers are now required to leave snags standing as a habitat for wildlife.

CEO: Yes.

HKS: I would assume that when this decision, when this transition was made from "You cut every snag down" to "Leave every snag standing," there were a lot of heated debates or serious debates at all levels in the agency, between the fire control people, timber management people, the recreation people. Can you give an example of these kind of cross-disciplinary boundaries where at the Washington office there were some sort of meetings where you would debate with people in protection research about silvicultural requirements?

CEO: No. We had to be aware of these interests of other disciplines in silviculture, and that was the idea of multiple use silviculture. But there wasn't too much debate about it. I mean, if we had to respect wildlife needs and leave some snags, so be it. If it meant increased lightning risk, okay. It had to be.

HKS: So basically the debates would have been on the National Forest Administration side.

CEO: Oh, yes.

HKS: That's where they would be debating.

CEO: Not in research.

HKS: Yes, the science side, you're still doing your work, and you're aware of it.

CEO: The job of silvicultural research is to know what is the response of different forest types and stand conditions to different silvicultural systems. So if silviculture research determined the response of the forest to the options available, then it was just a matter of administrative policy on the selection of the option for a given situation.

HKS: I notice in your report here that the people you talked to in the stations would propose they needed a new greenhouse, and they'd tell you it would cost twenty thousand dollars.

CEO: I would like to say a little more on silvicultural systems before we get into that.

HKS: Good.

CEO: I wrote a paper for a World Forestry Congress, "Silvicultural Systems for Rural Populations," and that goes into the choice of silvicultural systems for different stages of economic development in different countries. You might want to see the text of that, but it explains that the choice varies with the basic economy, where the people just need enough fuel wood to keep warm, on up through an agricultural situation where the farmer may have a forest that he needs to have a continuous harvest, so he might need a selection system. If he could use it in that timber type, he could go out each year and make a little harvest or get the products he needs on the farm; up to an advanced society, where the people are rich and are traveling around and want a beautiful, aesthetic appearance and want all sorts of ecological principles observed and so on. That gets into much more sophisticated choices, and then it ends up with a statement--and this was about 1972, I guess--and the statement ended, "what will people want next?" Well, now they want ecosystem management and germ plasm and all this sort of thing. But it's in that paper for the World Forestry Congress, and I have a copy here.

HKS: Which Congress was that? The sixth, I guess. The fifth was in Seattle.

CEO: Yes, it must have been the sixth. Then, there's a parallel situation here in time. That is, earlier in the United States, when we had big, stationary equipment, you had to do a lot of logging at each site. You could sell only certain species. The transportation was difficult, and the people in the cities didn't have means to travel out there and watch what we were doing. On up through the present sophistication, where people have much greater needs. So silvicultural systems go through progressive development, either with time or place.

HKS: It's a proper use of the term, to go into a third world country where forests are used primarily for fuel wood, or are used largely for fuel wood. And these are people who have no particular formal education, to call it "silvicultural system." I mean, silviculture doesn't require a forester to apply it. Your definition is much broader than anything I've heard before. You're saying when the native population in Nigeria goes out and collects firewood, that's a silvicultural system.

CEO: Yes, in a way. If they're very short of wood, they need intensive culture, fast-growing trees, even very careful culture to get the maximum fiber out of it. But that World Forestry Congress paper is interesting.

HKS: There is, for lack of better terminology, a political dimension to this, too.

CEO: Yes.

HKS: How did you choose this topic? And who had to approve it? Did someone have to approve the text? Because this is the U.S. government making a policy statement, at some level. It's also scientific.

CEO: The people who designed the program for the World Forestry Congress put that topic on, and the Forest Service I guess was invited to be the participant, and then they assigned me to help write the paper. So I wrote it.

HKS: I see that John Fedkiw was one of your collaborators here.

CEO: Oh, yes. Yes, I had to depend on an economist for some interpretation of economic systems, and as a background for the choice of silvicultural systems.

HKS: Even though you took that course from Dean Graves, you still needed some help.

CEO: Oh, sure.

HKS: [laughing]

CEO: And authenticity. But that was a particular interest of mine, that is the effect of time and place on the progress of silvicultural systems, and the choice of them.

HKS: Which in some sense goes back to that forestry is very much a political science, not just a natural science.

CEO: Yes.

HKS: I asked if there was more to talk about budgets. I was talking to someone recently who said, "The American approach to everything is to overwhelm it. We do it in war. We do it in research. And then if we had a larger budget we could solve problems in some other countries." This is what this person was suggesting. "Other countries with more modest financial resources find more efficient ways to study things than we do." Do you reject that?

CEO: I do. From my experience, if you want to, for example, determine the responses of forty different timber types and "x" number of stand conditions to, say, half a dozen silvicultural systems, that really takes a lot of time and money to do that job. You can't do it without the research. Furthermore, to get into new fields, like gene science and what that can do, genetics and so on. That all takes money. Through inspections you have to make sure that the money is efficiently spent, but you simply can't do it without the funding. No way.

Research Facilities

HKS: During your career, more and more work was done in laboratories as opposed to in the field, and the labs cost money. It's an expense that the earlier people didn't have.

CEO: That's right.

HKS: Major facilities. At Flagstaff, that's a rather impressive building.

CEO: Oh, yes.

HKS: And they built new greenhouses there, even though they had relatively new greenhouses out at Fort Valley. So a lot of money.

CEO: Furthermore, scientific equipment keeps progressing and getting more expensive and more sophisticated, but also gives more advanced results, so you have to put up with this increasing cost of equipment and technology.

HKS: I realize you didn't testify at Congress on budget.

CEO: No.

HKS: The Deputy Chief did that. But do you have a sense that Congress more or less accepted that research costs more each year, simply because of new technology?

CEO: I think so. It's rather obvious. It's obvious in medicine. Senator Stennis really pushed the need for Forest Service research facilities and laboratories, and I think his opinion was respected in Congress, and he made great progress.

HKS: Yes. I have a question I asked the three former deputies. The location of research centers. How the locations were selected. Obviously, if it's going to be a major facility, you need support from the congressional delegation, so that's a factor.

CEO: Yes.

HKS: But in your report you're talking about the location of one in Bottineau, North Dakota. I've never been there, but in my mental image North Dakota is rather bleak.

CEO: That's a shelterbelt state.

HKS: A shelterbelt state.

CEO: That was the topic of the research. There are obvious political factors, but they even out with time. One delegation this year may be strong, and this may be the optimum time to get a research facility at a particular location, but that changes with time, and over time tends to even out, so that you can fill in the missing spots in a desirable geographic pattern. But you can't do it in one year, when one delegation is much more apt to support the request than others.

HKS: It points out how essential it is to have a long-term plan

CEO: Oh, yes.

HKS: With pins on the map where you want centers, and you take advantage of them as Congress rotates through its committees?

CEO: That's right. You have to get what you can at the appropriate time. In any one year it may not look like an ideal balance, but over time it evens out. Or it should. But that's the value of having the plan, because sometimes Congress will want to put a facility where it's not needed. Then, if you have the plan, then you can say it does not fit in with a ten-year program.

HKS: Whenever possible the Forest Service prefers to have its own physical plant on a university campus, as opposed to using university facilities.

CEO: Yes.

HKS: In the early days, you would go on campus and probably have the attic at the forestry school or some such.

CEO: That's right. And then, as the school expanded, they had to use that space for their own people. That's the risk, of course, of using the university facility. That has happened time and again, where a university has expanded to the point where they need that space for their own people, and the Forest Service had to acquire its own. So it's just as well to get their own facility before it comes to an issue.

HKS: But being on campus is a benefit.

CEO: Oh, absolutely.

HKS: You have access to faculty and the students.

CEO: Yes. For cooperation. Furthermore, it helps the personnel of the Forest Service to be in contact with the academic people and to be able to take courses at the university and enhance their own education at the university while they're also working maybe part-time.

HKS: When I was a graduate student in Seattle, the Forest Service had a couple of people on detail, right in the forestry school building. There was also a research center near campus. But some of the Forest Service people taught. They seemed to have a reasonable course load. They had graduate students. Was this unusual?

CEO: No, I don't think it was really unusual. It's a *quid pro quo*, in a sense, that the university could benefit from the knowledge of the Forest Service scientists, and the scientists could benefit from maybe the resources of one kind or another at the university.

HKS: So it's more than personal preference on the part of the scientists, that "I would like to teach a course a year, and so I'm allowed to. Maybe the dean really wants access to my expertise and requests that I teach a course."

CEO: Yes.

HKS: So it could come from either motivation.

CEO: Yes. And the station director would have the responsibility for determining whether or not that was correct use of Forest Service time. But there are various kinds of *quid pro quos*.

R D&A (Research, Development & Analysis)

HKS: A topic that Bob Buckman talked about a lot, in terms of its importance, is RD&A, technology transfer. He described that in very broad terms, what technology transfer is. So I'd like to ask you about that. How you dealt with technology transfer and what it meant to you and where it was in the hierarchy of importance.

CEO: I considered it of top importance. Ideally the research people would work in concert with the administrative people on the ground. A lot of Forest Service research was done on national forest properties, in concert with the national forest personnel, and that's the way a lot of it should have worked.

Or with industry people. Maybe joint studies with industry. Particularly on a big study like a study of stand density on a given species, the growth rate related to stand density and site and age over a geographic area. There were many instances where some of the plots would be on private land, and some on national forest, some on maybe experimental forests.

That was a way of working with administrative people. Then the results are almost guaranteed to get to them. Special efforts were needed and special programs, especially the later RD&A programs that were set up to do it, for a crash program on an urgent problem. But I think it was part of the life of researchers to try to be in touch with administrative people so that they had cooperation right from the ground up. The results automatically got to the people in the field.

But when it comes to these crash programs, there were certain disadvantages. For the one thing, it took a great deal of administrative time to organize the program, to arrange all the personnel transfers, to sell the program to Congress, to get the funding for a crash program, and then to move all these people and their families. And if it were a short-term program, then what do you do at the end of that program with these people? That was difficult for me to handle, because I had had a long career of research people being assigned, you know, to a laboratory, where they lived and their family was there. Then they knew from one year to the next where they would be. So there were some advantages to these crash programs, but there's no doubt about the responsibility for day-to-day cooperation with people in administration. You get the results into practice.

HKS: But the most common vehicle of technology transfer is the publication, the station paper.

CEO: That's right. We put great emphasis, I thought, in research administration on progress in the preparation of publications. That was a very important part, particularly on summary publications, which meant they were used and they weren't just a scientific report but a usable recommendation.

HKS: Dickerman talked about when he was director of the station. He didn't say whose idea it was, but they shifted the publication program so the station papers were much more attractive physically, the design. Like the cover here, with a photograph on it, to attract the field people.

CEO: Yes. Some of the early publications were very bland in appearance. That's very true.

HKS: Who was your audience when you were writing? Were you writing for the timber management staff person on the national forest?

CEO: There were multiple audiences, depending on the nature of the research. One type was mainly a scientific publication, based on needle anatomy and all that sort of thing.

HKS: Yes. That's Weidman's 1939 study.

CEO: There should have been another publication for people in nurseries and seed collection to point out what this meant in terms of where they should collect seed to plant in a given place. That would be an entirely different publication.

HKS: Was there the other type of publication that you know of?

CEO: I don't recall. That was when I first started out, and I just did the laboratory work.

HKS: But that would be something on an inspection visit, you would look for, that the research was disseminated at different levels of sophistication.

CEO: Yes. The first concern would have been published, put on record. The second concern was that it would be in useful form and that efforts were made to get the research results into practice. If a person didn't publish, then nobody got the results.

I mentioned to a person in another division in Washington, one time that in timber management research, in our annual report of results, we used only published results. He said, "Gee, maybe I should do that, too. Put pressure on my people to get this stuff published." Because he was also reporting the unpublished.

We didn't even report it. Of course, we had a big division and many scientists and had a lot of information to pick from, but we would report annually from Washington on research progress only those things that had been published. That put pressure on people to get their stuff out.

HKS: I don't remember this clearly, but I remember some kind of discussion--this was over thirty years ago--at the experiment station that if the study fails, that should still be published. I mean, if you determine there is no relationship between one--

CEO: Sure. Negative results.

HKS: But it's pretty hard to publish something unless it's successful. You have to show new findings, that there was a large body of information that was being acquired that in fact wasn't disseminated because of the negative results.

CEO: That's very true. Some people say negative results are as important as positive results. And that's almost true. It's nearly true.

HKS: When you're editing these hundred papers a year for the journal, did you get many negative result-type papers?

CEO: No, no, we didn't. This one I mentioned, though, by Jemison, which was really to explain a new statistical technique I thought belonged more in *Forest Science*. It was more for people really doing research or studying research, and not for practitioners. But I very appreciate the value of negative results. They have to be reported. But you don't give them to a ranger, unless it involves his own interest.

HKS: Would the scientists sometimes go out and conduct a short course for forest personnel?

CEO: Oh, yes. After the war, World War II, there was a national program in which returning people in forestry would go to research facilities and have brush-up technical training. We did that at Lake City, Florida, when I was there. We had groups of returning veteran foresters come to the Lake City research center, and we'd put on brush-up training programs for them, and I'm sure this must have been a national program. That was a particular need.

A lot of research facilities, especially in the South, had annual field days, and their purpose was to bring in forest owners and users to the research facility and have a technical update. That was a very specific program in the South. And I suppose at other places where it was useful.

HKS: I'm sure you've heard this, so you won't be offended, but field foresters would say that the journal was too technical. No one reads it but professors. Is that a mindset? The journal is not really too technical. It's very arcane sometimes.

CEO: Now we have regional forestry journals, which deal with applied programs in that particular region. There's a *Journal of Southern Forestry*. There's a *Journal of Western Forestry*. They more nearly meet this need of the practitioner. They deal with programs in that one region, so that the national journal may be only a fifth of it applies to the South or to the Northwest. So I think that's one of the answers, and then of course all the different kinds of publications that are produced, particularly summary publications.

