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SPECIAL REPORT: High-level radioactive nuclear waste

WISCONSIN NATURAL RESOURCES

\$3.00

March/April 1987

Volume 11, Number 2



Leopold photos, essay

Today's wardens

State forestry, 75-year anniversary



White Lady's-Slipper

Not only is the white lady's-slipper rarer than the familiar yellow lady's-slipper (inset), it's also smaller. The yellow "slipper" is about the length of a thumb, whereas the white "slipper" is only the size of a thumbnail.

Mark Martin, Natural Resource Specialist

Many people are familiar with Wisconsin's yellow lady's-slipper orchid but are surprised to learn that a white lady's-slipper also grows here. The white one's lack of notoriety may be due to the fact that it is so rare DNR lists the plant as a threatened species.

Front cover:

Wisconsin's 1987 Wild Turkey Stamp by Artist/Naturalist Virgil Beck, Box 66, Stevens Point, WI 54481. Beck's painting was chosen from among 51 competitors.

The stamp will be purchased for \$11.75 by 6,040 lucky permit holders chosen at random to participate in the state's fifth annual spring turkey hunt April 22nd to May 17th. There were 14,000 applicants.

Restocking southwestern Wisconsin with wild turkey from Missouri has been a spectacular DNR wildlife management success. From an original release of 352 birds between 1976 and 1984, the population has now grown to an estimated 20,000. The number of permits issued and the number of turkey taken has also shown a steady rise. Last year 793 birds were bagged.

Proceeds from sale of permits go to support the program.

Its scientific name, *Cypripedium candidum* was taken from "Cypri," the Greek goddess of love and beauty; "pedium," which means little foot and "candidum," the word for shining white.

These beautiful orchids are found in wet prairies and fens (both rare communities) in southern Wisconsin. Flowering occurs around Memorial Day, when these plants quickly emerge and flower before other plants shade them out. The plants, only eight to 14 inches tall, may contain up to 100 flowering stems. Each clone increases in size with age and the individual plants are long-lived. Flowering first occurs when the plants are about 13 years old.

A small sweat bee pollinates the flowers—and when they are successfully pollinated, many small seeds are produced. To grow, white lady's-slippers, as with many other orchids, require a special fungi. This strange relationship may be a limiting factor in establishment of seedlings.

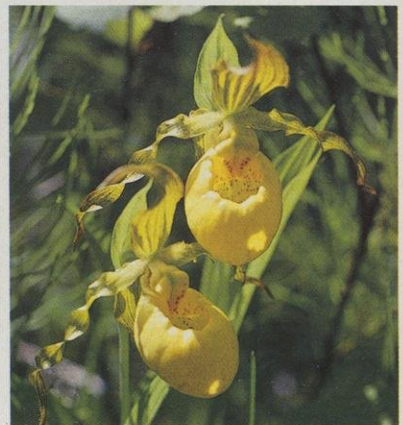
Historically, white lady's-slippers were once common in southern Wisconsin. Around the turn of the century these exquisite orchids were supplied to the Milwaukee and Chicago markets and

sold in bouquets. Collecting, wetland drainage, urbanization and fire control, which increased shrub competition, caused many populations to disappear. Only 10% of the populations known before 1960 still survive.

Recent data compiled by the Bureau of Endangered Resources indicate that at present only 27 populations are known, of which 11 sites are protected by public ownership. Seven of these are in state scientific areas. Several of the populations contain only a few plants and only 10 have more than 100.

Work is underway to improve conditions for the white lady's-slipper. Fire and brush cutting are being used on sites in public ownership to give this sun-loving orchid a fighting chance. An inventory will locate additional populations, and one site is being acquired as a scientific area by DNR's Bureau of Endangered Resources.

Individuals can help the white lady's-slipper survive in Wisconsin by reporting locations of these rare orchids and by contributing to the endangered resources fund through the state income tax. The fund helps locate, manage and acquire white lady's-slipper habitat.



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A Leopold gallery

Photos from the family album.



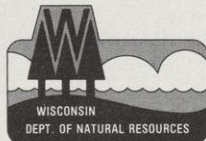
Pines above the snow

A version from the old Conservation Bulletin.

Aldo Leopold

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Wardens in business suits

Woods wise plus environmental savvy.

John Nelson,

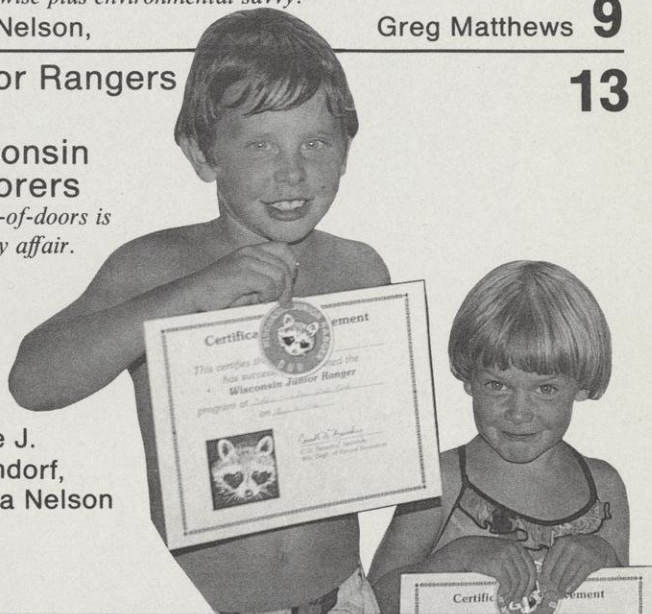
Greg Matthews **9**

Junior Rangers

and
Wisconsin
Explorers

*The out-of-doors is
a family affair.*

Laurie J.
Osterndorf,
Kendra Nelson



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75 years of Wisconsin forestry

Test by fire yields an industry, plus recreation and wildlife.

