AT COWETA

Notes of an ecology watcher

Article and photography by Jeffrey Smith

The hillside drops abruptly to the east, a tangle of dogwood, sassafras, rhododendron, and cat brier. The day is warm, and the air beneath the forest canopy is dense with the smell of decaying humus. Light from the midday sun pours over the leaves like honey. A vireo is singing sluggishly above us. I stifle a yawn and feel my ears pop and my head go hollow in the heat.

Suddenly, Larry Ragsdale calls out for me to move the pole again. We are surveying the slope, extending a line fifty meters through the underbrush down to where the hillside flattens out and converges on the Little Hurricane Branch of the Shope Fork of Coweeta Creek. Ragsdale is crouched behind a small tripod at the top of the hill, and peering through the narrow sight of a brass compass, he can't see me wagging the surveyor's pole from side to side below him. Once we complete this measurement we'll make another across the top and with lengths of nylon twine divide the slope into five parallel rectangles, after which we'll count all the white pine seedlings we can find. White pine seedlings look like small bottle brushes scattered among the vines, ferns, and fallen limbs that cover the forest floor. The whole exercise could take several hours. I wave the pole round and round and look up the hill.

No response.

The surveyor's pole is designed in five-foot segments that telescope out of themselves one after another. For increased visibility when the woods are especially thick, Ragsdale has painted the final two segments a stunning Day-Glo orange. I slide them out as far as possible until they tower overhead and the pole sways back and forth, even when it's planted in the ground and braced against my leg for support.

"Hold it still!" Ragsdale calls, and then after a pause, "OK, mark that spot!"

I look around and gather several small twigs, which I arrange in the shape of an arrow pointing to where the pole stood. The Little Hurricane Branch — scarcely three inches deep — gurgles through a lush patch of poison ivy at my feet before it spreads out calm as glass in a concrete settling pool and tumbles through a V-shaped weir built by the U.S. Forest Service to measure the water flowing off the hillside. The stream drains one of dozens of watersheds in the Coweeta Basin, a heavily forested 4,000-acre depression in the Nantahala Mountains in southwestern North Carolina. More than thirty streams in the basin — the Wolf Rock Branch, the Snake Den Branch, the Pinnacle Branch, and others — flow through weirs connected to electronic monitoring devices. The entire network is part of a program the Forest Service has operated in the basin since 1934 to determine how forests use water and how the activities of man affect water runoff and the quality of stream flow.

One such experiment, begun in 1939, was intended to demonstrate the harmful effects of hillside farming. Coweeta scientists clearcut the twenty-three-acre Little Hurricane watershed and developed a full-fledged farm, complete with cows and cornfields, on its slopes. After fourteen years each cultivated or grazed acre in the watershed was losing an average of fifty tons of soil every twelve months. Their hypothesis proven, the scientists stopped the experiment and planted grass to prevent further erosion. Shortly after, they planted white pine seedlings on the watershed's gentle eastern slope and yellow poplar seedlings on the rest.

Nearly thirty years later the watershed has recovered, and much of it supports a healthy stand of yellow poplar, shagbark hickory, red oak, sugar maple, and umbrella magnolia.

Across the stream from me the white pine seedlings have grown to forty and fifty feet in height. Little light filters through the canopy, and their deep shade looks cooler than the slope where Ragsdale and I are working. There is no underbrush, just a dark carpet of cinnamon-colored needles.

I turn to climb back up the hill and immediately stumble over a vine. Ragsdale is still crouched behind his tripod, writing down coordinate points in a notebook. Wearing khaki pants and shirt, heavy boots, and thick canvas leggings as protection against brush and snakebite, he is attired as he seems to think a field biologist should be. And, indeed, that's what he is today as we gather information about how white pine trees infiltrate and produce offspring within the Southern hardwood forest.

"In the Northeast," Ragsdale says, "white pine is thought of as an initial invader of abandoned cropland — much like loblolly pine and shortleaf pine are in the Southeast. Well, at Coweeta it's not an early invader. It looks like its ecological role at the southern end of its range is different than at the northern end. We want to study how it spreads and see what its effect is on the hardwood forest it's moved into.