HKS: You were in an influential position, editing all those manuscripts to determine was it proper for the journal or should it have gone to *Forest Science* or maybe this should be a station paper. Maybe there's all these other outlets. I know that professors collaborate with Forest Service scientists.

CEO: Sure.

HKS: The decision generally was made on outlet by the scientist himself? I mean, they could send the same thing to the *Journal of Forestry*. It could be a station paper.

CEO: I think the scientists, plus the station editor, and even the station director would be involved, if it were an important decision. But I think the station editors had a considerable responsibility. When they're editing a publication, they should know what the outlet's going to be, and edit it accordingly. The decision should have been made, by the time it goes at least through the station editor, that this publication is of a nature that will fit this outlet. That should be the editor's responsibility, along with the scientist.

HKS: Was there some sort of a quota? I'm a scientist. I've worked ten years, and I've never published anything in *Forest Science*. That maybe I'm not doing enough hardball science? Was there any kind of evaluation process like that?

CEO: Sure. In the man-in-job concept. There was a panel evaluation for each promotion that got strictly into this question. How productive has this scientist been in terms of published information and has it been of high quality and sufficient scientific level or practical importance to justify advancement? So that's the man-in-job evaluations for promotions. That's where that came in. It was very, I thought, effective and very well-performed, too, as we got into man-in-job concept.

HKS: Were the people on that evaluation committee only Forest Service scientists, or did you bring in university professors? I mean, was it purely peer review?

CEO: I think generally it mostly was Forest Service people, but I think at universities they must have brought in occasional other people. But I can't give any specifics on that.

HKS: I guess the question I'm asking, to advance in the Forest Service research program, is that different or the same as advancing on the university track? You're going from assistant professor to associate professor to full professor. Your publications are also evaluated by a panel of peers.

CEO: I don't know specifically, but I would certainly expect that at a university, they would put more emphasis on the development of new knowledge than they would on improvement of a practice in a profession.

HKS: Okay.

CEO: The Forest Service is responsible to Congress and to landowners. There would have to be more emphasis than a university put on producing results that had an effect on the practice of a profession. Perhaps less on the development of new knowledge, which a university might do more. That would be my guess.

HKS: Okay. That's a good answer. It clarifies the different priorities.

Anything more to talk about on technology transfer?

CEO: I don't think so, except that it's an obvious responsibility in research, and a whole lot of effort was put into it. There were many failures, but many successes.

Silvicultural Practices Review

HKS: Just one or two more general questions before I get into some specific topics. In the notes you prepared for me, you said you served on the Forest Service silvicultural practices review. Those are the silvicultural practices on the national forest.

CEO: Yes. We had that bulletin. That was the culmination of the whole effort.

HKS: "National Forest Management in a Quality Environment, 1971."

CEO: That was it. I was the major silviculturist on it, so I had a good deal of the responsibility. I wrote a good many of the recommendations which were further edited and developed and illustrated by Homer Hixon, who was the actual collaborator who got the publication out. But I made most of the silvicultural input.

HKS: This is a publication on the administrative side of the agency. There's no author. That's standard, right? I mean, you and others are cited in the foreword, but if this was an experiment station publication, your name would be on the cover?

CEO: Yes, because this doesn't represent original research.

HKS: I see.

CEO: It's a review of Forest Service practices by a committee. Homer Hixon, who was Director of Timber Management on the national forests, was assigned to take the report of the committee and get it into a publication, which he did. He had considerable editing skills, and he did a good job in getting it out in usable form for distribution to all the national forests.

HKS: Now, something like this could be controversial. The environmentalists would say that this is slanted in some way.

CEO: Sure, they could.

HKS: Was there controversy?

CEO: I don't recall any controversy involving this publication. It was mainly in-Service. Responses were required at certain periods on action taken on the recommendations. It also has some very nice illustrations of different silvicultural systems from the Forest Service photograph file.

HKS: Gee, I would have thought that, given the time period, that this would have been controversial, because the environmentalists might have said this is the same old sawlog forestry, whatever the terminology was used.

CEO: They might have later, but at that time--Was that '70? 1970?

HKS: '71.

CEO: '71. Well, the Environmental Protection Act came out only 1970.

HKS: Yes.

CEO: And had not, by that time, generated so much steam. I think the Endangered Species Act was later.

HKS: That's right. But clearcutting was getting to be controversial about the time this came out.

CEO: Yes. There were obvious things that needed correction. Some clear-cuts were much too big. They were not designed into the environment in an aesthetic manner, and there were other exceptions. In many cases, they didn't follow through all the steps required to get regeneration, which, for example, might be release of the future seed trees so that they would build up bigger crowns, and then leaving the seed trees. If fire were needed to open the cones, using the fire, proper site preparation. In many cases, they didn't follow all these steps to get regeneration. They might have followed some of them.

HKS: Why wouldn't someone trained in forestry do this? They had a year of silviculture and with access to various handbooks and timber management staff in the supervisor's office, timber management staff in the regional office--How come?

CEO: You mean why wouldn't they follow all these--

HKS: Why didn't they do that?

CEO: I don't know.

HKS: They had access to the technology, presumably.

CEO: Just variation in human ability and performance. They're not all perfect. Sometimes maybe they didn't have the money, or maybe it was very difficult to schedule the work. There were various possibilities, but there were large clear-cuts. That went back to the time when they had stationary logging equipment and had to get everything all into one point and make it worthwhile to have a setting.

HKS: Everything you can yard to that spar tree.

CEO: Yes. There's certain carry-over into the future from these past practices.

HKS: A concept that influenced a lot when I worked in a ranger district in timber management was the prudent operator concept. Do you remember that? That you couldn't require--

CEO: Yes, I just have some fleeting recollection of that. You can't require an operator to do something which is very unusual and very costly.

HKS: Even though presumably it is part of the appraisal and the stumpage is adjusted accordingly, in theory.

CEO: Yes, but it should have been into the specifications originally.

HKS: Yes.

CEO: So that you weren't promising that he would do more than would be possible.

HKS: I'm impressed how much time you spent on a face-to-face basis to people over in the management side, not just the science side. This was fairly common for people in the Washington office?

CEO: Yes, I think so. It varied with individuals. Stan Krugman, when he came into Timber Management, Research got right over to the National Forest Administration and started working with them right away. It varied some with how outgoing the people are. Bob Buckman was that way, too. He was so outgoing, he worked with everybody.

HKS: It's interesting.

CEO: But some researchers, if they are in a high specialty or a real scientist like Dr. Little, I wouldn't expect that he would be out working with administration people, because he'd rather be writing a book to help everyone.

HKS: [chuckling] So basically, what's today called "outreach" has always been important, at all levels of Forest Service research.

CEO: Absolutely.

HKS: Okay. Another dimension of technology transfer.

CEO: Yes.

Testifying in Congress

HKS: You accompanied Ed Cliff when he was chief to House and Senate hearings.

CEO: Yes. We started with the House hearings, under then Congressman Byrd. He had people in from West Virginia, and we were more or less up for criticism by the senator, I thought, to show how effective he was helping his people back home, because they were in there as the audience. So we did the best we could to defend Forest Service operations on the Monongahela National Forest, showing that in that timber type the faster-growing species are the ones that are intolerant and need light to grow. From a production standpoint, anyway, the results from clear-cutting had been quite good. If you used selection system in those mixtures you would favor beech and sugar maple and other slower-growing species. Particularly with beech, you'd have a less valuable forest.

That didn't go over very well with a man whose favorite squirrel tree had been cut down by the Forest Service. That was the attitude of these people. I wanted to say that I had spent forty years in silvicultural research, and I had seen the early selection cutting, which often degraded the forests, like when they took out only the tolerant, valuable species and just left all the junk. But I didn't speak out, because I felt that this was Congressman Byrd's day with his people.

HKS: I see.

CEO: I don't think he wanted to entertain a scientific explanation of something that would go counter to his show there.

HKS: Did you--

CEO: But at the Senate hearings, that was the other way. We could defend ourselves.

HKS: Did you rehearse at all with the chief or someone else about the sensitive issues? Or did you feel free as a scientist to come in and just relate the science of silviculture and let the chips fall where they may?

CEO: It was the latter. We didn't rehearse together. But when it came to the Senate hearings on clear-cutting, which were more important and were on a more objective basis, we did get together ahead of time. We prepared written statements, which we hadn't done for the other. We had opportunity to put our side of the thing on record. In the Senate hearings, we did make formal statements, and the statement which I prepared, along with the cooperation of our staff in timber management research, was the basis, then, for

the bulletin on silvicultural systems for the major forest types of the United States. The purpose of that bulletin, growing out of the hearings, was to defend the choice of silvicultural systems appropriate to different timber types and stand conditions. So the Senate hearings were entirely different, and gave the Forest Service a chance to put its story in the record.

HKS: This obviously was very controversial, the clear-cutting. The industry had a concern about what the Forest Service testimony would be. Was your testimony--I mean, did you discuss this, say, with George Staebler or somebody ahead of time?

CEO: No.

HKS: This was truly a Forest Service position.

CEO: Yes.

HKS: Industry would have an opportunity to testify, too, if it wanted to.

CEO: I don't know whether the committee entertained their testimony or not. I doubt it. I don't think they did. There was just a session for the Forest Service, particularly following up on this "exciting" testimony that they got from the opponents of clear-cutting.

HKS: These hearings were published, is that correct?

CEO: Yes, they must have been.

HKS: By your recollection, were the hearings overall relatively balanced? To the extent that hearings have any influence on the course of events.

CEO: I felt that the cards were kind of stacked against us. I know we mentioned to Senator Church, German forestry because they have used clear-cutting and age class distribution and so on for decades. Immediately Senator Church said, "I have seen the German forests, and they are horrible." That indicated, "Well, I better get off of that track." So I thought there was sort of a stacked deck there, especially with Senator Metcalf.

HKS: It's not surprising that there's a certain amount of ceremony in the congressional behavior for the folks back home. What was the net result of the hearings, if the case was stacked against the Forest Service position? Sort of "so what" in terms of the outcome.

CEO: It led on to the National Forest Management Act, which in effect put certain limitations on the use of clear-cutting, except where needed. So it led right into that.

HKS: This is the so-called "Church guidelines" then.

CEO: I think they were intermediate, and then I think the Forest Management Act consolidated that and made it official.

HKS: Is that the only time you testified in Congress?

CEO: Those two were, yes. The House hearings and the Senate hearings.

HKS: Okay.

CEO: When I worked later for the Society of American Foresters as Director of Science Programs, I attended hearings and then briefed Keith Arnold on what kind of reaction we got from different people on congressional committees. But I didn't testify myself.

HKS: I see. I guess it's pretty unusual for anyone other than the chief or a deputy chief to testify.

CEO: Except where they need technical input, then they get it from who's qualified to do it.

HKS: The Forest Service would decide who should testify.

CEO: Yes, that's right. It was unusual. It was this clear-cutting controversy that required that, and it's not ordinarily required to bring in scientists to testify.

HKS: How did you feel about how it was all turning out? Clear-cutting was the whipping boy for a long time. And still is, I guess.

CEO: Yes. The preservation thing was one aspect of it. Then the opposition to clear-cutting was another aspect. I felt the Forest Service was the whipping boy there at that time in the hearings. But I think with the National Forest Management Act this was intended to resolve it and to put certain limits on the use of clear-cutting, so that the different people could understand that there were places for it and then there were places where they shouldn't do it, or modify it. That essentially modified clear-cutting so that it was not so objectionable.

HKS: But in terms of proper silviculture, the Forest Service has access to the clear-cutting technology if it needs it to regenerate an even-age stand or to get rid of a diseased stand or whatever.

CEO: Yes, and provided public opinion will permit. If public opinion won't permit even then, then they've got a real problem. But I think I felt the first form of *The Silvicultural Systems for Major Forest Types in the United States* was intended to do a lot to cool down this controversy over the choice of silvicultural systems and show what you could and could not do biologically. That was the purpose of this. I initiated and directed the preparation of the first version of that silvicultural systems handbook for that purpose, of helping to cool down the clear-cutting controversy.

Environmental Legislation

HKS: Since it's at about the same time, maybe here's a good place to talk about the National Environmental Policy Act and how science was affected by that. How did your work day change because of that?

CEO: It came gradually, of course, but first the Environmental Protection Agency had to get going. They were set up, and it took time for them to get into certain problems and issue directions and guidelines and so on. So at first it didn't amount to much, but it built up more and more as it went along. With increasing transportation and leisure time and more people getting out seeing what was going on in the forest, then it gradually built up to become real constraints in many ways.

HKS: Where did science fit into this? Production of impact statements? Or did the impact statements show where science was deficient? How did it impact you?

CEO: It didn't impact us so directly, except for the responsibility for knowing, having the information on what would happen in specified timber types and stand conditions with the different silvicultural options. That was the research obligation. To know what would happen, and then be able to advise. If you clear-cut this, the soil will wash down. Or if you clear-cut this, you'll get good regeneration, and so on.

For example, if you try to use a selection system in a heavily mistletoed hemlock stand, the mistletoe will just come down on the seedlings and they'll all be mistletoed, and that's the obligation of research. But the choice of the silvicultural option for a specific stand or condition, that was the responsibility of management, and not of research.

HKS: Can you recall a specific project being started because of spin-off from the NEPA requirements?

CEO: Oh, yes. It was not in my division, but in the forest protection division. Research at Corvallis, Oregon, was greatly expanded on chemical influences on forest and wildlife and environment. That became a real

important push, and great progress was made, too. Particularly on chemical effects on the environment. Things like the effect of DDT on bird hatching. That became very important. And use of silvicides in the forest and their effect on water quality and wildlife. But that was not in my division. We had to be aware of it, of course. We had publications on control of understory vegetation in particular by use of chemicals. So we had to observe environmental restrictions on that.

