

ESSAY: From Forest to Farm to Urban Forest

From Forest...

Duke Forest is located east of the Appalachian Mountains in the rolling piedmont of central North Carolina. When the European colonists arrived in North Carolina, they found the landscape managed by Eno and Occaneechi Indians. Patches of land were cleared for agriculture and the forests were burned to increase game. The "Great Indian Trading Path" bisected the region, supporting diverse trade among the mountain and coastal tribes. The choice spots for trade and agriculture had been villages for hundreds of years.

During the mid 1700s, waves of Scottish, Irish, English and African Americans settled on this landscape. Early settlers cleared the forest to build houses, plowed the land to grow corn, and dammed streams to turn water wheels that would grind their meal. Timber was harvested from woodlots for houses, barns, fences and house wares. For a hundred years, the landscape was populated with numerous families subsisting on small farms. A local plant, however, growing on poor soil around Durham, was going to change the goal of farming from food and timber to cash.

...to Farm...

The most popular strain of tobacco prior to the Civil War was a dark variety grown on rich soil. Prompted by the demand of consumers for a more mild-flavored smoking tobacco, growers in the early 1800s began searching for ways to produce a lighter variety of tobacco. They experimented with less fertile soils and new curing methods. In 1839, Steven Slade, a slave of Caswell County, North Carolina, devised a formula that

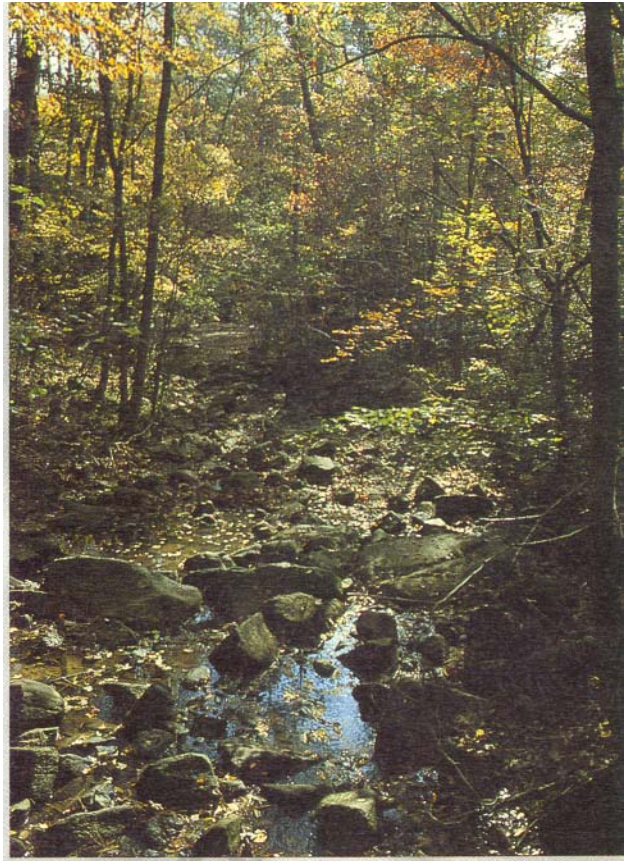


Figure 1: One of the creeks running through the Korstian Division of Duke Forest. Duke Forest pamphlet, 1990.

consistently produced a yellow tobacco or "bright" leaf. The new "bright" leaf was going to generate a fortune for an industrious Durham businessman and create a major corporation in the American tobacco industry. Washington Duke built an empire paying good money to any farmer who would produce the big broad "bright" leaves. By 1873, the Duke tobacco business was curing around 125,000 pounds of smoking tobacco annually. For the next 40 years, entrepreneurial farmers planted acres and acres of the crop and Washington Duke and his family generated one of largest tobacco fortunes in the world.

As lifelong Methodists, the Duke family practiced the kind of philanthropy encouraged by their church. In 1924, James B Duke, son of Washington Duke, invested a substantial amount of the family's fortune to expand the Methodist-owned Trinity College into a new university. He would honor his father by renaming it Duke University.



Figure 2: Trinity College Campus, Durham, North Carolina.
**Photo courtesy of Duke University Archives*

The new University was built to rival the prestigious ivy-covered universities of the Northeast. J.B. Duke built ornate Tudor Gothic architecture of imported stone. During the early phase of the University's development, the shrewd business experience of the tobacco man accidentally planted the seeds of what would become Duke Forest.