"We're working on the hypothesis that reproduction can occur in any right niche. We want to know if development of the seeds into seedlings occurs best on southeast-facing slopes. There are obviously some seedlings on this slope that are doing quite well."

Larry Ragsdale crouched behind his tripod, writing down coordinate points in a notebook.

Ragsdale is an ecologist with a special interest in forest plants and how they fit into their niche in the environment. He attended undergraduate school at Emory in the late 1950s and early 1960s, and after receiving his Ph.D. from the University of Tennessee in 1968, he returned to his alma mater as an instructor in the biology department. Now a full professor, he began studying white pine stands at Coweeta in 1980, when he and more than a dozen other scientists from several Southeastern universities received a grant of more than $1 million from the National Science Foundation to conduct long-term ecological research in the basin. The program, which is administered through the Institute of Ecology at the University of Georgia, is one of eleven the NSF is sponsoring nationwide to enable scientists like Ragsdale to plan experiments over longer periods than those normally covered by governmental grants.

Many of the natural and anthropogenic events in the world's ecosystems occur slowly over years or even decades. For the past twenty years, however, during the time when environmental issues were just beginning to receive much notice in the United States, most ecological research focused on circumstances or events within the environment that were relatively short lived. Funding policies demanded it. Public and private research grants were available in one- and two-year cycles, and ecologists were forced to concentrate on short-term projects. They studied sudden peak infestations of insects, for instance, rather than the long-term dynamics of how a species developed and increased in density until it rose to troublesome levels. As a result, ecologists say their understanding of ecosystem dynamics may be weakest in regard to the lengthier, less conspicuous events in nature, and they are beginning to direct more attention to those areas.

The NSF began laying the groundwork for its long-term research program in 1977 at a scientific conference in Woods Hole, Massachusetts. The thirty-one scientists who gathered for the three-day meeting at the Woods Hole marine biology center concluded that American science is "peculiarly lacking" in long-term research efforts. "Too much of our research seems to appear out of a temporal and spatial vacuum, lacking the context which can make results most meaningful," the scientists wrote in their report. "Clearly, for the benefit of American science as well as science in general, the situation needs correcting. This is all the more important now that man is bringing subtle, long-term pressures on natural populations, communities, ecosystems, and the earth's entire biogeochemistry."

The first Woods Hole conference was followed by another in 1978 and by a third in Indianapolis in 1979. "At present," said the scientists at the Indianapolis meeting, "few research strategies are available to determine which changes [in the environment] are cyclic and which are unidirectional or to distinguish anthropogenic changes from natural ones. These and other central ecological issues can be addressed only when long-term quantitative data are available for both theoretical and practical purposes."

Based on the recommendations of those conferences the NSF agreed in 1980 to fund research projects in the Coweeta Basin, in an alpine valley in the Colorado Rocky Mountains, in a Douglas fir forest in the Oregon Cascades, in a salt-marsh estuary on the South Carolina coast, on a system of six freshwater lakes in northern Wisconsin, and on the Konza Prairie near Manhattan, Kansas. Earlier this year five other sites were also designated for long-term research — a system of short-grass steppes in Colorado, the Okefenokee Swamp of southeastern Georgia and northeastern Florida, a northern Minnesota forest, the Illinois and Upper Mississippi rivers, and the Chihuahua Desert in New Mexico.

In all the NSF budgeted about $14 million for the eleven projects, all of which are scheduled to continue for five years. Furthermore, scientists at each project are required to plan their experiments as if they will continue beyond the initial five-year period.

"We have legal authority to make fiscal commitments for periods of up to five years," says Tom Callahan, who is the associate director of the NSF Ecosystems Studies Program in Washington, D.C. "So we've decided to see about taking maximum advantage of that in this program. We've also decided to see what we can do beyond that, which would be to require that at least in the planning philosophy of each project a much longer time frame be imposed. There is no guarantee that we can fund beyond the five-year period. What we do is fund projects for five years and then explicitly expect the scientists to submit the projects for renewal for a second five-year period."