HKS: The Endangered Species Act obviously had a lot of impact on silvicultural practice.

CEO: Yes. And now it's gotten so emotional, and it's gotten right into the courts. Everything was tied up in the courts, I gather. Although that was after I retired. Essentially, that Endangered Species Act began to take effect and result in a lot of restrictions.

HKS: When I was on a ranger district, we gave--I guess it wouldn't be unfair to say we gave lip service to wildlife habitat when we laid out clear-cuts. We pointed to the increased browse for deer herds and so on and so forth. I don't know when the science of wildlife management began to play a role. And I don't know historically if that was just merely a rationale for clear-cutting, that there's more deer now than there used to be, and so on. I'm just trying to think how the research programs have been affected by new statutes. I suspect that the Endangered Species Act is more significant than the National Environmental Policy Act.

CEO: Yes, probably so. There again, it's a matter of administration and research. For example, now research has the obligation to find out whether in a habitat for spotted owl, let's say, whether a light system of removing mature trees, or even over-mature trees, can be developed which will not affect the habitat for spotted owl and other inhabitants of the mature forest. So there's a new research obligation there, to find out what can be done, rather than just preserve these trees till they fall down.

One solution, as suggested by a recent article in the journal, was to go to a biological rotation instead of an economic rotation in sensitive forests. In other words, keep the trees till they're starting to decay, and then get them out. Or maybe just before that. So that's an important new thought, a biological instead of an economic rotation. That only applies to areas where the people are interested in and aware of the aesthetic value of the forest and the wildlife and so on. It would not apply to extensive miles of southern pine, with rattlesnakes and redbugs and mosquitoes.

HKS: This would only really be viable on public land. You couldn't expect a land owner to hold this timber for two hundred years.

CEO: That's right. He's got to have the right to get his money back.

HKS: Yes.

CEO: Then there's an important point there, too. Forest capital is not going to stay where they can't operate. So forest capital will move to the places where can operate, like southern pine. The regions who insist on putting all sorts of restrictions on forestry are going to find that the timber capital will go elsewhere. It's a fact of life. It's the way it is.

HKS: The South does have the woodpecker. I don't know whether other species are involved.

CEO: Yes, there is the woodpecker, which means they have to preserve more of the older stands, and this can be done on public forests, but there again, a biological rotation would be, I think, a reasonable answer to that on public lands.

HKS: To generalize, did you find timber management staff on national forests receptive to new science, to new changes, like the requirement of preserving wildlife habitat? Or did they dig in their heels and say, "We've to create jobs. We can't do this."?

CEO: I think in areas where hunting is important and wildlife are important, because of hunting interests, like in the central states, forest management people are sensitive to that. Now, in great areas of southern pine,

on the other hand, the hunting interest there is not nearly so important to them. If you have to get out with all these uncomfortable things that you find in the southern pine swamps and so on. That's regional, I think.

HKS: It may not be representative, but it's the only sample I have. *Silent Spring* was published while I was at the station in Portland. I used to play volley ball with a variety of people at the station, including some people from entomology, who tended to view that as an attack on them. Pesticides was a key issue, of course. From the two or three entomologists that I knew, they rejected the validity of *Silent Spring* outright.

CEO: But I think in research the response was the assignment to Portland of scientists charged with finding out these effects of herbicides and other forest chemicals on the environment and other organisms. I think a lot of good research was done on that.

There was a fellow, Dr. Logan Norris, who did a lot of that work. That was Keith Arnold's property because he was director of that forest protection research area.

HKS: He talked about getting a permit from EPA to use DDT, the last time it was ever used, I guess, for the tussock moth in eastern Oregon.

CEO: But as far as forest management research was concerned, we just had to go easy on silvicides. And live within guidelines of the EPA on the use of silvicides. But it didn't bother other major parts of our work.

HKS: So to use the *Silent Spring* example one more time. Suddenly, there's a new issue, like the use of pesticides. I mean, they had a certain urgency about it. The president of the United States is talking about the problems of DDT. This is a big ticket item. If it was under your jurisdiction, you would look at those areas to make sure that they were properly staffed. You might transfer people there to make sure that the Forest Service had people.

CEO: Absolutely, and recommend new programs to Congress.

HKS: The crash program concept, although it may be a permanent program.

CEO: Sure. But then there are conflicts that can come up with these new issues. Here's an example: They say that the spotted owl favors mistletoe trees. So are we going to let mistletoe grow to favor the spotted owl, and let our stands go to mistletoe and so on? All these things will have to be new issues and research, that type of thing. And the possible slow removal of dying trees for timber value in areas reserved for spotted owls. These are new issues.

One of the key thoughts is, as far as wildlife goes, silviculture must provide a diversity of stand conditions in time and place. At a given time you have to have the diversity of stand conditions for different wildlife. Some are ground-feeders, some need acorns and older oaks, and so on. Then you have to provide in time for a sequence of different stand conditions, so that's a very important new concept, considering the importance of wildlife in certain regions. It's the diversity of stand conditions in time and space.

Forest Health

HKS: What's the difference between ecosystem management and forest health? I hear them both now. Forest health is gaining momentum on ecosystem management.

CEO: Forest health is a preventive kind of thing. For example, one of the best examples is with fire protection in the West. For lack of thinning, many of the pine stands are overcrowded, and they're more susceptible to insect damage. Unless they regulate stand density, they won't have healthy trees to prevent attacks by insects and possibly by diseases. That's part of the forest health.

Also it involves fire protection, that the trees will be dead if that stand grows so thick that you can't keep fire on the ground, say in ponderosa pine, and the fire goes right on up and have a crown fire, and it destroys everything. Then you'll have zero health. So that's a aspect of forest health, in a way, the regulation of stand

density and understory, to keep fire on the ground. That's an important concept in ponderosa pine. So that's an aspect of health.

HKS: I would assume, then, if ecosystem management is properly applied--I'm not sure we know what that means yet--the forest will be healthy.

CEO: Probably, yes. But ecosystem management also implies that there may be things like a yew tree which ordinarily you might eradicate, but you save that because maybe it will of medicinal value, which it is, and you save other elements of the ecosystem which may have unknown uses, just that we don't know about. So some people say, "Save the whole ecosystem," a species may be dispersed in time and place, but don't eradicate anything. I mean, that's one negative aspect of ecosystem management, not to eradicate certain things.

You could say that some people object to southern pine plantations, artificially established plantations, because they say that this is a monoculture and it may be biologically vulnerable to a particular disease. Maybe you've got a bad disease that will wipe out slash pine. If you have a county that's all slash pine plantations, there goes your forest. That's part of ecosystem management. That's the ecological safety.

HKS: How about the issue that we look only at the trophy animals and the major vegetation. How about the bacteria and the subterranean beetles and the whatnot? In terms of science, how does one do ecosystem management? It seems to me awesome. No matter how much you would want to, if you're going to manipulate, you're going to manipulate.

CEO: If management, particularly in a public area, provides for sufficient diversity of stand conditions and composition over time and space, then you're safeguarded from future developments that might indicate a very adverse effect of removing, say, all the yew trees or some other element in the ecosystem which may be important in the future. Maybe a certain insect may provide an additional element that we need, and we may have eradicated that by a monoculture. It's sort of monoculture against diversity. A lot of ecologists feel that you need this diversity through this dispersion over time and space of different stand conditions, composition and so on.

HKS: If you have a major fire, so whatever comes in is even-aged, whatever it is.

CEO: Yes.

HKS: Even though it starts with fireweed and whatnot. Because of seed source, it seeds into Douglas-fir, or lodgepole pine, and you have a monoculture, in terms of the dominant species. But under that, you have, depending on site and so forth, you have different kinds of ferns. So monocultures do appear in nature.

CEO: Oh, yes. they certainly do, especially in the Northwest with those severe fires and wind storms.

HKS: I'm not sure if the terms I learned in school, "intermediate" and "climax" and so forth are still valid.

CEO: Sure.

HKS: What is the difference between a naturally occurring monoculture, which is desirable--this is a natural thing--and a human-produced monoculture? Is it the rotation length, that there's no intention of letting this stand of loblolly pine become over-mature and be replaced with something else? Is it a philosophical question or a scientific question?

CEO: Well, it's both, in a way. Maybe people don't realize that we have natural monocultures resulting from fire and windfall.

HKS: But Jerry Franklin knows that.

CEO: Oh, yes.

HKS: A lot of people know that.

CEO: But in southern pine, an artificial monoculture *is* more vulnerable because, for example, a pulp company will go in with great big machinery, and they'll eliminate all the ground vegetation, perfectly bare soil, and then plant one species and maybe even weed out other stuff later, or have a prescribed burn to avoid the buildup of brush. That is probably more strictly a monoculture than a windfall in the Northwest, where on different topography you would have different effects of that windfall, and there would be more variation.

HKS: You would have the remnants of the killed trees that cause shade and all the rest of that.

CEO: Yes.

HKS: So there's a difference between a clear-cut and a fire, naturally caused fire, in terms of the impact on the site.

CEO: In a naturally caused fire, windfall--You have all this decaying material there to provide biological habitat for different organisms.

HKS: The Yellowstone fires burned very hot, so I've read. I've not been there. And must have destroyed the organic matter on the surface.

CEO: Probably, but they released a lot of nitrogen, too. That's an example of preservationist thinking where it doesn't apply. The Park Service, of course, left most everything alone, and lodgepole pine is a particular species that gets overcrowded. The trees get in very poor health, they get attacked by beetles, the trees fall down all over each other, and then you have a tremendous fuel situation there in lodgepole pine. You get a lightning strike, and the whole thing goes.

That's very typical of lodgepole. It's not true of spruce. But that was a lesson that you just can't use preservationist ideas in lodgepole pine. In Forest Service areas, where they went out and thinned, tried to keep the stand healthy by thinning, they didn't get this fuel buildup. They might have even had some prescribed fire under certain conditions, possibly. That's what you may have to do for that one species. But that's not true of spruce.

HKS: But keeping fire out of the park creates an unnatural condition.

CEO: Yes.

HKS: I know there are debates on this. If lightning causes a fire in a wilderness area, you should allow it to burn.

CEO: Yes, there's a lot of thought in that direction. Until it threatens an area of economic value.

HKS: Would you like to talk more at length about ecosystem management and forest health? I don't know if you think that's an important topic or not.

CEO: I think we've covered the essentials. A very important part of it is forest health in ponderosa pine. You probably saw at Fort Valley the example of this, where on the research natural area there had been such a buildup of young stand as a result of protection that if a fire got in there, it would have wiped out the whole thing, and then wiped out those buildings. So in areas near public use in ponderosa pine now, they have to keep the fire on the ground. That means avoiding a tremendous buildup of understory vegetation which would be vertical fuels and take a fire right up to the crowns. It means proper control of stand densities so that the crowns aren't so close that fire would just sweep through everything. That's an important aspect of forest health, giving the trees space to be healthy. Keep the fire on the ground.

HKS: Well, in that sense, the Keen Classification would be, too, forest health, where you mark the trees the beetles were going to kill during the next ten years.

CEO: Yes. An important aspect is to keep sufficient crown ratio on the trees--that is, the percent of tree height that's in crown--so that they will be healthy. When you see a stand with just a little tufty crown up there, you know that you have over-density. You're going to have bad health. You're going to have danger of beetle attack, and mortality, and trees falling down. Crown ratio is a very important index of forest health.

HKS: At Fort Valley, right next to one of the houses, is a little plot of spruce, planted in 1936. There may be a hundred or two hundred stems in a small area. I didn't measure, but I would guess the largest spruce is about twelve inches in diameter. I don't know what the plan was. I don't know if it's been abandoned. They're in straight rows. Obviously, it was planted for some sort of a study. But it shows the impact of stagnation. Or maybe the site was wrong for the seed, but those trees are not growing very fast.

CEO: Stagnation is a real problem on poor sites. Pines have this tendency to stagnate, but on poor sites particularly. If they're overcrowded, they will stagnate, and then you'll have all kinds of troubles. And no economic value.

HKS: I'd like to follow up on something you mentioned earlier. We can speak generically. You had wanted to get some money for a project, and another division opposed that, apparently because maybe they'd prefer the money for them. Since silviculture cuts across so many different fields, was this a rare thing?

CEO: Yes, that was unusual.

HKS: Very unusual. Basically you were very supportive of everyone else.

CEO: Yes. Yes, that was an unusual case, and maybe there should have been money for both divisions to attack this program cooperatively.

HKS: Okay.

CEO: But that's one problem with functional organization of research. It makes it a little more difficult to have a multi-disciplinary attack on a broader problem.

HKS: Is there more to discuss on forest health, ecosystem management, new forestry?

CEO: Just a little aside: "New silviculture" was a term used for intensive culture, with stand density control, control of understory competition, use of fertilization, and maybe improved varieties. That at that time was called "new silviculture." That's one thing now, with ecosystem management, we wouldn't consider new silviculture, just intensive culture.

Silvics of Forest Trees

HKS: Let's turn to some specific issues, and we've mentioned them from time to time, but to make sure that we cover them completely. The Silvics of Forest Trees. You sent me a list of some important publications. Let's talk a little bit about how they come about. How was the need determined? And why this year rather than ten years earlier or ten years later?

CEO: Francis Eyre, Windy Eyre, was my predecessor in forest management research. He realized that before determining practical applications, we need to get the silvical requirements of all the important species of American forest trees down and do the research to find out--seed production, seed requirements, regeneration requirements, stand density requirements, all that sort of thing, rotation length.