Ample land and good access to roads and water were cornerstones of J.B. Duke's successful tobacco factories. He recommended the same thing for the new University. After 40 years of intensive tobacco farming, most of the land surrounding Durham had lost its fertility and was rutted by gullies. Many farmers were willing to sell their land inexpensively. Duke bought enough land to build access roads to the highways leading to both Greensboro and Chapel Hill. For water access, he bought "Patterson's Mill", where two creeks entered the New Hope River. This tract was a particularly scenic piece of land with steep hillsides covered in native rhododendrons and huge rocks and cliffs along the stream bank. By the spring of 1925, Duke had 5000 acres in hand, many times more than he needed for the Gothic quadrangle of the main campus.

A School of Forestry was not included in the original list of professional schools to be established at the new University. The idea gradually took shape, however, in the mind of the University's President William Few as he spoke with colleagues and foresters around the country. He came to realize that the South's future prosperity depended

upon the proper management of its forest resources and that a School of Forestry would promote sound forestry practices in the south. When Clarence Korstian, a senior forester in the Forest Service, toured the enormous land holdings at Duke, he liked what he saw. President Few liked what they heard when Korstian described his recommendations for the development of the forest as a teaching lab. In 1930, President Few made the decision to include a School of Forestry in the new University and hired Korstian to become the first director of Duke Forest and Dean of the School of Forestry.

Clarence Korstian came to Duke with a vision. He wanted to take the best of what he'd seen at the schools of forestry at both Harvard and Yale to create a self-supporting demonstration research forest that would model scientific forestry practices. He wanted to use research to advance timber growing and use the forest itself as an outdoor teaching lab for silviculture students. He also wanted to prove that he could generate enough revenue from timber sales to pay for the forest management activities. He and his successors managed the landscape to fit these purposes for the next 70 years.



Figure 3: Dean C.F. Korstian (right, with loudspeaker) teaching silvicultural techniques. *Photo from Forest History Society Collection, courtesy of American Forest Institute.

Duke Forest, today, is a maturing second growth forest of pines, oaks and hickories. On the land around Patterson's Mill, rhododendrons still cover the huge rocks and cliffs above the stream, making this part of the forest one of the most scenic in all the North Carolina piedmont. The Duke School of Forestry has matured as well. Today it is the Nicholas School of the Environment. The research carried out in the forest is about how to grow big trees *and* how to understand big ecosystems. Huge arrays of sophisticated technology are measuring the impacts of acid rain and global warming on entire ecosystems. One experiment is designed to help NASA understand the images of the earth gathered by the space shuttle. Another measures the impact of increased carbon cycles on forest growth and development. Without a large-scale forest ecosystem at hand, this research would be impossible. Duke's Nicholas School of the Environment is respected worldwide for its emphasis on both ecosystem and global research.

...to Urban Forest

The region surrounding Duke Forest has changed as well. Due to a thriving research and technology park located in the triangle between Durham, Raleigh, and Chapel Hill, the Durham area has experienced rapid population growth and urban development. Duke Forest is now bounded on all sides by housing, shopping areas, and roads. The constant need for more housing puts pressure on all undeveloped land inside the city. In such an environment, there is incentive for selling off parts of the forest to developers to generate money to support other projects of the University.

Meanwhile, the large patches of urban forest throughout the city and county provide area residents with many benefits. The spongy soil on the forest floor absorbs and holds rainfall in heavy storms. The vegetation holds the soil and prevents erosion. The leaves remove dust, chemicals and carbon from the air. The forest deadens noise and reduces glare. The beauty of scenic roadways, shaded sidewalks, and ready access to nature has enriched the city's tax revenues. With over 200,000 people visiting the forest each year, Duke University has a large population of stakeholders who are very passionate about the benefits of this urban forest to their community.

From forest to farm to urban forest, the trees of Duke Forest tell a story of on-going transformation of the landscape. From Eno and Occoneeci hunter-gatherers to colonial farmers, from farms of several crops that provided food and fiber to farms of one crop that provided cash, from a forest in a rural setting to a forest in an urban setting, and from a forest laboratory to a much loved urban forest, the nature of Duke Forest has been, and always will be, the result of the relationship between people and trees.



Figure 4: Students measuring the diameter of a loblolly pine as part of a Duke University's Nicholas School of the Environment Field Class.