Beside Ragsdale on the ground is a canvas and leather knapsack bulging with tools, twine, tape measures, plastic stakes, notebooks, pencils, and insect repellent. He unzips the main compartment and tosses me a bundle of stakes. For the area we survey to be exactly 2,000 square meters, we have to set out the stakes at ten-meter intervals, finding the distances by holding the tape measure parallel with an imaginary horizontal plane rather than with the incline of the hill. This means that after one of us attaches his end of the tape to a stake near Ragsdale's compass, the other, standing ten meters downhill, raises his end until it seems level. The hill is so steep the person on the lower end must hold the tape over his head.

Ragsdale had told me to expect this the day before on a preliminary tour of what we'd be seeing during our three-day trip to the basin. "I'm going to give you a lesson in steep," he had said.

That day had also been warm. High humidity and a persistent gray haze had made it seem even more so. We drove the 135 miles from Atlanta to Coweeta in a noisy paneled truck owned by the University. If I rolled the window down I could barely hear Ragsdale's voice over the sound of the truck, but if I rolled it up I baked. We drove through Gainesville, Demorest, and Clayton before we crossed the North Carolina border and turned west off Highway 441 where Coweeta Creek flows into the Little Tennessee River.

The creek meandered through a wide valley that over the years had been subdivided into pretty little farms with shaded houses, murky stock ponds, and vegetable gardens planted in corn, squash, cauliflower, and beans. The houses had deep porches fringed with pots of geraniums. The creek, which looped back and forth under the road, never seemed much more than six feet wide and hardly merited its own valley. That evening, however, a gangling young motel clerk in nearby Franklin pointed to a five-pound brown trout mounted on a plaque in his office and swore that he had caught it just two months before under a farmer's bridge on Coweeta Creek.

After two miles the valley narrowed and we entered the Coweeta Basin. Hills of green rose before us and faded into blue and gray in the distance. The basin is shaped like a cupped hand with thick callouses in the palm. The entrance is at the wrist, and Pinnacle Mountain, Albert Mountain, and Big Butt serve as faraway fingers. High Knob, Blue Rock Knob, and Screwdriver Knob rear up in the center. Thick forest covers the slopes, and water springs from fissures in granite and quartz and winds its way downward throughout the basin.

Ragsdale steered past Forest Service headquarters and drove up a narrow dirt road alongside Ball Creek. The road climbed higher, a twisting notch in the hills. I was getting my lesson in "steep." Trees hugged close by on either side. I leaned out the window and watched the canopy humming by overhead as Ragsdale called out the names of trees. Black locust. Shagbark hickory. American basswood. Striped maple. Yellow buckeye. Sweet birch. Everywhere we saw great gray logs sprawled on the forest floor. American chestnut. Once a dominant species in the forest and one of the most valuable of American hardwoods, the chestnut was virtually destroyed in the 1920s and 1930s by chestnut blight, a fungus that affected its bark. Occasionally, the great chestnut stumps send up root sprouts, but the new growth always dies before it reaches maturity.

"Chestnut was the all-American tree," Ragsdale said. "It could do everything. I'm surprised that when it died it didn't cut itself into planks and stack itself up by the side of the road.

"As an ecologist I'm interested in the dynamics of how systems change. What happened in the forest after the chestnut died out? If you introduce white pine, what other species will you lose? Which species will it replace? Not everything that's there now can stay if white pine moves in. I don't know what will happen. It's an important question because it has to do with how we think of forest systems. . . . What we're interested in in plant ecology is how these change — which species come and which species go and why."

I asked Ragsdale to stop so I could collect leaf specimens. Beside the road I found chestnut oak and sassafras and Dutchman's pipe, a luxurious green vine with hard, fat fruit the size of walnuts. I had never seen some of these plants before — or had never paid them much attention — and Ragsdale helped identify them. After a minute we returned to the truck and continued our climb.