He initiated a national compilation--this is the final version --to record the silvical requirements of species, as a basis for the selection of silvicultural systems. He started it before I came into Washington, and Dr. Harry Fowells, who was on my staff, took hold and gave a great deal of his own time to bring this whole national

publication to fruition. He did a whole lot of this editing work at home at night. Because he was also the branch chief in silviculture and had a big job on that. He deserves the credit for getting this publication out. This is the second version.

HKS: Yes, this is a 1990 publication, the date on this one.

CEO: It's been expanded. This is only conifers. The first version was all species, conifers and others, and was shorter.

HKS: This is species by species.

CEO: Yes, absolutely. Just biological requirements.

HKS: There was some sort of recipe. Each species had to have these elements described about it.

CEO: Yes. Eyre sent out an outline as to what should be covered in each write-up and that was followed insofar as it applied.

HKS: I suppose you would find, during this sort of process, that you didn't know about certain species. Some were pretty obscure.

CEO: That's right. It brought together all existing knowledge, and that helped to pinpoint the needs for information.

HKS: Elbert Little--what does a dendrologist do in a project like this?

CEO: First of all, in his own research, he has to determine the correct nomenclature that the Forest Service should use. He studied the distribution of species. He did a whole series of publications on the distribution of forest trees in the United States, and even in pines of the world and so on. Then he's responsible for backup assistance and publications of the division and maybe of the whole Forest Service to ideally see that correct nomenclature is followed. Also for getting out the publication on the trees of the United States and their nomenclature. You've probably seen that one.

HKS: That's right. We used this particular volume, and others, as an authority. What is the proper scientific name? Which unfortunately keep changing.

CEO: He was responsible for deciding what is the correct choice of scientific name, based on precedence, and validity.

HKS: So he would be influenced by the botanical congresses. He was responsible for keeping track of that literature.

CEO: Yes.

HKS: That's a rather awesome responsibility. An immense amount of things a dendrologist has to know.

CEO: That's right. It requires a man who can really fully concentrate on that scientific problem.

HKS: It takes a lot of field work.

CEO: Yes, and he did a lot of it. He had help, of course.

HKS: Sure. It's amazing. So we have that benchmark now. This is not controversial. This is a compilation of the best science for all the species and what we know about it.

CEO: Yes. Now, whether other dendrologists would agree with Dr. Little, I'm not competent to judge. But I have faith that Dr. Little thoroughly studied the literature and could make the right decision on what was the correct name.

HKS: So this is a very important, fundamental contribution to our understanding of the forest, of the commercial species.

CEO: That's right. Before you decide on silvicultural systems, you must have this information on the silvical requirements of the species involved.

So Windy Eyre started that, and then Harry Fowells, who was on my staff, and on Windy's staff, really pushed it through at very considerable investment of his own time. He was determined to get it out in the first form. This is the second.

HKS: Let me follow up on that. No one would challenge the importance of this document. Why wasn't he given some relief so he could do it on official time? Or is that just his own nature, and it was his choice?

CEO: Well, it's hard to answer that. His area of responsibility was silviculture, the basics of silviculture. It was just a big job to direct a silviculture program, and also to get this manuscript through. He felt it was so important that he devoted a whole lot of his own time to getting it out sooner. He could have paced it out longer and, on Forest Service time, gotten it out sometime later. But he wanted to push it, and he did.

HKS: There's obviously a big step between the silvics of forest trees and silvicultural systems, where you have these species growing in mixtures.

CEO: Yes.

HKS: Was it difficult to design the report *Silvicultural Systems of Major Forest Types*, or was that pretty well established, like there's a Douglas-fir type and there's a white pine type. Are those the standard types?

CEO: Yes. There is a Society of American Foresters' publication on the forest types of the United States. Which was revised, incidentally, by Windy Eyre. So that gave us the basis for the selection and nomenclature of forest types. That was not a difficult problem.

There was also an outline provided to the field as to what should be covered in each write-up as to the choice of silvicultural systems. That was all brought together in the Washington office, and a number of people worked on it. I wrote the introduction, based in part on my testimony at the Senate hearings, indicating that the choice of silvicultural systems should be a matter of prescription, just as a doctor prescribes for a given person for his condition. It should be a matter of prescription by a person knowing the forest type and the stand conditions, and even the markets.

But a number of people in the forest management research division helped to review the statements, edit them, and bring them all together. Then Windy Eyre actually reviewed the whole manuscript himself, after retirement. And it was reviewed by David Smith, who was silviculture professor at Yale, and it was reviewed by people in the wildlife division and the insect disease division and by, I think, too, by some people at administration.

HKS: My memory is pretty rusty, but let me try to tie this to ecosystem management today. The forest types--That's an economic determination. The one that sticks in my mind is that white pine is so valuable that only 10 percent of the volume in an area needs to be white pine in order for it to be classified as a white pine type. The others were like if 50 percent of the species were Douglas-fir, it would be a Douglas-fir type. It's not a biological determination as much as economic.

CEO: You're thinking perhaps for management purposes, for national forest management inventory. But from the standpoint of research publication, it would be more what the type really is.

HKS: Okay.

CEO: We used to use the term "white pine and associates," white pine and associated species. The statement you made is more characteristic of a national forest inventory.

HKS: Okay. I was trying to link this to the so-called "new thinking" on ecosystem management that might challenge the validity of some of these timber types. That that's not really what it is, and it's the economic motivation of management that causes us to think of it as a Douglas-fir type.

CEO: I think that that's not nearly so true of this scientific publication as it was of inventories for economic use.

HKS: I see. Okay.

CEO: A Douglas-fir type here, for this purpose, would require, I think, a very important component of Douglas-fir to be called Douglas-fir for this purpose.

HKS: This is an immense topic. Obviously, it summarizes an incredible diversity of scientific information. Is there more to discuss, or are its contents self-evident?

CEO: There's a lot more to discuss in the choice of silvicultural systems for different situations, but that's largely an administrative matter, not a research matter. But there's always more information to learn about modifying standard silvicultural systems, maybe for these new purposes of forest health, for germ plasm conservation, and for ecosystem management. That's the new area, of getting modifications to fit these new interests.

HKS: So in all likelihood these silvicultural systems, in terms of a scientific document, are still valid today.

CEO: In my opinion, yes. Because you have eighty years of accumulated knowledge on response of different forest types to standard silvicultural systems. To ignore that and say, "Throw out these silvicultural systems" and say, "We won't pay any attention to it," well, that would be foolish, because our basic knowledge is based around the standard silvicultural systems. I think most everything gets back to them, and they can be adapted to these new objectives.

HKS: The silvicultural system is oriented toward the trees rather than the lesser vegetation, and so if we need to know today how to maintain a diversity of all species, is that just a modification of a silvicultural system? Or is that a whole rethinking of what a system is?

CEO: No, I think it would be mainly adaptation of silvicultural systems and applying them in different situations.

HKS: So, to ask one more time, this document is still valid.

CEO: Oh, yes.

HKS: New forestry, ecosystem--None of that rejects the basic premises in this.

CEO: That's right.

HKS: Okay.

CEO: But there may have to be modifications. Say, in a selection system, a modification to use a biological rotation instead of an economic rotation. And to make sure that representation of each species is maintained in the selection system. These are just modifications of the standard silvicultural systems.

HKS: So the manager who wants to go on a biological rotation has the choice, for whatever reasons. This is still his Bible.

CEO: Yes. I think so.

Seeds of Woody Plants

HKS: Okay. Let's go onto the next publication that you had mentioned, *The Seeds of Woody Plants*. Obviously, this is highly significant. What's the story?

CEO: The current publication that I mentioned, that came in with Dr. Schopmeyer, was a modification of the old *Woody Plant Seed Handbook*. I don't know just when the original was published, but probably thirty, forty years ago. Dr. Schopmeyer was assigned to update it, to bring in all the new information on germination tests, to expand it to additional species which hadn't been tested previously. It was largely updating and bringing up to date and more completely reporting the current information on treatment of seeds of woody plants. Really a scientific updating.

HKS: Does a woody plant go down to something like huckleberry? Or is it trees?

CEO: I think it covers trees and shrubs. He covered trees and important shrubs. For example, some shrubs are very important for wildlife, and those would be included. And "woody plants" means the larger shrubs and all the trees.

HKS: Of course, a lot of the other plants reproduce by spore or some other things, so there wouldn't have the seeds to begin with.

CEO: No. If they're not woody plants, then they're not included. Dr. Schopmeyer did a fine job on that. He also had cooperation from a photographic expert from the Agricultural Research Service to use proper light and proper photographic techniques to get the right colors in the illustrations of the seeds in the *Woody Plant Seed Manual*. Which was quite a job. I mean, you can't just take a photograph with bad equipment and bad light and get the right color.

HKS: This important as part of identification. If you had a seed, you could tell what it is.

CEO: That's right.

HKS: Without having to germinate it and wait for the thing to grow.

CEO: Yes. So he was freed from other work. He was a plant physiologist, but he was freed from other work to revise that publication.

HKS: Tell me the practical applications. I'm a land manager. When would I use that?

CEO: It would be more for people responsible for nursery work, or seed collecting. It tells you some of the aspects of how to collect and clean the seeds. If you were a land manager and you wanted to collect seed from your area for use by the nursery, then you would have to consult that for proper methods of collecting and preparing the seed for the person who was going to use it. Cleaning seeds. Things like that. Of course, some of them require special stratification--that is cold, wet storage--for the winter before they will be able to germinate.

HKS: What came to mind is someone doing transect work, a milacre plot, and digging around the duff to see what kind of seed is there.

CEO: Yes. You might want to identify seeds, yes. There was a big controversy in Idaho at one time. There was a researcher called Seed in the Duff Hoffman, because he sponsored the theory that certain trees

regenerate mainly from seed stored in the duff. Other scientists disagreed with this. But that's an important little point.

HKS: Where else would they be? I mean, there was duff. That's where the seed would be.

CEO: But the alternative is current seed supply as a source of regeneration.

HKS: Okay. All right.

CEO: The seeds may have deteriorated in the duff, or they may not have.

Checklist of Native Trees

HKS: Okay. The next major publication is this checklist of native trees. That's related, I supposed, to the silvics.

CEO: Somewhat. If you had to go back to Dr. Little's names and identification of trees as a basis for looking after the silvical requirements as to which ones were separate species or just varieties which did not require special write-up.

There's always a controversy there. There are splitters and lumpers in plant identification. Some identification specialists like to split species into other species, and some like to say they're just varieties. They're the lumpers.

HKS: I suppose in terms of land management, by and large, those scientific controversies don't affect you, but from time to time you need to know what you've got.

CEO: Yes, and you have to just have faith in a particular identification expert.

HKS: I would suppose those kinds of things could be highly controversial, or highly significant, under Endangered Species. What is a species?

CEO: Oh, yes. Yes, it could be a legal question.

HKS: Are there any trees that you know of that are endangered?

CEO: I think there are a few minor species in California which have been considered endangered, but I'm not up-to-date on it.

HKS: Okay.

CEO: That would be a specialist kind of information.

Pesticides and Fertilizers

HKS: Silvicides and weed killers. What's there to discuss other than it's controversial? And regulated by EPA and so forth? What's the story on silvicides and weed killers, other than the controversy?

CEO: The controversy, of course, generates the problems and guides the research. The Forest Service answer was largely the establishment in Corvallis of a project to examine the effects of forest chemicals on forest vegetation, and wildlife and other organisms. I think that was very successful, particularly by Dr. Logan Norris. He got out a lot of helpful information on possible effects of forest chemicals on the environment.

For example, we soon found that DDT had been so much used that it got into the water and the environment and was affecting the hatching of some of the birds of prey and was seriously threatening the populations of certain birds. Of course, that had to be stopped, and it was.

There were similar problems that came up on the use of new chemicals and the environment, and a constant effort to plan new chemicals. The Forest Service particularly went into--not in my division, but in other divisions--the use of biological methods of control. That controversy started the research on biological control, which has long been an objective of forest protection research, to find biological methods which had no adverse environmental effect.

There are examples there of certain predators or other agents brought in to control a pest so that pesticides would not have to be used. I'm not qualified in that area.

HKS: When I was in forestry school, I studied silviculture under Dave Scott, whom you must have met over the years.

CEO: Yes.

HKS: This would have been 1956. In 1956, we went out on a field trip where we, as students, applied 2-4-5T to alder. We didn't wear any protective gear. I don't even recall having to wash our hands when we got through. I don't know if it's dangerous or not. We read about Agent Orange in Vietnam causing cancer and so forth. Was that always a problem when new materials come along? Maybe EPA has solved this, but how do you handle it? How do you distribute it?

CEO: It is a real problem. We have to depend on expert advice as to whether the things will have harmful effects on the environment or whether they haven't.

HKS: Is the manufacturer obliged nowadays to come up with recommendations on dosage and application? Obviously, there wasn't a label on the bottle of this silvicide that we used as students, of how to dress and how to protect yourself and what to do in case we drank some, and all this other stuff.

CEO: I'm no expert in that area, but as far as I know, they're required now, the manufacturers are required to state necessary precautions. But as a new chemical comes out, these precautions may not yet be known. Ideally, the research would have to be done before it's put into general use, but that's not always the way it works.

HKS: I was interviewing someone a month ago who had done forest management work in the Amazon for about fifteen years, and he said that without silvicide there couldn't be silviculture in the tropics.

CEO: So much competing vegetation.

HKS: That's right. The new stand just wouldn't make it. It would be overwhelmed. Has the Forest Service done much tropical work?

CEO: No, not a whole lot. Essentially there are two programs. In Hawaii the Forest Service does subtropical research on forest culture. Then in Puerto Rico, the Caribbean island type of culture. But there's so much tropical forest and such a tremendous variety of it, that it's nowhere near been covered, not by the U.S. Forest Service. And it will be a long time before all the varied situations are known as to how to handle them.

HKS: It seems to me that forest application of silvicides would receive--maybe indirectly--but would receive a lot of support from the agricultural community that uses chemicals extensively for weed eradication and so forth.