WORKSHEET 1: KEYWORDS

Read the essay entitled "From Research Forest to Urban Park." Copy a sentence that uses the word below. Then propose your own definition of the concept.

Silviculture

1. Sentence:
2. Definition:

Urban Development

1. Sentence:
2. Definition:

Urban Forest

1. Sentence:
2. Definition:

Stakeholders

1. Sentence:
2. Definition:

WORKSHEET 2: ESSAY ANALYSIS

Read the essay to answer the questions below.

1. How many centuries have people been managing the forest in the region now called Durham, North Carolina?
2. What was the impact of the tobacco plant on this region?
3. What was the legacy of Mr. Duke's tobacco fortune on the region?
4. What was Mr. Duke's purpose for purchasing the land that was to become Duke Forest?
5. What was Mr. Korstian's goal for Duke Forest?
6. How does the Nicholas School of the Environment use Duke Forest today?
7. Who else uses Duke Forest today and for what purpose?

WORKSHEET 3: MAP ANALYSIS

Sketch Map #1

1. Tape a piece of tracing paper over the 1931 Map of Durham.
2. Use your black pencil to trace the outline of the map and the registration marks. (*A registration mark is a circle with a cross in it. There are 4 on the page.*) Make a scale on the bottom 1 cm = 2 miles. Then label the map: Greenspace vs. Urban Space in Durham, North Carolina in 1931.
3. Use your green pencil to trace the shade of every piece of Duke Forest. (*Duke Forest is depicted in green on the 1931 map*)
4. Use your yellow pencil to shade all urban areas. (*Careful! Urban areas on the 1931 map are outlined in black with a city name in the middle.*)

Sketch Map #2

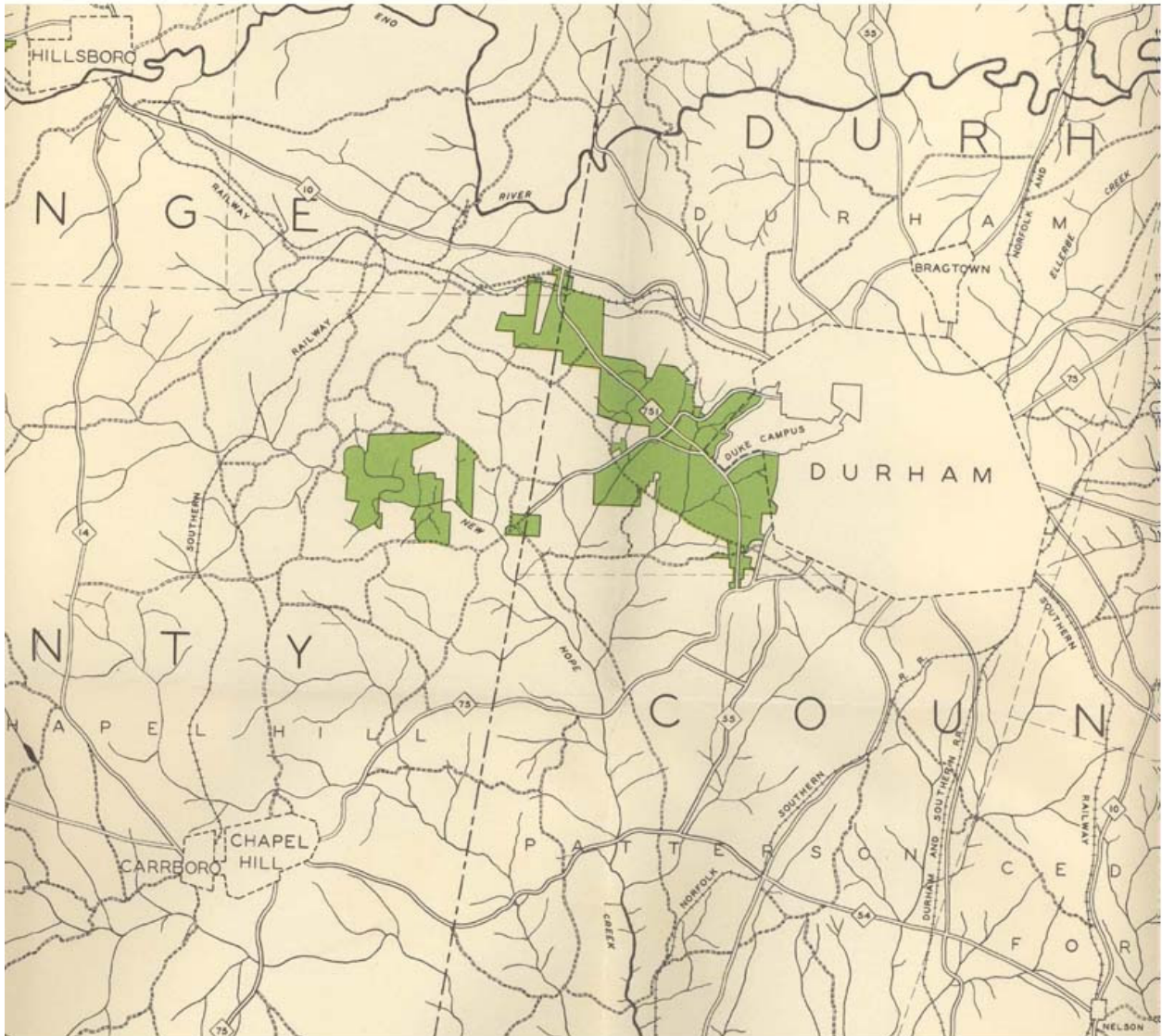
*Note: The 2006 map must be in **color** to complete this activity.*