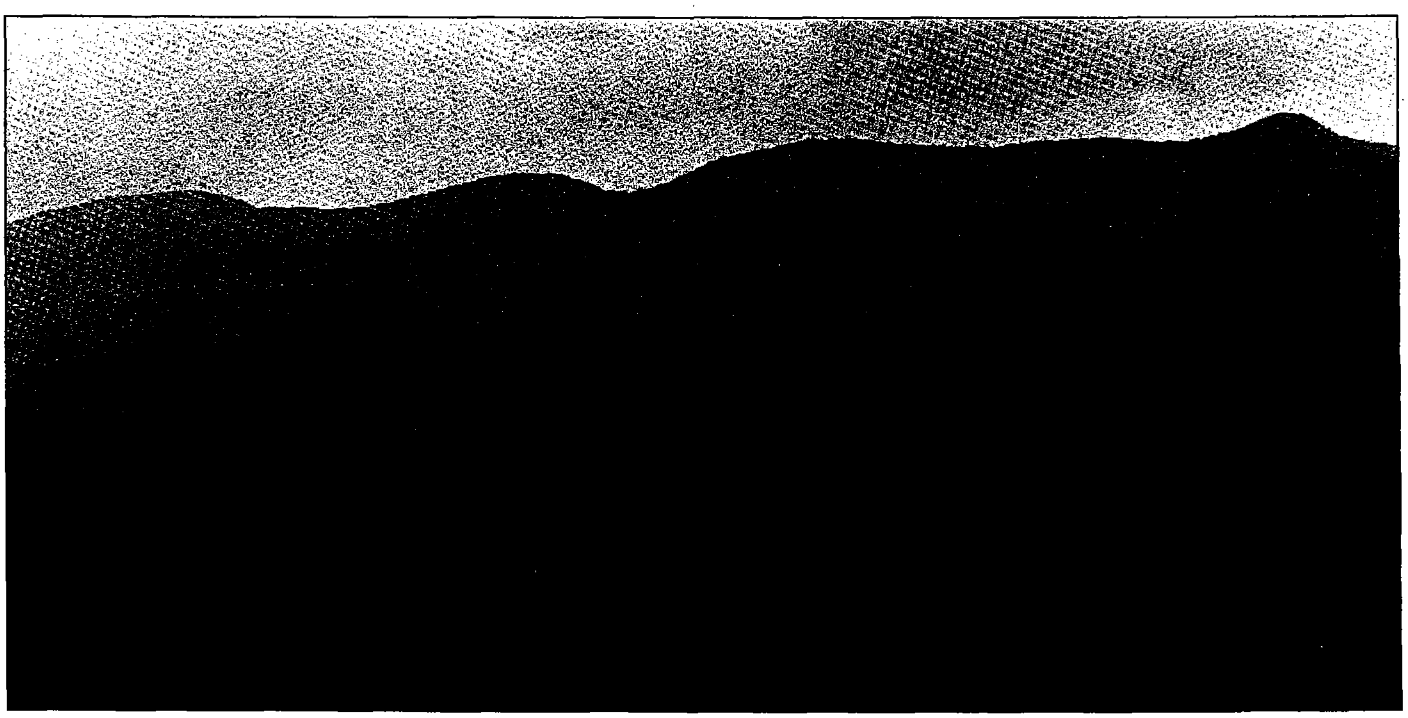
At a small, flat clearing scooped out between two hills, Ragsdale said, "That's a cove. You'll find more diversity of plant life in a cove than anywhere else in the forest. They're very important."

The road had begun to curve back on itself in a series of sharply engineered switchbacks, so when we reached Reynolds Gap we turned back. We drove into Franklin, about five miles north of Coweeta, and checked into the Franklin Motel, a low, concrete building with a swimming pool surrounded by orange-and-white-striped metal umbrellas. That night we had dinner at Tallent's Steak House, a restaurant with a Western motif and greasy, inexpensive food. Old rifles and harnesses and photographs from cowboy films of the 1950s adorned the walls. We ate stuffed crabs and steak and talked — until after the restaurant closed — about Emory and the difficulties associated with being an environmental biologist or an ecologist at a school that places so much emphasis on biomedical science. Ragsdale referred to it as a "reductionist" approach to science.

A large, youthful-looking man with ginger-colored hair, a gray-flecked beard, and wide blue eyes, Ragsdale speaks with enthusiasm about nearly any topic. He explained that he first came to Emory as an eighteen-year-old science major intending to study medicine or dentistry after he graduated. But as he took more courses he became increasingly dissatisfied with what he was being taught.

"I found that everyone was ripping the world apart through their very narrow little classes, but there wasn't anybody trying to put the world back together so it actually made sense," he said. "I couldn't find anybody to talk to who was interested in doing that.