CEO: Yes.

HKS: I'm trying to get at the controversies. There are those who feel we shouldn't introduce anything into the natural system that's not already there.

CEO: Yes.

HKS: We'll just call that an extreme view, for the sake of discussion. Then there are more moderate views of how to use it properly. But still, when you fly an airplane over a place and drop it, how precise is that? I'm a land manager. I have goals. I have to deal with the issue, and I have to apply new technology.

CEO: The drift is a real problem, especially if it's controlled by wind. If the wind comes up, you've got drift and it's over on another property, and that's a serious problem.

HKS: The manager has to make all these subjective decisions on too much wind and all the rest of it. But basically, do we know enough for safe application of these chemicals?

CEO: Well, I think so, provided precautions are used, like not going too close to the adjacent land ownership. Just simple precautions like that. But we have to be very careful about the selection of the chemical, because a number are known to have harmful biological effects or effects on water, particularly on getting into the water supply.

As new chemicals come along, there's obviously much more need for new knowledge about the effects of the chemicals. Or the search for more biological controls.

HKS: When I read *Silent Spring*, my reaction was generally, "That's right. That's what I learned in forestry school, that biological control is preferable to chemical." Yet the ruckus, so to speak, suggested that foresters were offended by it. You were involved in research at a high level at the time that it came out. Earlier you said there wasn't much of an impact on what you did and the way you did it.

CEO: It came about gradually, because the environmental effects of these chemicals were not known, and the data were short. But as the data became better known, then of course there was a lot more attention paid to it. We didn't know at first that the hatching of certain birds would be impaired by DDT. That wasn't known at first. It took time for these things to become apparent.

HKS: It's been a long time since I read that book, even though I have my students read it--but that was her argument, that we don't know what we're doing. One of our major problems then was food surplus, so we didn't need to apply these chemicals the way we were until we did the research. This is my recollection of what the argument was. If I read it today, I might have a different reaction.

CEO: Yes.

HKS: But we should have waited.

CEO: She didn't study the food supply in some of the developing countries, I guess, like parts of Africa.

HKS: Is there more to talk about on silvicides and weed killers and use of chemicals?

CEO: Not particularly, because that's mainly the responsibility of the forest protection division and not the work that I was involved with, and specifically at Corvallis, Oregon, who are studying the effect of forest chemicals.

HKS: Does fertilizer enter under this same category?

CEO: That comes in there, too, because apparently excess nitrogen and phosphorus in particular has led to degradation in certain water bodies.

HKS: I can see that on agricultural land, but I don't know how much fertilization goes on in forest lands.

CEO: Not enough to really be a problem at this time. Eventually it might be. But there again, where you have a forest stand with the forest humus, you're much less likely to get runoff of a fertilizer than you are in a row-by-row culture in agriculture. So I think there's much less of a problem there of the effect of fertilizers on water in forest areas, but it's something that must be monitored.

Research Natural Areas

HKS: Research natural areas. Talk about natural areas and how they're used scientifically.

CEO: The federal land management agencies sponsor the system of research natural areas, and then the landowning agencies are directly responsible for them, the Park Service, the Fish and Wildlife Service, the Forest Service, and the Bureau of Land Management. There is an inter-agency committee, which got together periodically and considered the adequacy of the system, and the needs for supplementing the research natural area systems, and perhaps any questions in regard to management, or lack of it--Leaving it alone or scientific study.

I imagine the system was started maybe forty years ago or more, and it's a real concern. It's one answer to the fact that Forest Service is involved with ecological processes, that these areas are set aside specifically to study the natural ecosystem processes, and they're available for people to do research on this, and they're specifically for research and not for public use.

We had to change the name a while back, when we became more interested in preserving areas. The State of Virginia and others set up what they called "natural areas," which were not really long-time preservations for scientific study, so we changed the name from "natural areas" to "research natural areas," to limit it to these specified areas for permanent preservation and scientific study.

I think it's a very important system, and there have been very active programs in certain regions. Jerry Franklin really pushed that selection and preservation of natural areas in the Northwest, and Charles Wellner devoted his retirement time largely to selection and identification, description, and preservation of natural areas in the intermountain region and the northern Rocky Mountain area. He did a lot of work in that. It's a thing that needs more notice by preservationists and others, that the Forest Service is engaged in this activity with all the federal land management agencies.

HKS: What's the size of a natural area? I know it varies.

CEO: It varies a good deal, according to ideally what is considered a necessary unit to keep that study area intact ecologically. It might be, oh, several hundred acres.

HKS: Is there a checklist of how many different ecosystems there are? In a perfect world, if you had a natural area for each system, how many natural areas would it take? Is it thousands or is it hundreds?

CEO: It involves range, wildlife, forestry, desert ecology, and all that sort of thing. There's no specific listing that I know of that crosses all kinds of ecosystems. It's done by groups that are qualified in each area. For example, in forest types. There they're guided by the forest type publication of the classification of the Society of American Foresters. I assume that the Range Management Society also has a comparable system of range types and ecosystems. And so on for deserts. But I don't know specifically about that.

HKS: So an area is designated. Money has to be set aside somehow to do the measurements, to describe it.

CEO: Yes, and that's largely contributed by research personnel, with some cooperation from a land management agency.

HKS: People who know trees, and you'd have a soil person, wildlife person?

CEO: Ideally. But you probably and generally would just have a forest ecologist type of person describe the forest condition or stand.

HKS: A Jerry Franklin, as a single individual, would be qualified to describe the area, in that sense.

CEO: Yes, but not necessarily to inventory the wildlife and the things other than vegetation.

HKS: Since our interests have changed during that forty-year period, are the original descriptions still useful?

CEO: I would think so. Except they may require updating. But are you aware of the International Biological Program?

HKS: The biosphere research?

CEO: Well, that's part of it. Biosphere reserves are a part of the International Biological Program, which was set up worldwide. The Forest Service cooperated in that and used to give some money to the general program, and we made available Forest Service research areas for study, and some of the International Biological Program studies were on Forest Service areas.

At one time, I was the Forest Service representative on an inter-agency committee for International Biological Program in Washington. That was under the National Science Foundation. A representative of the National Science Foundation was the chairman of the International Biological Program committee.

We contributed use of facilities and some funding, some shifting of funding, to help the general administration of that program. So the Forest Service was in on this ecosystem research in the International Biological Program, which had a finite span of years, and now it's over.

HKS: In the debates in chief and staff during the 1920s on wilderness, whether to establish a wilderness system or not, one of the rationales offered was to set aside natural areas, undisturbed areas, as a control plot, to see what impact we were having on areas that we were manipulating. So the idea goes way back.

CEO: The weakness of that is that they were open to public use.

HKS: How do you--

CEO: A research natural is not intended to be open to public use, because of the possible impacts of people on the ecosystem.

HKS: So part of the criteria for the selecting of it is it's not next to a major road or something. Otherwise, the public has access.

CEO: That's right.

HKS: Administratively, how are they protected? Is there a fence around it?

CEO: No, they're not fenced, and it's up to the forest supervisor and his staff to know that they have certain research natural areas in the area, to certainly protect them from any disturbance and especially any timber removal. It's up to the supervisor to see that they are respected and maintained in perpetuity in the natural condition.

HKS: To your knowledge, even though supervisors change and rotate around, the continuity is not broken, that this is--

CEO: Well, there are exceptions, of course. An exception is the one at Flagstaff, where the forest fire danger becomes so important near the historic buildings that they felt it necessary to control the fuel in a section of

the research natural area, and just reserve the remaining undisturbed portion as the reduced research natural area. There are problems like that.

HKS: But they knew it was an area. It was a specific decision. It wasn't through ignorance.

CEO: It was a specific decision on the part of the Rocky Mountain Forest Experiment Station. They could not afford to have a fire get in there and wipe out those historic buildings.

HKS: What I was thinking about when I asked the question, a forest supervisor--They lose track of it, and they build a road through it. It's not really marked on the ground. It's just done.

CEO: I had no knowledge of the extent of this happening.

HKS: But it wasn't a problem in your mind that these things--

CEO: It's a possibility, of course. It's a potentiality that has to be guarded against. Certain regional foresters have put more emphasis that others on the research natural area system. I know that was a concern in the Southwestern region with respect to the research natural areas and protecting them.

HKS: You kind of answered this, but I want to make sure I understand it and it's clear on the tape. There is a variety of research natural areas. One that a forester might select. One that a range person might select.

CEO: Yes.

HKS: They can even overlap, theoretically.

CEO: They might.

HKS: Wildlife people would have their own research natural areas for habitat for spotted owls, and on and on.

CEO: I'm not sure that the wildlife people have their own areas, unless Forest Service wildlife people have done it through the Forest Service channels, and in the formal research natural area system of the Forest Service and the Society of American Foresters. I assume they have collaborated, but they may not have done this on their own as wildlife areas.

HKS: So there are two types: forest type and range type? Are there other types?

CEO: There must be desert types. But that's just out of my area of knowledge.

HKS: All right. Let me ask you this other question, to make sure I understand. At the Forest History Society, we have the records of the Society of American Foresters. In those records is a substantial body of material on natural areas. What's the relationship with those areas to what the Forest Service is doing?

CEO: They're integrated. That is, the Forest Service has a number of the areas which happen to be on Forest Service property in the Society of American Foresters system. The Bureau of Land Management has others in the Society of American Foresters system--It's really a federal system. The Bureau of Sport Fisheries and Wildlife would have other areas, research natural areas, in the federal system, which is sponsored by the Society of American Foresters.

HKS: Okay. I've never really looked inside those records to see what's there.

CEO: There have been publications in the Northwest on the research natural area system in the Northwest. I think Jerry Franklin probably got that out, but I saw a publication on that specifically. There ought to be more regional publications on the extent and location the research natural area system in that region.

HKS: I would think that with all the emphasis now on ecosystem management, this will evolve.

CEO: I hope so.

HKS: Yes. But the protection of these areas. The Forest Service established them administratively, and they, as they have done at Fort Valley, can disestablish at least part of one. They're not protected by law. They can be condemned if Tennessee Valley Authority wants to run a power line through?

CEO: I can't answer the legal question.

HKS: Okay.

CEO: But I'm certain that a forest supervisor would make every effort to see that that is not done. But this was a tough decision at Fort Valley, where they had to face the possible loss of headquarters buildings.

Endangered Species

HKS: We've discussed the Endangered Species Act impact. What is there to discuss from the standpoint of silviculture on endangered species, since apparently trees themselves aren't endangered.

CEO: Habitat. Habitat goes back to the choice of a silvicultural system, because that influences the habitat very much. So it's of direct concern to silviculture, but should be done in collaboration with wildlife specialists who can specify the habitat requirement. Then it's up to silviculture to know how to create and preserve that habitat.

HKS: How about, to use the modern term, "getting ahead of the curve" and not endangering species?

CEO: There are two grades. There are threatened species.

HKS: That's right.

CEO: And threatened species would be an answer to being ahead of the curve and providing for protection of the threatened species now.

HKS: Some species of wildlife, I've been told, are habitat generalists, and you can manipulate the dickens out of the land, and they survive. Coyote would be an example, and deer, and so forth.

CEO: Deer require openings. They're browsers, and they have to have leaves within reach. The only way to do that is to have some openings with tree seedlings or brush, or if you had a solid second-growth stand, especially a tight stand with no undergrowth, there will be no deer feeding there.

In fact, I did a little study one time. Where do deer and rabbits feed? I published it. It turned out that deer and rabbits feed in the openings because that's where the small vegetation is. If you don't have any openings, then you don't have any feeding habitat for deer and rabbits.

HKS: Getting back to ecosystem management, the science bothers me of how do you know what the stand is supposed to be? If you had the tools and the time and the incentive, so you could create the natural forest, do any of us know what that is? Did the natural areas help?

CEO: I think part of the answer is that for wildlife, considering there are many species of wildlife, the need for wildlife habitat is a diversity of stand conditions over space and over time. You can't let the whole thing grow up to one condition over time. You have to provide for a succession over time of different habitat conditions for wildlife. You have to have some openings, some older oaks for mast, some browse coming along here, and just different situations. The key is a diversity of stand conditions over space and time, for wildlife.

HKS: The wildlife people themselves have something to say about this. We are near the Kaibab plateau where they had this deer explosion, when about 1920 or something?

CEO: Yes.

HKS: Because they took the predators out. So that's not a silvicultural question. You could manage the trees correctly and still have immense wildlife problems.

CEO: That's true. Kaibab has been devoted to wildlife management from its inception. That's a very interesting case. I've hunted up there. It's real nice timber type, with aspen, spruce, pine, a very nice forest to work in. It's been devoted to wildlife management. It's one case where wildlife management has been predominant and a major consideration in management.

HKS: I don't know what more to say about endangered species. If you maintain, as you say, the diversity, the habitat takes care of itself, more or less.

CEO: Yes, if you have a diversity. Because different species of wildlife require different things. Now, an interesting side point is that in the Allegheny National Forest, at least at the time that I was up there on inspections, they were successfully regenerating the older northern hardwoods by clear-cutting. They had clear-cuttings spotted around. When the hunters came or people interested in deer, the national forest would give them maps of the clear-cut areas, and they would go there if they wanted to see or hunt deer. Because that's what the deer needed, and that's where the deer were. So you must have openings for deer.

The deer and elk feed in the openings, but within a prescribed distance, because they need the cover of the adjacent stand in case they had to dash for cover. So that means that the clear-cut areas, the size of the areas really should concern the feeding distance of the deer and the elk, too, from the adjacent forest. But this is well-known through some elk research in Arizona and deer research in Pennsylvania.

HKS: Another species that has been manipulated heavily historically is the beaver. Essentially it was trapped out and reintroduced and then caused a lot of trouble.