1. Tape a piece of tracing paper over the 2006 Map of Durham.
2. Use your black pencil to trace the outline of the map and the registration marks. Make a scale on the bottom 1 cm = 2 miles. Then label the map: Greenspace vs. Urban Space in Durham, North Carolina in 2006.
3. Use your green pencil to trace the outline of every piece of Duke Forest. (*You will see 2 additional green areas. Just color these green.*)
4. Use your yellow pencil to shade all urban areas. Un-tape your maps and place them side by side to answer the questions below.

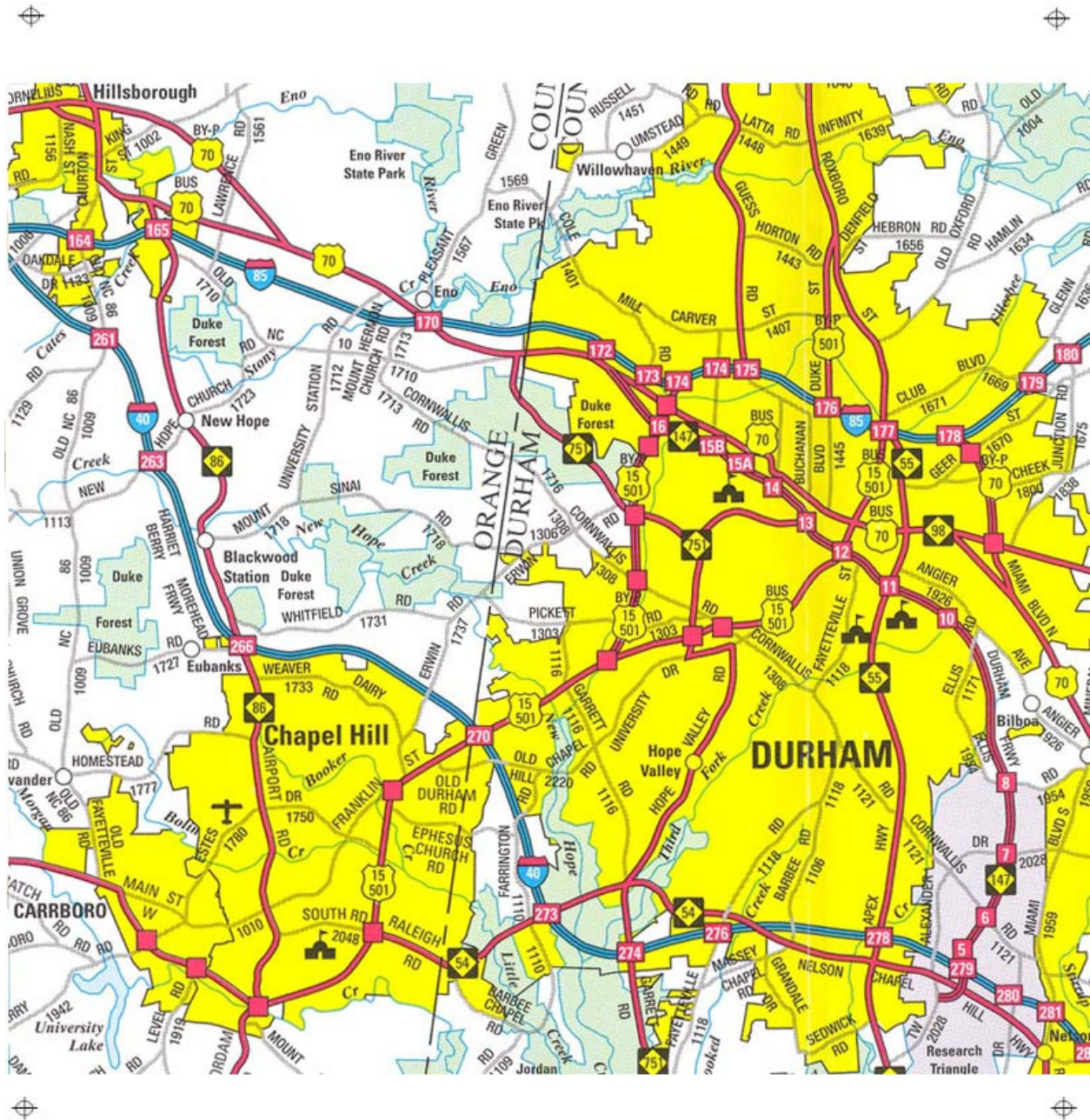
Questions

1. Using the Map Analysis Tool transparency, how many squares were open or green spaces in 1931?
2. Using the Map Analysis Tool transparency, how many squares were open or green spaces in 2006?
3. By what percentage did the amount of open or green space decrease in the 75-year time period?
4. If the growth rate increases at the same rate for the next 75-years, how many squares will be open or green space in 2081?
5. Based upon these maps, what do you think the value of Duke Forest was to Durham residents in 1931?
6. Based upon these maps, what do you think the value of Duke Forest was to Durham residents in 2006?
7. What do you think the value of Duke Forest will be in the future?

1931 MAP



2006 Map



Note: This map needs to be pulled off the web in color and given to every student.

MAP ANALYSIS TOOL

Student Note: For use with Worksheet 3.

Note: This page needs to be photocopied on a transparency.

WORKSHEET 4: FOREST MANAGEMENT: THEN AND NOW

1. How many people visited Duke Forest in 1932-1934?
2. What research was conducted in the forest in 1932-1934?
3. What were the primary management activities carried out by Korstian in 1932-1934?
4. How many people visited Duke Forest in 1994?
5. What research was conducted in the forest in 1994?
6. What were the primary management activities carried out by Edeburn in 1994?
7. What problems do you think the recreational users of Duke Forest create for Duke University?
8. What benefits do you think the recreational users of Duke Forest offer Duke University?

The Duke Forest

Annual Report 1932-34