"It was about then that I had the opportunity to become involved in a course on ecology. Bob Platt [professor of biology emeritus] was teaching it. It was a graduate level course, but I decided I would take it although it might be a bit difficult, because when I asked about the course the whole point of it seemed to be to understand all the different parts that were lying around out there. We had studied the parts of flowers and the parts of animals. We



Hills of green rose before us and faded into blue and gray in the distance. The basin is shaped like a cupped hand with thick callouses in the palm.

had even studied the parts of hearts. This course seemed to put things together. So I took it, and sure enough you could see that there was this undergirding philosophy that synthesized things.

"This was appealing to me, because everybody else seemed to be cutting off their little piece of the world and leaving nothing but a flurry of questions behind in their courses. After that I tried to find other courses on campus that were oriented in somewhat the same way. At that point it became clear to me that people who looked at the world through ecological eyes were seeing it differently than anybody else."

Ragsdale explained that he has given David Minter, the dean of Emory College, a proposal for an interdisciplinary program in ecology and earth science. The ecology program at Emory has always been small, he said, but it is now in the process of becoming "tiny." The number of biology faculty members who work on a scale above the level of the organism has been cut in half during the past seven years. The program is endangered, he said, and so is the very intellectual climate necessary for his kind of science to flourish at the University. He did not sound hopeful about the chances for reversal.

The next morning we loaded our gear — including Ragsdale's tripod, surveyor's pole, and bulging knapsack — and drove south. He was in an expansive mood and didn't seem to mind that a fog bank had settled into the mountains during the night and now threatened to ruin our day. He felt certain it would clear. We turned into the parking lot at a neat wooden building that serves as Forest Service headquarters. Ragsdale got out to see if any other ecologists were running experiments that day, and I walked down to a fenced enclosure in a nearby pasture to inspect an assortment of meteorological instruments — wind meters, rain gauges, thermometers, barometers.

Coweeta is an ideal location for long-term research because the government has compiled so much information about natural conditions in the basin during the past forty years. What scientists call base-line data. An ecologist who wants to know, for instance, how much rain fell during the 1963 growing season can find out by consulting Forest Service records. Similar information is available on many aspects of the climate, soil, geology, hydrology, and vegetation of the basin.

The idea of conducting research on how forests use water was practically unheard of before 1926. That was the year Charles Hursh was appointed to the staff of the Appalachian Forest Experiment Station. Hursh was an innovator who conducted early hydrologic experiments on the Bent Creek Experimental Forest near Asheville, North Carolina. As the years passed he began to look for an area where he could perform comprehensive experiments on watershed management, and largely at his urging the Coweeta Basin was set aside for hydrologic research in the early 1930s. Other researchers soon pulled out of the basin, and for the next forty years Coweeta was used almost exclusively for studying the effects of forest uses on water resources. Now the experiment station is an internationally recognized source of information on forest hydrology.

One of the most famous experiments conducted at Coweeta was on the watershed drained by the Hertzler Branch of Ball Creek, across the basin from the Little Hurricane Branch. In the early years of the century some scientists believed more sunlight and wind would reach the ground after clearcutting, thereby increasing evaporation and decreasing stream flow. Others contended that water formerly used by the trees would remain in the ground and increase stream flow. Beginning in 1941 the watershed was clearcut for eight years, and scientists found that stream flow rose by an average of twenty-four percent over what it had been when the natural forest covered the slopes.

Subsequently white pines were planted on the thirty-three-acre watershed in 1956 to determine whether evergreens or hardwoods use more water. It was known that rain and snow trapped in the leaves of trees never reaches the ground and that mature pine trees, which keep their leaves year round, will trap considerably more water than hardwoods. In addition, pines may actually use water on warm winter days. After fifteen years scientists found that each acre of the young pine forest used 220,000 more gallons of water per year than the mature hardwood forest that once grew on the slopes.

With some trepidation Ragsdale compared the basin to a large white mouse, sitting there waiting for scientists to perform experiments on it. "The analogy is useful for the idea of introducing the concept of a large landscape as an experimental unit," he said. "But it's not an exact kind of thing, and there's an argument among ecologists about whether an ecosystem is equivalent to an organism.