CEO: I think the importance of these ecosystem considerations, there is a time and place. You should have dedicated areas where you raise the importance of this issue or that issue, and the comparison is between a beautiful, old-growth stands near the cities in the Northwest, where everybody knows about it, and the snake-infested flatwoods of Florida and Georgia, where recreation is on the streams and not in the forest.

HKS: One example on beaver. I was in New England a year ago, and the land manager is linked to the Yale Forest School--They're not totally market-driven in the decisions they're making. They're trying to have a natural forest. And how important the beaver were to the ecosystem.

CEO: Where was that location.

HKS: It's in northwestern Connecticut. The beaver ponds would silt up and create meadows, and then if you take the beaver out and put him back in, it had a very substantial impact on, quote, the "naturalness" of the forest.

CEO: Sure.

HKS: Of course, this beaver, after a long absence, there's a major disruption, and people are inconvenienced, and the roads are washing out.

CEO: It's a good example of these conflicts that must arise from the ecosystem approach and which must be addressed through research.

3-Bug Program

HKS: You've mentioned that several times. Let's talk about 3-Bug Program. Was silviculture involved? Is that a forest management problem? Or entomology?

CEO: It was considered a forest protection problem. Put it that way. Since the possible solution was biological control, that became largely a forest protection problem, not a silviculture problem. So it was really a forest protection division effort.

HKS: Throughout the South, the pine beetle is important. I lose a pine tree a year in my yard, loblolly pine. Isn't that a silvicultural question?

CEO: It certainly is from the standpoint of maintaining health and vigor of the trees through control of stand density. It's pretty obvious that where you have overcrowding, especially on poor sites, then you get those stagnated conditions of very short crowns. Those trees are in bad health, and they're going to be attacked.

There may be some other aspects of insect attack that I'm not acquainted with, but I'm pretty sure that if you let the stand get overcrowded and in poor health, that they're more vulnerable. What other things there might be? Local injuries due to landscaping, things like that that I'm not aware of.

HKS: But the research itself was protection research, and you in forest management were not on a daily basis watching that.

CEO: No, but we were concerned with the growth and vigor, which in turn has a considerable effect on insect attack. The forest management silvicultural studies were called "stand density studies." There was a cooperative study through the Southeastern station. Every research center had plots, a series of stand densities, and they built up a regional set of information on the growth of loblolly and slash pine in regard to stand density, the effect of stand density, site, and age on volume growth. That became a very important tool in forest management. In turn, it affects the vigor of the trees and their susceptibility to attack. The growth rate of individual trees and their crown ratio.

HKS: I asked Dickerman about the 3-Bug Program--I guess he was deputy when that was started--if it was successful. And he said, "Yes, it was."

CEO: Yes.

HKS: But we've still got the southern pine beetle. What constitutes success in research? That you gain knowledge?

CEO: I assume that they developed a biological control for one or more of the insects in the 3-Bug Program, wasn't that true?

HKS: Yes, the tussock moth, I think. I forget which one. The gypsy moth is still heading our way. It's getting into North Carolina now. We have them out on the coast.

CEO: I was in northeastern Pennsylvania earlier in June, and the defoliation by insects there is very serious. Oh, it's terrible. There are whole hillsides where trees have been defoliated.

HKS: Is that killing the trees, or just setting them back?

CEO: There will be a certain number of years of defoliation which will kill them. What that is, I'm not qualified to say. Some people say if they're defoliated three years in a row, that this will threaten the life of the trees.

HKS: That's gypsy moth.

CEO: Partly gypsy moth, but other insects, too. I don't think it's only gypsy moth. But there again, it's out of my area of competence.

HKS: The 3-Bug Program, when you mentioned earlier, was in the context of a crash program. You mobilized these resources, the study is completed, and then what do you do with all these people? Do you have examples in forest management of other programs like that that came to mind?

CEO: No, no. This came along just as I was retiring, and I retired before it was over. But in a sense, it relieves the repetitive nature of ordinary research as you go along doing the same thing, reporting on the same stuff every year. It gives you an exciting new program. There are these personnel aspects that I wondered about, how it affects those people's families.

Then there's the question of how much administrative cost is involved, and just organizing these things and getting the funding for it. I think it took an awful lot of organizing, administrative overhead, to design and propagate and fund these programs. Then move all those people.

HKS: They got special funding. I think a total of six million dollars, which was more than it is now.

CEO: Keith Arnold, of course, operated in that way. He understood crash programs, and he was able to handle it. But it's not usual for people who were brought up in long-time research year to year.

HKS: So, in your experience in forest management, there were crash programs.

CEO: No. No, I don't think we had any crash programs. So much of it is long-term. There's a progression. You feed in studies, and you take out something that was put in before, and then the next guy comes along, and he harvests some of your studies, and he puts in something new. It's a put and take process over a long period in silviculture.

Clearcutting

HKS: In terms of publicity, I guess clear-cutting was a major issue and a whole lot was done, but most of that knowledge was already available, right?

CEO: A good deal of it, sure, and this long-term test of silvicultural systems in different timber types. A good example of that was the work at Priest River, starting back in 1911. At the time I was there in 1933 and '34 and '35, there was considerable knowledge from earlier plots, using different silvicultural systems in the western white pine type.

That was an objective over the country, too, to have enough installations of different silvicultural systems in different timber types and stand conditions so that we would know what is the response and what will happen. Research in silviculture is responsible for knowing what will happen if you do this and that over the long-term.

HKS: Even though there was enormous spotlight on clear-cutting, it didn't require a crash program because the basic knowledge was already there.

CEO: That's right. There were certain places where we knew that you had to do it. I think aspen is a case. The regrowth comes from suckers in the soil, and if you don't give them light and space, they won't amount to anything. But if you clearcut aspen, then the root suckers will come up and you'll have a new, vigorous stand. That's what you have to do.

This example of slash pine with the saw palmetto and gallberry understory draped with pine needles, where you have to use prescribed burning, and you must use even-age management, of one type or another. It doesn't have to be clear-cutting. It could be shelterwood or seedtree, and there should be an appreciable shift toward shelterwood in places where we previously used clear-cutting, if only for public acceptance.

New Fields of Research

HKS: During your time in research, insects, disease, engineering, marketing, recreation, wildlife. These are all new fields.

CEO: Watershed.

HKS: Watershed. "Forest influences," it was called then.

CEO: Yes.

HKS: Were pieces chopped off as they were well-identified?

CEO: No.

HKS: What was the basic topic?

CEO: No, it's mainly new funding, because the chiefs of Forest Service research went to Congress and got the funding needed for these new areas. The appropriation committees were sort of industry-oriented, I think, and they're job-conscious, of course, and it was easier to sell them on timber management research than it was on specifically recreation. Which had, to them, not much economic appeal.

But it wasn't at the expense of forest management research. I gave you some figures about the tremendous increase in timber management research. But there were additional funding resources. All the chiefs of research that I worked under were trying hard to support these additional fields of research, in the name of multiple use.

HKS: Okay. Harper to Jemison to Arnold to Dickerman. How much of what goes on depends upon who the deputy chief is? How much just depends upon what the world is--what's happening in the world right now?

CEO: Well, you've mentioned in previous interviews with research leaders the change. Under Harper and Jemison, things went along in an orderly progression. But Keith Arnold was all hep to have special pushes and to change organization, modify things, and have ad hoc groups and so on. Then the chief suggested that Dickerman get things back on an even keel again. This was the major thing that I noticed, between them.

But the personalities were very different. Jemison was a very nice blend of firmness and friendliness and humor, and he was an excellent man to work for. He held people to his requirements, but he was also very friendly and humorous, and he was a friend to everybody. Everybody loved him.

HKS: Yes. Harper was there so long. Buckman was there quite a while. Jemison, Arnold, and Dickerman all had short tenure. Relatively speaking.

CEO: Yes.

HKS: So other than Keith, who had his innovative ways, they weren't there long enough to put their stamp on it.

CEO: That's right. There was a pretty good continuity right on through. Buckman, of course, came in after I left. Of course, as you noted in your interview with him, he faced serious opposition from the national administration.

Ostrom Alumni

HKS: Do you have a sense of alumni? People you're especially proud of?

CEO: I hesitate to name names because somebody will be omitted, but I did make a conscious effort in performance reviews to make them a career development interview and to sit down with the person and say, "What are your career aspirations, and how do we implement that? Specifically, what kinds of training or other exposure do you need while you're here so that you can progress?"

I enjoyed making this what could be sort of pressure interview for performance into a career development interview, make it a positive thing. I enjoyed that very much. I enjoyed visiting in the field and trying to spot people with potentialities for development, like Buckman. A whole lot of people who came through forest management research became station directors, deputy chiefs, even presidents of the society, people like that.

But just to name a few station directors, Wenger, Lane, Boyce, Callaham, Doolittle; Deputy chiefs: Tom Nelson, John Barber; Warren Dolittle was associate deputy chief. Of course, Bob Buckman, deputy chief; and Stan Krugman, Division Director and World Bank Expert. It was a great pleasure to work with all of these fine people. And I realized that many of them had administrative potentials greater than mine, but I enjoyed working with them and helping them along.

HKS: It's a lot like teaching, where your students go out and do famous things.

CEO: Yes.

HKS: You're handling these people. You're trying to get their full potential. Were you typical of the other division directors, or did you put more time on it than you felt the others did?

CEO: Perhaps I put more time in it than the others did. Of course, other people got their work out, got their names on their effort and so on. I can't really answer for the other divisions. I hope that they had the same attitude about giving people advantages to develop their potential.

HKS: I guess it's quarterly that the chief meets with the station directors and regional foresters. How often did you meet in the Washington office with your counterparts in the other fields of research? Just to touch base.

CEO: Dr. Harper had division director meetings maybe approximately monthly. Whenever there was something that ought to be discussed among the research divisions, he had a division directors meeting and same with the other deputy chiefs of research.

HKS: Now, chief and staff meets every day.

CEO: Yes.

HKS: Sometimes for a half hour, sometimes for longer. There's not that much activity going on in research that requires that intense--

CEO: No. But oftentimes, when the deputy chief would come back from the chief and staff meeting, then he would call a division directors meeting to follow up on an issue that came up at the chief and staff. So there was a continuity in that respect.

One other thing, about Bob Buckman. He had the initiative to go back to Harvard for a whole year to get a master's degree in public administration, even after he had a Ph.D. from Minnesota. I thought that showed real initiative on his part to be willing to do that and to be away from his family here at mid-career to get more knowledge of public administration at Harvard.

HKS: Yes. And obviously there was some financial impact of that.

CEO: Oh, I think he was on salary.

HKS: On salary.

Environmental Silviculture

CEO: I would like to go back to environmental silviculture for a minute and explain that there are certain modifications in silviculture to accommodate the ecosystem approach.

One of these, in ponderosa pine, is cluster thinning: thinning in clusters rather than uniform spacing. That gives better dispersion of stand conditions, from a stand condition in a cluster and open spaces between the clusters. Furthermore, it helps the squirrels, who hop from tree to tree, which they can't do on wide-spaced trees. If ponderosa pine, which needs a lot of moisture in this dry climate, is spaced evenly, they tend to be too branchy. By thinning in clusters, you tend to get self-pruning within the cluster, and still the roots can go out around the cluster and get enough moisture. So that's one modification in what you might call environmental silviculture.

HKS: Roughly how large are the clusters?

CEO: They might be six to ten trees. Something like that.

HKS: Okay.

CEO: Then, another similar modification is that is sometimes used here in ponderosa pine is group shelterwood. It's not an officially recognized silvicultural system, but it makes good sense having a shelterwood arranged group-wise, because again you get a variety, a dispersion of a variety of stand conditions for various purposes, including self-pruning.

HKS: Isn't there a term, "group selection?"

CEO: Oh, yes. Group selection is a recognized--

HKS: Very small clear-cuts, in effect.

CEO: Yes, but that's directed toward all-age management, specifically.

HKS: Okay.

CEO: Group shelterwood is directed toward even-age management. But it's done in groups for the several reasons that I mentioned, in ponderosa pine, anyway.

HKS: It's not in your book on silvicultural methods.

CEO: No, this came later. This is some current thinking of silviculturists here in the Southwest, ponderosa pine.

Personnel

CEO: Then I would like to pick up on a few details on personnel that I failed to mention earlier. When I came into the division of forest management research in Washington, Harry Fowells and Bert Lexen were there as the staff members. They moved on then, as assistant directors, moved up to assistant directorships in the Public Law 480 research program, for research in foreign countries with the money from the sale of agricultural surpluses from this country. They did very well, and in turn helped the Forest Service get its PL-480 program of foreign research underway.

HKS: Lexen is somebody that Frank Wadsworth talked about. He must have been at Fort Valley in the early years.

CEO: Yes, he was at Fort Valley in the early years. He was the one who developed sample scaling. He told me that in the first trial of sample scaling, you were supposed to take every twentieth log, and he had a forest supervisor and a new junior forester in the test, and the forest supervisor knew better than to take every twentieth log. He knew that was not average, so he would fudge. He would pick an average log near the twentieth one.

HKS: [chuckling]

CEO: The junior forester didn't know the difference. He did what he was told. He took every twentieth log. So when they got the results, the junior forester was right on in the standard deviation based on a complete measurement, and the forest supervisor was way off on the standard deviation, and he was off on the average.

HKS: [laughing]

CEO: But that was Bert Lexen. I also should mention that in timber management research, we had a very fine secretary, Edith Clark, who moved on later to be the chief's secretary after I left. She was from Maine. One time the Maine congressional office called up, and they asked us for information on "back beetles." Well, none of the men understood what they meant by back beetles, and Edith said, "Well, I can answer that." And she got on the phone, being from Maine, and she told them all about bark beetles.

HKS: [laughter]

CEO: She was a very fine secretary.

HKS: I recognize the name. So she would have been maybe John McGuire's secretary?