To the President of the University from Clarence Korstian, Director of Duke Forest:
I have the honor to present herewith my report as director of the Duke Forest for the years 1932 - 1933 and 1933 - 1934.

Further progress was made in developing the Forest as a field laboratory for demonstration, research, and for educational use by the students and faculty of the proposed graduate school of forestry. New plantations comprising 92 acres planted to 85,800 trees were added during the winter of 1932-1933, bringing the total area planted during the first three winters to 266 acres. In this planting, loblolly pine, yellow poplar, shortleaf pine, black locust, longleaf pine, red gum, southern cypress, black walnut, and slash pine, were used. Most of the planting was concentrated on a few large open areas in the Durham Division of the forest. The remaining open areas, chiefly run-down farms from which the buildings have been removed, were included.

Increased attention has been given to protection of the Duke Forest and surrounding timberlands from fire and to the immediate detection and prompt suppression of such fires as may start. Through the cooperation of the University officials and the forest staff, the University Chapel tower was made available for use as a forest fire lookout station for the countywide cooperative forest fire control organization. The Chapel tower overlooks practically all parts of the Durham and New Hope Creek Divisions of the Forest; and, as the county organization maintains a lookout on the tower during spring and autumn, the Duke Forest is under constant daylight observation during these critical periods.

Increased interest has been shown by the University community and by the people of Durham in the use of the forest for purely recreational purposes or for combined recreational and educational activities. Five picnic sites were developed in 1932, each with an outdoor fireplace, a table, and a garbage receptacle. During the picnicking seasons the grounds are serviced once a week to renew wood supply and dispose of garbage. Over 4,000 people used these picnic grounds in 1933-34. The forest roads and trails are much used for horseback riding by students, faculty, and townspeople.