"It's possible to think of the basin as being like something that can be studied in the laboratory, but you can't study it with one person. It takes many people to look at the different facets. You ship a virus or a bacterium or a fruit fly to the scientists so they can work on them in their labs. In our case you ship the scientists to the 'organism,' to the ecosystem. For people who aren't used to dealing with the environment in an experimental way, that kind of analogy can be helpful so they can stretch their thinking out to include a 4,000-acre basin.

"It's very difficult for me to explain to a laboratory scientist what I'm trying to show you unless he has actually worked in the field or is imaginative enough to think of himself wandering around inside the system he is studying."

Historical records refer to a time when horsemen rode headlong through Coweeta's hills, a time when the basin was much less heavily wooded than it is today. Obviously great changes have occurred here; horse and rider would now have to negotiate their way through the basin very carefully.

Scientists with the University of Georgia's Institute of Ecology and with the Forest Service have conducted ecologically oriented research at Coweeta since 1968. Like scientists elsewhere, they say they have a relatively good understanding of the complex ecological changes that occur during brief periods or cycles in the forest. However, they're still ignorant about many of the subtle, prolonged changes, and the NSF project will allow them to concentrate on those.

One of the major components of the project involves studying the gradual accumulation of heavy metals like lead, cadmium, copper, and nickel in the basin. Another focuses on the effects of human activities on the forest. Because Coweeta is isolated from major population centers and because of the very real prospect of increased development in the Southeast, the basin is a prime location from which to study the gradual consequences of modern civilization for natural systems. Scientists will be able to determine, for instance, whether plant growth and decomposition change as the region becomes more industrialized. And they will also be able to observe whether industrialization reduces soil fertility or causes different kinds of plants to grow in the basin.

Finally, the project will focus on long-term biological questions: What are the major cycles of defoliation in the southern Appalachian forest; do they occur over periods of ten, twenty, or 100 years? How do forests respond to long-term changes in climate? How do rates of organic growth and decomposition vary over time? How do natural disturbances like fire and wind storms affect forest systems? Scientists involved in the project say that without more information about such biological processes the impact of human activity can never be completely evaluated.

For Ragsdale, the Coweeta project means long-term research in several interrelated areas.

In cooperation with William H. Murdy, who is also a professor in the Emory biology department, he is conducting inventories of the plants that grow on half a dozen watersheds.

"What is most important for me right now is to know what plant communities should occur at different locations in the basin and to develop some meaningful labels for them," he said. "For example, the heath shrub community seems to be a very important one for white pine growth. If I can have an inventory of plant communities for each watershed we look at, then I can begin to get a pretty good idea of where white pine might develop.

"Bill Murdy, though, has interests that go beyond just that kind of habitat analysis. He's interested in the fact that scarlet oak occurs in two different places at Coweeta. It occurs high up in the watersheds in dry places, and it also occurs low in the watersheds. Most species don't do what the scarlet oak is doing; they usually occur in only one habitat or another. The forms don't look quite the same, and Bill is interested in their genetics. There's the potential here for the evolution of a species."

(Donald L. Phillips, a young assistant professor in the biology department, is also involved in habitat studies at Coweeta. Phillips is using a computer to analyze information from a plant community inventory taken in the 1930s — shortly after chestnut trees disappeared from the forest — and from another taken in the 1960s. He plans to develop a computer model to explain forest succession, that is, which species appear or disappear in response to various natural and anthropogenic forces.)

Another aspect of Ragsdale's work concerns the accumulation of heavy metals in the basin. Using air filters and rain collectors, he can determine which elements are being deposited in the forest from the atmosphere, and by analyzing samples of forest litter and vegetation, he can see which of those are becoming part of the forest food cycle. Litter and leaf samples from dogwood trees, rhododendrons, and a shrub called buffalo nut have already provided evidence of the presence of such trace elements as aluminum, cadmium, cobalt, nickel, lead, and zinc; but none is present in high enough concentrations to cause concern at the present.