CEO: Yes. Probably several chiefs. I'm not sure. But after I left, she became the chief's secretary.

Bob Buckman had a very effective way of writing. He used devices like underlining, capitals, and brevity, and paragraphing, frequent paragraphing. He could make a very effective written presentation, using these devices. I heard a person in personnel say that after Buckman left our division, the writing they saw coming out was not as good as when Buckman was there.

International Research

I attended the World Symposium on Manmade Forests in Australia in 1967. For that symposium, Ralph Read and I wrote a paper on shelterbelts and windbreaks, from sort of a world point of view. There is some more international cooperation in this area and exchange of germ plasm and techniques.

HKS: Is there any other kind of manmade forest other than a plantation?

CEO: Not that I know of, if you include direct seeding.

HKS: Okay.

CEO: I think they would all come under the term, "plantation." Although it might have been seeded, it would still be a plantation.

In your outline you mention global change. I had an article with Carl Wenger, Phil Larsen, and others on global change at one time, and we went into the possible effects on changes in the carbon dioxide, temperature, light, and pollutants. It was a rather abstruse paper, depending largely on laboratory research done at Cal Tech by Austin Helmers. That was just one--

HKS: What was the date of this, approximately? I want to establish that global change is not something that they thought of yesterday. Concern for it has been around for a while.

CEO: It probably would have been in the '60s. Your outline discusses IUFRO. IUFRO was a European and American organization at that time. I was not directly involved, but because I had several assignments dealing with Asia. Dickerman told me that they would use me a little more in the context of Asia rather than in IUFRO, which I accepted. Of course, I did go to the U.S.-Japan Forestry Panel. I was a panel member of the U.S.-Japan Forestry Panel, which comes up a little later.

In 1968 I was one of the delegates to the UNESCO Biosphere Conference in Paris. That was a most interesting conference. For example, there was a fine Russian paper on the phosphorus cycle in the world, giving a real global aspect to studies of things like the phosphorus cycle. It was very enlightening. But we were under a real constraint there. We were told not to propose anything that would cost any money.

HKS: What doesn't cost money? I mean, in other words, the work you were already doing is okay.

CEO: Yes. I wanted to propose more on environmental tree planting for urban uses and shelterbelts and so on. But that would have cost money. So with that constraint, I didn't think that we could broach that under the rules that we were given by the State Department. But it was a most interesting conference. It was real enlightening.

HKS: Is this the group or the organization that establishes, in a sense, natural areas around the world, the Biosphere--

CEO: No, the International Biological Program was a different entity, although it was international. That established the biosphere reserves. We nominated some of our own experimental areas as biosphere reserves, under the IBP program.

Under the Foreign Research Program, I went in 1959 to Finland on foreign research projects under Public Law 480 and negotiated with the forestry school there what I think were the first foreign forestry research projects in the Forest Service.

HKS: Give me a few words on PL-480, because until you just said Finland, I thought it was basically a Third World program, where they didn't have foreign exchange and so we would build up credits in that country.

CEO: No. It could be any soft currency country.

HKS: At that time Finland was a soft currency country.

CEO: A soft currency country, yes. It was at that time. Or their funds could not be used here. They had to be used there. So, I initiated then the first forestry projects. They were dealing largely with silviculture, seed production, and that sort of thing. We did get very competent research in forestry in Finland, and they also did some very good biochemistry research for agriculture in Finland. That was very profitable.

HKS: I'm still thinking about that soft currency. I suppose it still had its enormous war debt to Russia to pay off.

CEO: Really, and it was under the Russian club.

HKS: Yes. Eventually, when they paid off that debt, I suppose then they became hard currency again. We don't think of Finland as an impoverished nation.

CEO: No, they're not. But they did fine research. And, of course, they're very competent in forestry.

Another assignment was the U.S.-Japan Forestry Panel. That was initiated in 1970, and we met in Tokyo. At that time, the subject matter was mainly on research, and the research was largely in my area of silviculture, genetics, tree improvement, and so forth. In fact, I was the only research person. The others were Ed Cliff, chief of the Forest Service; Boyd Rassmussen, chief of BLM; and a couple of more people from Interior.

I sat down with the director of the Tokyo forest experiment station, and he and I wrote the report on the train as we went along. We wrote the report, particularly on the indoor sessions. I heard later they had a Japanese term for me which meant "walking encyclopedia."

HKS: [laughing]

CEO: It was because the meeting was in the area of my competence and not in the others'.

HKS: But when you go to another country, obviously silviculture has at least some similarities with the United States.

CEO: Oh, yes.

HKS: But there are some differences, too, so--

CEO: Yes.

HKS: I mean, how exotic is Japan in terms of growing trees?

CEO: The east coasts of continents tend to have similar vegetation, and the west coasts tend to have similar. So Japan is essentially an east coast country to Asia, and its timber types are very similar to those in our East Coast, except that they don't have yellow poplar. They have many of the other hardwoods we have. *Cryptomeria* or *sugi* is one of their main conifers, which we do not have.

But a very interesting point was that for a century or more they have been selecting and breeding trees, particularly *Cryptomeria*. They were way ahead of us in tree improvement or genetic selection, especially with regard to *Cryptomeria*. And they had different clones of *Cryptomeria*, which they are actually using in timber production.

They have been using clear-cutting and establishing different age classes for a century or more. And in the landscape you see a whole array of different age classes in their clear-cut blocks, so that has been accepted there for a long, long time. But when it first started here, in the '80s, it just was not accepted.

Another assignment was a pulp mill survey with Chidester, the pulping expert from the Forest Products Laboratory, in 1962. It was mainly a forest products mission, to study the feasibility of a pulp mill, but it involved some look at the timber resource and whether the species were pulpable and so forth. We wrote a report in the field and handed that in to the UN. But it was a rather a short survey and not of great consequences, as far as I could see, except for forest products.

HKS: Why were you there?

CEO: They wanted mainly to find out the situation for establishing a pulp mill. They were also interested in the resource base, the potential supply of wood.

HKS: I see.

CEO: So we looked at the forest, and Chidester assured us that, although their resource was largely hardwood, that there were now good pulping methods for hardwood as well as conifer, so there didn't seem to be any real problem from the standpoint of the resource base.

HKS: Okay.

CEO: As far as I know, that covers my assignment as the Director of Timber Management Research. So I could go on to a brief assignment as Associate Deputy Chief before I retired.

HKS: I have two other things here: the SAF representative to AAAS, but that's in retirement.

CEO: No, that came while I was Director of Timber Management Research.

HKS: Is there anything to say on that?

CEO: Not particularly, but I had that opportunity, through the society, to attend the AAAS meetings and keep up a broader knowledge of scientific advances. I found that very helpful. The only problem was, they always met at Christmas-time, and I had to be away from my family. But I put up with that, for the advantage of being in on new information on science coming out of the AAAS meetings.

HKS: Okay.

Associate Deputy

CEO: So I think that wraps up that assignment.

Then, in '74 for about a year before retirement, I was given this Associate Deputy Chief assignment, in charge of the biological research.

HKS: This is under Dickerman or under Buckman?

CEO: That was under Dickerman. Buckman came in later. The work included timber management research and other biological research divisions: wildlife, recreation, watershed, and pest control. But it was general oversight. It didn't involve a detailed knowledge of every one of those fields. It involved mainly assistance to the deputy chief in his function.

HKS: There were two associate deputies?

CEO: Yes.

HKS: And the other associate handled all the other subjects, then.

CEO: Yes. He handled particularly engineering, fire, products, the physical sciences. I had the biological sciences.

HKS: Okay.

CEO: But it was quite a brief assignment, and it was mainly assistance to the deputy chief for whatever he needed. But there was an assignment there. I was assigned to go to India and make a problem analysis on cooperative research on manmade forests. So I was there for three weeks. I identified the problems, particularly how to meet the great need for more food and fiber, but fiber especially. That involved more intensive plantation forestry, the import of better germ plasm.

For example, they had a great need more subtropical pines to get better construction timber. The subtropical pines had not been much brought into India. It was a great opportunity to do that. And other methods for intensive culture to increase the fiber production per acre, because that was a big need. They didn't care how it looked.

HKS: When the World Bank has a major forestry program in India, as it did have, is the Forest Service automatically a part of that in some way? Or is the World Bank independent and does it own forestry thing?

CEO: I think they would have to work with the Forest Service.

Dr. Stan Krugman did tell me that recently there had been follow-up on my problem analysis for research on manmade forests in India, that they had got it out and were pursuing some of that in current efforts between the U.S. and India.

I also in that report identified the projects in silviculture in the United States that were parallel to those in India, for example, in spruce-fir, and pointed out the locations where folks in India could obtain cooperation in the U.S. program in silviculture of the same timber types.

HKS: At this time--and this was a couple of years ago--international forestry was a part of research.

CEO: Yes.

HKS: Who handled that international part? Was that the deputy, himself?

CEO: The Deputy Chief for Research had sort of a division director in charge of international forestry.

HKS: Okay.

CEO: Of course, he gave it oversight, and he did some of the foreign travel involved in the--

HKS: So you're in research. You're going to Japan. You're going to Finland. You're doing India. But that's not a part of international forestry. In terms of the way the bureaucracy is set up, international forestry does something else?

CEO: Yes, they did, particularly on administrative matters. Dickerman was, as I read in his report, very active in international forestry. He realized the value of just stopping in to see people in other countries. I mean, just a visit, to let them know that he was aware of them and had them in mind and would do what he could.

HKS: It's puzzling to me. You have international forestry program, and then you have work overseas. I would have thought that international forestry would have coordinated all of these things you just talked about.

CEO: Well, they knew about it. But I don't think they had a direct technical responsibility for the research under Public Law 480. That was between the authorizing research group in the Department and the technical divisions in the Forest Service.

HKS: Okay.

CEO: A great deal of the PL-480 research was in my area of silviculture, timber-related crops, shelterbelts, and that sort of thing, possibly because two of the former staff members of timber management research were over there in the PL-480 field, as assistant directors and knew opportunities for forestry research.

HKS: Who succeeded you when you retired?

CEO: Bob Buckman was brought in for a short time because it was pretty obvious that he was the logical choice to follow me and then to become deputy chief of research. I mean, informally, that was pretty obvious. So that's the way that went.

HKS: He came in from Portland.

CEO: Yes. He was director of the Pacific Northwest station in Portland. I think his family liked it so well there, some of them stayed. I think the boys stayed there. It must have been a wrench for him to accept an assignment in Washington at the time his family were finishing up schooling in Portland, but he accepted it. He did a fine job.

Society of American Foresters

CEO: When I retired, I was offered a job as Director of Science Programs at the Society of American Foresters. That was a part-time assignment, oh, more than half-time, but not full-time.

HKS: There was compensation. I mean, you weren't a volunteer.

CEO: There was compensation, by the day, just part-time. One thing I accomplished there was to get funding for revision of the old Society of American Foresters bulletin on *The Forest Types of the United States*, which formally characterized and named the forest types in the United States.

HKS: Is there a coordination between forest types and silvicultural systems?

CEO: Yes, there is. In general, as far as we could, we followed Society of American Foresters forest type names in our work in silviculture and things like this bulletin. But for purely economic purposes in a forest survey, they may have used types and designations that you mentioned in naming the major commercial species, even though it might not have been a majority.

HKS: Okay.

CEO: They employed Windy Eyre, Francis H. Eyre, who had been my predecessor in timber management research but who had retired. He was involved with the original bulletin, and he was hired by the Society of American Foresters to revise the forest types bulletin and bring it up-to-date. Which he did, and which he completed.

While I was there, the society, of course, moved into the old Grosvenor Estate with the related agencies, Fish and Wildlife groups and several other natural science groups. At that time, we had very good cooperation. I worked with their representatives on some program proposals. I thought things were going very well. I had no premonition of the rift that developed later. But after a year there, my wife retired from teaching, and she needed a dry climate because she had respiratory problems. So we decided that we should move.

HKS: So the SAF booklet on forest types was your primary assignment.

CEO: It wasn't an assignment. I got the funding. Then Windy Eyre did the revision, with the funding supplied by the Society of American Foresters, and with the outside funding that I obtained. So they didn't lose too much paying me, because I got them some outside funding.

HKS: Is *Forest Science*, the publication, under that program, or is that part of the journal? In terms of the bureaucracy of SAF.

CEO: It's all sponsored by SAF, with a separate editor.

HKS: But as director of the science programs, were you involved in the publication of *Forest Science*?

CEO: No. That was handled separately. As well as the editorship of the journal was a separate responsibility of the journal editor. Even though it was under SAF.

HKS: List the kinds of things that were under the science program, because I've been a member of the SAF since 1956, and I don't have an image of SAF of itself doing things. It's a facilitator, and it publishes a journal and so forth.

CEO: The science part of it was done in the working groups.

HKS: Okay.

CEO: The Society of American Foresters has working groups. There's a working group in silviculture, and there were many different working groups. The director of science programs, for example, worked with the chairmen of the working groups, and he was responsible for keeping in touch with them, getting news from the working groups, and reporting the working group progress in the *Journal of Forestry*.

A forest science board met with the director of science programs every year or so and got a report from him and gave him feedback on their ideas and needs.

Personal

In retirement, it was obvious that my wife should benefit from a dry climate because of her respiratory problem.

HKS: Let the record show that the weather forecast said the humidity is 8 percent here.

CEO: Eight percent.

HKS: Eight percent. That's pretty dry! [laughing]

CEO: This proved to be correct, because on two occasions my wife moved back to the East Coast, to take care of a daughter or for some other purpose for several weeks, and on those occasions she developed respiratory problems, and she does not have those back in Arizona. So that's why we went to Arizona.