In April 1932, a study was initiated to determine the soil-leaf moisture relationships between five different forest types in the Duke Forest. The account, mostly by Mr. T.S. Coile, covers the essential features of this project: The data collected add materially to our knowledge of the relationship between soil moisture and leaf moisture through the growing season, and are an aid in explaining the reason for the development of forest types.

1994 Newspaper Article

Herald Sun, Durham, North Carolina, October 30, 1994
Copyright Durham Herald Company, Inc.

Duke Forest: An outdoor lab that looks like a park

by Jennifer Talhelm

DURHAM: As Duke Forest Manager Judson Edeburn maneuvers a large pickup truck over a concrete bridge in a popular spot of the Korstian Division, a visitor looks up in surprise. "I didn't expect to see cars back here," the man mutters in a protective tone. The man's reaction is a common one, said Tanja Vujic, a staff specialist in Edeburn's office. "People are very protective because they see it as their natural beauty area," said Vujic, a Yale University graduate who will begin graduate work in Duke's School of the Environment next year. "A lot of people are unaware [of who owns the forest] and feel like this is public land and a big park."

But it's not. It's private land - and it has been since the 1920's when James Buchanan Duke began buying up land for the brand-new Duke University. The forest, which stretches out in disconnected lumps, now spans Durham, Orange, Chatham and Alamance counties. It is listed among the Triangle's great resources, and it attracts an estimated 270,000 nature lovers, hikers and bikers a year, according to a 1990 survey. Since the 1930s, Duke Forest has been a managed forest. Today, it is home to dozens of experiments by scientists. The focus (of the research) has changed from forest conservation and management to ecology and global change.

As the forest's manager, Edeburn and his staff of two or three student assistants and four full-time employees are the forest maintenance crew. Edeburn controls all prescribed burning or cutting to sustain a certain age or stand of trees. His staff also maintains the roads and firetrails and is responsible for safety and public access. If there is a problem in Duke Forest, Edeburn knows, and it's his job to help solve it. For example, an outbreak of Southern pine beetle contaminated a number of trees this summer. Edeburn and his staff were at work burning the infected trees to contain the outbreak.

The real value to Duke now is the research that goes on in the forest and the grant money and notoriety it brings. Two experiments in particular have attracted national attention. Because of the size and nature of the forest - and because 60 years of records exist - Duke Forest was identified as a super-site for a radar experiment by the Space Shuttle Endeavor. Another experiment not far away is measuring the effects of carbon dioxide on a stand of trees and the earth and foliage beneath. Both projects involve predicting environmental change over time.

The constant stream of visitors to the forest has accelerated in the past 10 years. Combined with a technological advance in the equipment used by researchers, the increased traffic is creating a

security and environmental headache for Edeburn. The forest has 22 miles of firetrails and roads made specifically for Duke Forest maintenance vehicles and workers. Visitors are welcome on the roads, but when they form their own trails, they may cause erosion on vulnerable land or destroy plant or animal habitat that is being studied. Sometimes even well-meaning but ignorant hikers interfere with researchers' equipment. Mountain bikers create the biggest hazard right now, Edeburn said, "Twelve years ago, there wasn't such a thing as mountain bikes; you couldn't ride off road with 10 speeds," he said.

About two years ago, large blue signs marking Duke property and stating the rules for forest use were added. We've been fortunate to not have to restrict public access altogether," Edeburn said. "But it's becoming increasingly difficult to provide for teaching and research needs."

"In 2094, if there's still a Duke Forest," Edeburn said, "given we fully understand that development around the forest will continue, perhaps it will be the largest forest tracts in Durham and Orange counties."

Worksheet 5: Public Opinion Analysis

Summarize the view of each of the following characters:

Real Estate Developer:

Duke University Senior Vice President:

Faculty Chair and Romance Language Professor:

Dean of School of Forestry:

Consultant's Report:

County Planner:

City Planner:

1987 Newspaper Article

The News and Observer, Raleigh, North Carolina, Sunday April 5, 1987

Pressure building to develop parts of Duke Forest

by Nash Herdon, Staff Writer

DURHAM - Tall pines catch the breeze and sway as a yellow gust of pollen swirls just above the thick mat of needles on the forest floor. In a nearby ravine, a leafless sycamore stands apart from the spring dance and the surrounding budding greenery, with motionless, white limbs, like a skeleton's hand. This is Duke Forest, an 8,300-acre natural sanctuary enjoyed each year by 135,000 bird watchers, hikers and picnickers. Foresters and environmental scientists conduct more than \$1 million worth of research yearly amid its stands of rhododendron, hardwood and pine. But as the bustling Triangle grows up around the forest, Duke University officials are weighing other values. A study by the Urban Land Institute, based in Washington, has urged Duke to consider developing portions of Duke Forest for housing and other uses.