"They did this in the Smokies a few years ago and found alarmingly high concentrations of lead and what appeared to be high concentrations of aluminum and nickel," Ragsdale said. "You can look out over the areas where those concentrations were recorded and what you see is the Tennessee Valley and all the industry that is occurring there. There don't appear to be high concentrations of any of the elements I'm testing for at Coweeta. What I'm doing is building a starting base so we'll have this information to refer to in the future.

"It will also allow us to look at the cycling flow in the forest. For example, there is almost no cobalt in the dogwood and rhododendron samples we took but high concentrations in the buffalo nut. It turns out that buffalo nut is a root parasite on other species. It actually connects itself into other plants' root systems and derives nutrients from them. And it also seems to derive a lot of cobalt."

By knowing more about how nutrients and trace elements flow through the forest, he can develop theories about why different plants prosper in certain locations. Does the existence of different habitats depend on which trace elements are present? Does providing different kinds of habitat have an effect on the evolution of plant populations? Do some plants seem to avoid each other? Why?

Ragsdale's research on the spread of white pine through the basin is also a product of his interest in the relationships among plant species. "I guess it gets down to being a question of understanding how forest communities function," he said, "and to do that you have to be able to observe them as they change.

"You can make certain inferences by looking at the forest and saying, 'This is how it must have happened,' but it's not very frequent that you can actually walk into a situation like we have here and make observations at the time change begins. We obviously have a potential change in the forest structure at Coweeta because of the introduction, in a very large way, of white pine. The measurement of how the white pine population changes would establish a base for reinterpreting the way we think about the natural forest system.

"Are they things that don't change? Should we preserve a forest just as it is? If that's the case then we should come up here right now and remove the white pine, because it doesn't belong here. Or should we think of the forest system as a more dynamic thing with species that come and go?

A half mile up the Shope Fork we turned onto a narrow spur road and drove to a small clearing. . . . To our right stood a cathedral of white pines.

"Now the man in the street may not care about the migration of white pine through Coweeta, but ultimately these issues have important implications. They get discussed first in the scientific literature, and they help us reevaluate how we think of natural systems. I think it's fascinating. The ramifications have to do with public policy and how we spend our money. If we have large expanses of land that we're trying to keep in a natural state, what does that entail? Should we spend money to prevent fire? Should we spend money to eradicate nuisance species? Should we spend money to spray insect-infested trees? What's your management strategy?

"If your assumption is that the systems change and that certain species disappear, then maybe you won't spend nearly as much money managing the forests. But if you think insects and other kinds of nuisances should be reduced to preserve the forest as we know it, then you're talking about investing significant amounts of money to prevent changes that otherwise might occur naturally. Those are important practical issues."

Ragsdale had been right. Just as I returned to the truck, the sun burned through the fog and filled the basin with light.

We bounced around a corner near a Forest Service barn and passed Jack Webster, an ecologist from the Virginia Polytechnic Institute, who had knelt to watch a column of ants march across the road. Webster had come to Coweeta to study the effects of thunderstorms on the ecology of mountain streams. Most days had been clear recently, and he had little to do but wait.

"Watch out!" he shouted in mock agony as Ragsdale drove over his ants.

"Out of my way!" Ragsdale laughed.

A half mile up the Shope Fork we turned onto a narrow spur road and drove to a small clearing beside a weir. An unpainted wooden shed sat in a nearby thicket, a remnant of the experimental farm that had once covered the slopes above us. To our right stood a cathedral of white pines and to our left a thick stand of hardwoods.

We climbed out of the truck, strapped on heavy leggings, and slowly made our way up the hillside through a tangle of dogwood, sassafras, rhododendron, and cat brier. In a patch of sunlight beneath a leafless oak, Ragsdale dropped to his knees.

"Here's a pine seedling," he said. "It looks like it's six years old. The nice thing about white pines is that they only put out new growth once a year so it's easy to age them by counting the branches."

Then he spotted another and, forty feet away, another.

"These clearly have the opportunity to grow into mature trees where they are now. This could be an excellent opportunity to gauge the development of white pines within a hardwood forest. It looks like what we need to do is inventory the whole hillside."

We returned to the truck, and Ragsdale withdrew his pack, his tripod, and his surveyor's pole. "Here, you take this," he said, handing me the pole. We started back up the hill, as light poured over the leaves like honey. □