I mentioned that at Girard College we learned from these visiting dignitaries that they regretted that they had not followed up on fine arts and cultural things. I had a real interest in art and music. I played bassoon in band and orchestra in high school and in college, although I didn't have enough money to buy one when I got through. I was always interested in photography and pictures. Because photography is a part of your work in research. Especially in silviculture, you have to be able to photographically record some of your work.

So in retirement I had a three-point program. The first part was foreign travel, because of my interest in international affairs and so forth and in other cultures. So we visited thirty countries, between my last few assignments in the Forest Service and travel after retirement.

HKS: Did you travel as a Forest Service representative to some of those countries?

CEO: Yes, about five. The rest was pure personal travel. The second point was travel photography, and the third point in this retirement program was painting from the photographs that I took in travel, particularly painting memorable scenes in other countries and other cultures. I continued an interest in music, and I have good music equipment at home, and have had for maybe thirty years.

HKS: But bassoon is the only instrument you play.

CEO: Yes, that's the only one I played. I was also interested in public affairs. I'm a fifty-year subscriber to *Time* magazine. Recently they sent each subscriber a cover with his own name printed on it.

HKS: Is that right?

CEO: So I've been on the front of the *Time* magazine.

HKS: [chuckling] Okay. I get *U.S. News*, so I guess they don't do that.

CEO: I've been interested in silviculture, and I was a consultant to the Prescott National Forest a year or two ago. I rounded up research information from all ponderosa pine silviculture research projects in the West, and summarized it for the Prescott National Forest, for use in a new multi-resource program that they were undertaking in Prescott.

HKS: Are there extensive BLM holdings in this area?

CEO: Yes. In fact, the strip where we live is BLM land, but it's administered by the Forest Service, because it's just an isolated spot.

HKS: Okay. What's the history of that?

CEO: I really don't know. About eight years ago, there was a considerable move to try to consolidate and maybe consolidate between BLM and the Forest Service, and among national forests, and so on.

HKS: Except for the O&C lands in Oregon, I thought that the only land the BLM had was what was left over after the homesteaders took all the good stuff. Utah and Nevada.

CEO: They have quite a lot here, too.

HKS: But around Prescott, this is fertile land.

CEO: They have quite a bit of range and brush land. The Forest Service has, in the main, the timber land.

But anyway, I worked with the supervisor of the Prescott National Forest, in concert with the senator's office here, to point out that the Forest Service was the better administrator for the forest land here in the Prescott National Forest, and that the community was very much involved. There were friends of the Prescott National Forest in the community, and that it would not be right if the community had to go to Phoenix to see the supervisor or, if it were turned over to management of BLM because they had not the capability in Arizona to administer forestry. So I worked on that, of course, informally. I've given about thirty slide talks since I came here in the community on art and travel.

HKS: You mentioned to me the other night that you've taken how many credits, seventy-three credits?

CEO: Seventy-two in Yavapai College.

HKS: Seventy-two credits.

CEO: And I will take some more, too, next semester.

HKS: Are you going to get a degree pretty soon?

CEO: Oh, no. It's just informal. I did work in languages and art, mainly painting. But some French and Spanish. But I like to try to keep up with that. I try to brush up in French about every ten years. I enjoy going to Paris. I've been there four times. I hope to go again sometime.

I do some editing, too, for my wife. She's doing sections of a proposed book on the travels of a family from Ohio to Prescott in the early days, in the 1850s. She has a real feel for the human side of it.

HKS: You grew up in Pennsylvania. Where did she grow up?

CEO: First in Missouri, then in New York state, and then Pennsylvania.

HKS: So the dry air requirement. That's something she acquired as she grew up. I mean, she lived in a humid climate.

CEO: Yes, she did.

HKS: It wasn't a problem then.

CEO: Well, she always had some respiratory problems, and they're much better out here than they were in the East, at least on the East Coast. I didn't know it at the time, but when I was moved from Asheville to Washington, D.C., her doctor advised her not to go to that climate, but she didn't tell me. So, in other words, up to that time she followed me in all my moves, so I wanted to give her the benefit of this one.

HKS: Sure. It's a nice place to live, if you can stand dry air.

CEO: Oh, yes. Just to wrap things up, we are in an adult fitness program here, going two days a week for an exercise program to keep our health up. I like carpentry. I've designed some table and chairs that we have at home.

Then, of course, our family. Just to illustrate, in the last month, in June, we went to three reunions. One was my sixty-fifth reunion of the graduating class from Girard College in Philadelphia. One was my wife's sixty-second high school reunion in Sullivan County, Pennsylvania. Another was a family reunion of my wife's family from all over, about forty-five people, and a wedding of my daughter in Bethesda. And all this was in June on the East Coast, in New York and Pennsylvania.

I think that brings me up-to-date, except for one point.

Miscellaneous Research

I showed you the basic report on the silvicultural systems, the silvicultural practices review of the Forest Service in which I participated. I neglected to show you the second one, which is the action plan resulting from the report of the committee. This required action in the field.

HKS: Try to find the date of this. This is, according to the preface, in response to NEPA. It starts here with the National Environmental Policy Act.

CEO: I think it followed the silviculture practices review. There was an interesting tug-of-war between terminology. Dr. Harper liked the term "shelterbelt" because the congressional interest at the time they were established was all in terms of shelterbelts, the U.S. shelterbelts. Ralph Read, our project leader in Nebraska, likes the term "windbreak." He didn't like the term "shelterbelt." But Dr. Harper had this feel, you know, for the politics of it, and he knew that congressional committees had been coached in the term "shelterbelt." So he insisted on the term "shelterbelt." So we put it down both ways.

HKS: [laughing]

CEO: As for my ideas on silviculture, they're pretty much included in this short introduction to the USDA Handbook on silvicultural systems.

HKS: You sent me this introduction.

CEO: That embraces what we thought at that time. Of course, we did not provide then for endangered species, and we didn't provide for genetic diversity or germ plasm conservation in silviculture, which came along a little later. But the salient ideas up to that time are in this. It shows how silviculture was influenced by wildlife, by watershed considerations, by atmosphere conditions, by insect and disease problems, and animal problems.

HKS: You mentioned wildlife requirements, as a part of a silvicultural system.

CEO: Yes.

HKS: If this book were written today, you would have maintenance of germ plasm. What else would be added?

CEO: Biological diversity, which is closely associated with germ plasm preservation. Ecosystem management, which is very closely related to what we were doing.

HKS: Yes.

CEO: But this does not carry the implication that you're going to have every successional stage or climax stage either, necessarily. Because I think in many places you do not want the climax stage. Like in southern pine. The southern pine are a seral stage. Left alone, it will ultimately go to hardwoods of much lower value.

HKS: Okay.

CEO: So I don't go with the concept that you necessarily have to have climax stage of the ecosystem. You may have to work with a successional stage in the ecosystem.

HKS: You drive from Virginia to east Texas, you're driving through pine, and that's--

CEO: Yes.

HKS: All that forest is there because of some disruption?

CEO: Yes, except for the bottomland hardwoods, of course.

HKS: Yes.

CEO: The bottomland sites are real hardwood sites, and you can grow very good hardwood there, and they should. That's the place for hardwoods, I think. There's oak all through the southern pine region, but it's generally of very poor quality and of little commercial value, compared to pine, for construction and pulp.

HKS: At the Forest History Society, we get a question over and over again, in a variety of ways, what were the forests like before European settlement here? The general public has the feeling that if we hadn't settled North America, the forests would be the same as they were five hundred years ago. The public sees the forest as a very stable kind of thing. But you're saying that the pine forests are a very unstable situation, ecologically.

CEO: Yes, but it was fostered by wildfires and frequent burning. The Indian cultures had a lot of fire, and in southern pine that favored--

HKS: So the fires must have been very extensive to maintain a pine forest across a third of the United States.

CEO: Yes.

HKS: Then, of course, we cleared the land for agricultural purposes, and then farms were abandoned, and they come back into forests.

CEO: Yes. But that's probably more oak-pine than it is now, because I think originally it was probably more oak in these stands, and more mixed. All the bottomlands were hardwood because any hardwoods there could shade out the pines. Good hardwood sites.

HKS: So in terms of forest health, how does one maintain a healthy pine stand that is ecologically trying to turn itself into hardwood? Someone in timber management asked me this question: Since the Forest Service more and more is obliged to manage the forest under ecosystem management and healthy forest and maintain the forest in the so-called "natural" conditions, what is the natural condition of a pine stand, if you've eliminated Indians and fire?

CEO: Yes. But there's a hardwood component, usually, there. But they don't, if it's for commercial production, they don't let the hardwood dominate. But the hardwood component helps the soil.

HKS: So in the national forests of North Carolina, in theory, we will see an increased amount of hardwoods in those forests, if in fact ecosystem management, forest health, and natural systems do become the way the forests are managed. But the private lands will be mainly pine.

CEO: That would not be true if you accept as ecosystem management the climax stage. But I don't think that is essentially right. You can maintain a successional stage, and that's still part of an ecosystem.

HKS: We've had pine forests I don't know how far back, for over five hundred years, so it would be hard to argue that these were not a natural ecosystem. Sometimes I think forestry is getting more and more philosophical and less and less scientific.

CEO: Yes. And in ponderosa pine there's been a lot of attention as to what was the nature of the original forest here before the invasion of western man.

HKS: Yes.

CEO: They seem to conclude that there was frequent fire, that the stands were much more open than they are now, that the fire danger was less. Now, with fire protection, the stands have gotten much more dense, and of course the young stands have come in. In many places you have a continuous fuel from the young understory up into the overstory, and a real hazard from lightning fire, if we don't get in and, as they say, keep the fire on the ground by clearing out unnecessary understory and spacing the trees' crowns out so the fire doesn't travel. There's considerable attention to what was the state of the original forest here in ponderosa pine.

HKS: When you were involved in silviculture on a day-to-day basis, were there serious proposals for wide-scale, prescribed burns throughout the West, to reintroduce fire as part of the natural system?

CEO: There's some interest in certain cases. Now, in one of the parks in California, they're trying to perpetuate certain species, and they're considering use of fire there so that other species don't take over. I think in the Sequoia National Monument in the mountains.

HKS: Well, I know that at Yosemite--Was it Ralph Biswell at Berkeley?

CEO: Yes.

HKS: Anyway, he was burning for the Park Service at Yosemite.

CEO: Yes. They wanted to try to maintain the species for which the area was set aside, and he felt that burning would help maintain the sequoia. And the sequoia has very thick bark. It's very fire-resistant, and you can presumably kill out the species that could have taken over from the sequoia.

HKS: Now fire is an example of many, I suppose, where silviculture overlaps with some other important program. The fire control people would be very much interested in reducing fuel load.

CEO: Oh, yes.

HKS: Silviculture would be very much interested in manipulating species. Did you work cooperatively with, as an example, using fire with the fire control people?

CEO: Yes. Buckman did some of this in the Lake States. In the Southeast, where prescribed burning is needed in the saw palmetto-gallberry type for slash pine--Of course, there's real close work there with fire. Because they use prescribed burning every three or four years, and that had to be fit into silviculture, and we couldn't recommend a selection system that brought in new seedlings which would be burned up.

HKS: That reminds me of a question that I intended to ask you but didn't make it in the outline. In 1961 or '62, Ashley Schiff's book came out, *Fire and Water: Scientific Heresy in the Forest Service*.

CEO: Yes.

HKS: That in some sense looked directly at silvicultural practices in the South, when you were involved in silvicultural research in the South. Were you aware of the book at the time?

CEO: Oh, yes. I was aware of the book. But apparently it didn't make much impression on me, because I've forgotten what his case was.

HKS: Most of the book was about water. In the fire part, the case he makes is that the Forest Service, since its inception, has been a fire department, putting out fire, preventing fire. And it was such a high priority in the '20s and the '30s, when the scientists began advocating prescribed burning in the South, the Forest Service suppressed this work so as not to confuse the public that fire was bad.

CEO: Yes, that rings a little bell.

HKS: That was his basic hypothesis. And H. H. Chapman and other people are mentioned in there, and I've asked Keith Arnold, Dickerman, Buckman, and they all reject that book.

CEO: Yes, that's my impression. It made very little impression on me. And we know that in a longleaf/slash pine type, even the local people know that they had to burn periodically. And they burned periodically for many, many decades.

HKS: Yes.

CEO: The whole thing was to do it on a prescribed basis, not just let them burn up anything they wanted.

HKS: His book is cited a lot. Historians use it, because it's an example of, to put it bluntly, administrative meddling in science. So the administrators can carry out their policies without interference.

CEO: But there were places where local people were burning too often or too much, especially the state forest services had to try to get it under control.

HKS: Okay. Well, Carl, I appreciate your taking the time.

Carl Eric Ostrom

Biographical Information

Born

Philadelphia, PA
May 29, 1912

Education

Graduate of Girard College High School, Philadelphia, PA, 1929
B.S. (Botany) Penn State College, 1933
M.F. (Forestry) School of Forestry, Yale University, 1941
Ph.D. (Forestry) Graduate School, Yale University, 1944

Employment

1934	(January to April) Emergency Appointment, Forest Service, USDA, Washington, DC
1934-36	Silvicultural Research, Northern Rocky Mountain Forest Experiment Station, Missoula, MT
1936-42	Silvicultural Research, Northeastern Forest Experiment Station, Philadelphia, PA
1942-44	Tree Physiology Research, Northeastern Forest Experiment Station, Beltsville, MD
1944-50	Naval Stores Research, Southeastern Forest Experiment Station, Lake City, FL
1950-57	Director, Division of Forest Management Research, Southeastern Forest Experiment Station, Asheville, NC
1957-74	Director, Division of Forest Management Research, Forest Service, Washington, DC
1974-75	Associate Deputy Chief (Research), Forest Service, Washington, DC
1975-76	Director of Science Programs, Society of American Foresters, Washington, DC

Awards

1964	Superior Service Award
1972	Distinguished Service Award