The prospect of this vast green preserve being opened for development stirs deeply mixed emotions in one Durham real estate developer. "Given the opportunity, I'm sure I'd be at the head of the line" if Duke offered parts of the forest for sale," said Nick Tennyson, president of the Home Builders Association of Durham and Chapel Hill and part-owner of Barber & Tennyson Properties, a Durham-based real estate firm. "I can say without hesitation there would be tremendous desire to develop quality, low-density housing in that part of town," Tennyson, a Duke alumnus, said of the U.S. 15-501 tract. Duke's well-paid faculty, he said in a telephone interview, would provide a strong market for such housing. "But on a personal level, I would say I'd be disappointed," Tennyson said. "The forest provides a nice ambiance for the two counties, and I would hate to see that go."

University officials described the Urban Land Institute study as merely one of several views that would help trustees decide how to manage the forest. "We could see areas around Duke Forest being affected by burgeoning urban development - new roads, new subdivisions- which were having an impact on Duke's land holdings," said Eugene J. McDonald, Duke's senior vice president, who asked the institute to perform the study. "Against this background, it seemed important that we at least look at what these land assets were."

The Urban Land Institute, which is composed of developers, land planners and scholars, has performed similar studies for the universities of Virginia and Wisconsin and a number of cities, including a 1986 study of Raleigh's downtown. Duke paid expenses for an 11-member panel from the institute to visit the Triangle and write the report, but the members themselves donated their time. The group was composed mostly of nationally prominent real estate developers. "I suppose the developers' voice on the panel would speak more loudly than the conservationists' voice by the end of the

day," McDonald said in a recent interview. "But I think, honestly, that the major message was neither to develop nor not to develop, but merely that... by doing nothing the university was, in effect, making a decision-albeit a passive one."

Duke trustees in February directed the administration to review the report and come back to them with recommendations in September. McDonald said he expected those recommendations would not include a proposal for developing parts of the forest, which covers more than 10 times as much land as the university's 800-acre campus. Instead, McDonald said, suggestions are likely for further study or other steps that should be taken before specific proposals evolve. At the request of the Academic Council, a Duke faculty body, the administration also is expected to appoint a faculty panel that would advise the trustees of the forest's research and educational values.

"The ULI report underscores the development potential of these lands," said Philip Stewart, chairman of the Academic council and head of Duke's romance languages department. "But the assumption was not that the ULI was deciding university policy with their report. We know the forest is going to face new kinds of pressure to be developed, with or without the report, Stewart said. "They (the ULI panel) themselves said the study was to be more of a provocative tool to help raise questions about the future uses of the university's land holdings." McDonald said: "What was once a fairly pristine reserve has been buffeted by development around it. We should know what parts of the forest are most highly prized for research and what areas are less highly prized, and even what areas are no longer useful for research."

George F. Dutrow, dean of the university's School of Forestry and Environmental studies, said in a separate interview that he could not single out parts of the forest that have little or no research value. "This is the finest outdoor research laboratory in the nation," he said. "We have 50 years of data in that forest. It's kind of hard for me to say we can do away with this one parcel or another." While certain areas have more vital research under way than others, the relative importance of ongoing experiments is likely to shift over the years, he said. And areas where no research is being conducted may be useful later. More than 50,000 trees in the forest have been measured at five-year intervals for nearly 60 years. Current research ranges from exploring the effects of acid rain to testing Radar for the National Aeronautics and Space Administration. "I would object to the board of trustees reaching any conclusions based solely on the ULI recommendations," said Dutrow.

The 40-page institute report, which also discussed how the campus itself should grow, said of the Duke Forest: The panel finds it difficult to justify the allocation, on a permanent basis, of all of the undeveloped forest properties solely for the benefit of the departments that use, manage, and occupy portions of them for direct educational research purposes." The Triangle is undergoing rapid growth, the panel found, and I-40 through Durham and Orange counties will open traditionally rural areas to developers.

The forest, the report says, "is thus becoming strategically situated, where the values of commercial, industrial, and residential lands have doubled and, in some cases, tripled in recent times." The university should consider forming a real estate management team to "capitalize" on its land holdings, it said. "By not having set up a separate, organized real estate function, the university, in the panel's opinion, missed some good opportunities," the report said.

"The panel did not advocate doing these things that are in the report," said James L. Van Zee, senior associate for the institute who worked with the panel during its November visit to Duke. "We identified acreage that probably could be developed in the not-too-distant future --areas with the most direct development potential-- if the university should choose to do something along those lines." Planners for Orange County and the City of Durham said their land-use policies had assumed that Duke intended to preserve the forest indefinitely. "These kind of resources can't be purchased," said Barry M. Jacobs, Orange County planning board chairman and Duke alumnus. "They can't be reconstituted. Once they're gone, they'll be lost forever."

"I would like to believe an administration of a major learning institution like Duke would at least give some equal weight to such values as maintaining quality of life and open space. Duke Forest contains some of the most unusual, sensitive and useful for research property in central North Carolina. To allow this to be developed for something other than education and research would be disappointing."

In a land-use plan composed last year by Orange County and the towns of Chapel Hill and Carrboro, a 38,000-acre rural buffer north and west of the towns was established. Much of the Blackwood and Korstian divisions of the Forest lie within the buffer. The governments have agreed not to provide sewer lines into the buffer area and to require minimum residential lots of at least two acres in an effort to preserve the open space. But the Blackwood and Korstian divisions were targeted in the institute report as prime locations for residential development. Scenic New Hope Creek slices through the heart of the Korstian Division, a popular area for hiking and jogging. "Orange County would like to maintain those lands in their pristine state," Jacobs said.

Paul Norby, Durham City planning director, said there are already half a dozen shopping centers in a mile and a half of the N.C. 751 - U.S. 15-501 intersection, where the panel suggested a small shopping center serving the university community. Near Duke's East Campus is Durham's Ninth Street business district, where restaurants and other shops cater to university tastes. Brightleaf Square, a former cigarette manufacturing plant turned into boutiques, and Northgate Mall are within blocks of the campus. "There are shopping centers in that area, and our comprehensive plan does not encourage commercial development in the area of Duke Forest," said Norby, "it would depend on a specific proposal, of course. But it's certainly something we would not say OK to."

Zoning regulations permit one dwelling unit per half acre in the forests' Durham Division. The city has targeted specific areas for encouraging residential growth over the next 20 years. It discourages residential development elsewhere, including in Duke Forest, by requiring developers to pay the full cost of water and sewer line installations, Norby said. "Our understanding, to this date, is Duke pretty much wants to keep the forest in its natural state," said

Norby, explaining why areas northwest of Durham were not targeted for commercial or residential growth. Jacobs, the Orange planning chairman, said Duke officials had expressed similar views about the forest in that county.

But McDonald of Duke said no official policy about the forest's future had yet been outlined. Formulating such a view, he said, was a primary reason for the institute's study. "We hope our future dealings with our neighbors will be in a positive, fruitful and symbiotic relationship," McDonald said. "I don't anticipate any conflict (between Duke the local governments) over the Forest in the years to come. On the other hand, the university would assert its interests if we're at odds."

ASSESSMENT 2: TEST

1. What was the state of the landscape surrounding Duke Forest in 1932-33?
2. What is the state of the landscape surrounding Duke Forest today?
3. What were the forest management activities in 1931?
4. What are the forest management activities in 1994?
5. What are the benefits to the community of Duke Forest today?
6. What was the impact of rapid growth and suburbanization on the lives of postwar Durham residents?

ASSESSMENT 3: IN YOUR OWN WORDS

Write an essay using specific examples of how scientific and technological land development have changed people's perceptions of the natural world.

Trees in a Squeeze

Use the notes below to help you write a cohesive essay.

Paragraph 1: Take a stance.

Have science and technology changed people's relationship to forests in Durham, North Carolina? Why or why not?

Body: Back up your argument with proof.

Describe the science and technology in 1873 and Washington Duke's relationship with the land. Describe the science and technology in 1930 and Duke University's relationship with the land. Describe the science and technology in 1987 and Durham residents' relationship to the land.

Last Paragraph: Conclusion.

Restate your stance. Summarize your proof. State the long-range implications of your argument for society.