Rick Mulhern

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Forest Biotechnology

*Genetic engineers can add traits that improve tree growth,
resist insects, fend off disease and avoid other calamities.*

Neil D. Nelson

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Parks' Almanac

Wisconsin State Parks for the
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SPECIAL REPORT

High-level radioactive nuclear waste:
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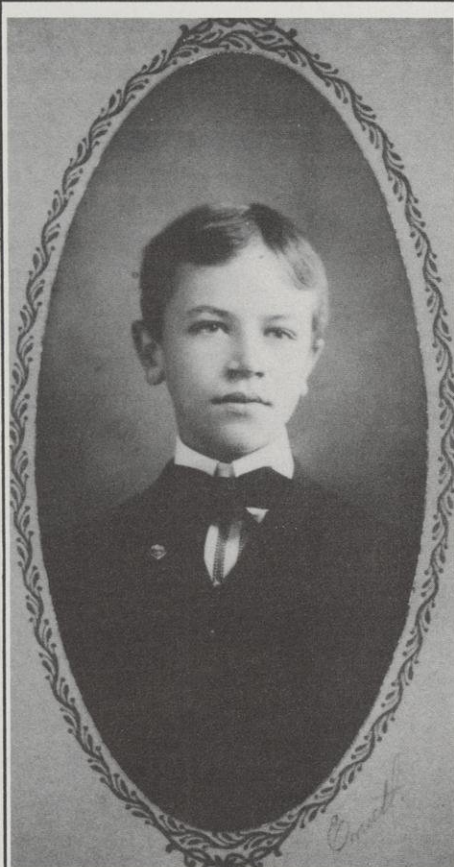
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In 1933, Leopold's classic text on *Game Management* came out, and he began to teach that subject at the University of Wisconsin-Madison.

Aldo Leopold

A Leopold gallery



Young Leopold grew up in Burlington, Iowa near the Mississippi River.

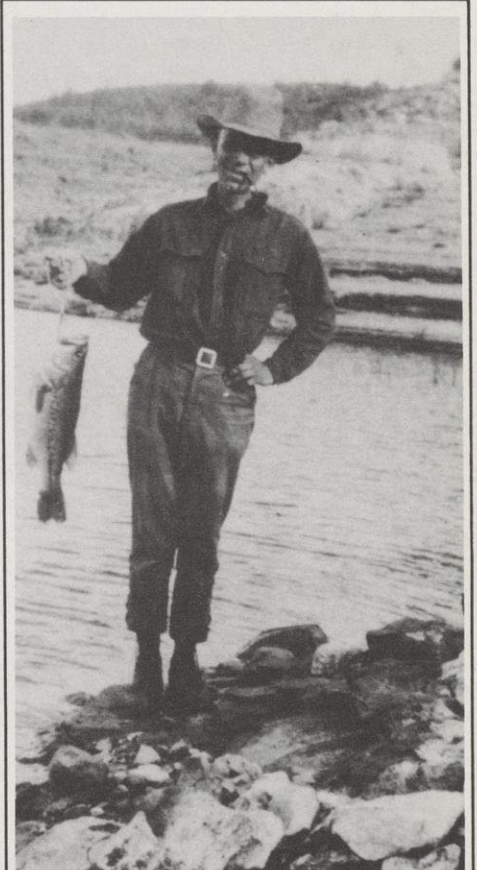
Wisconsin Natural Resources continues its observation of the Aldo Leopold 100th anniversary with this gallery of historic Leopold photos. In addition, a Leopold essay is reprinted from this magazine's predecessor, the *Wisconsin Conservation Bulletin*. Called *Pines Above the Snow*, the essay was first published in March of 1943. It has the same title as one Leopold used in *A Sand County Almanac*, but the content is different. More Leopold essays from the old *Bulletin* will be reprinted here later this year.

PINES ABOVE THE SNOW

Aldo Leopold

When winter has locked up the soil and dispersed the birds and denuded the hardwoods of their leaves, one needs to be assured that things will one day grow again. At such a time a young pine, green above the snow, talks louder than many voices.

The rain falls on the just and the unjust, but pines do not grow wherever rain falls. Only farmers with acid, and preferably sandy, soils are privileged to have real pines. By real, I mean pines with that inner bloom which bespeaks abounding health—pines with blue needles, long clean internodes, and rifle-barrel leaders aimed straight at the zenith and intending to hit their mark.



Among Leopold's affiliations was membership in the Izaak Walton League.

I mean, too, *native* pines, white or Norway, sure of their roothold in native earth—not Scotch, or Austrian, nor any other stowaway from foreign parts. Nurseries have peddled these foreigners because they are easy to raise. They make a big show for a few years, but they do not stand the test of time.

“Norway” sounds like a foreign pine, but the tree is as native as the ruffed grouse who treads the brown carpet under his branches. He is called Norway because first logged at Norway, Maine.

Pines, like other blessings, come to him who waits. When the labor of planting is done, you wait for a rain. When the plantation is safely rooted, you wait three years for real growth to begin. Then, for a decade or two, you wait all year for May to come, for buds to burst, for waxy “candles” to reach skyward, each year a little farther: First a foot a year, then two feet a year, finally sometimes three feet a year. If, during the pyramiding period, your own clock shows signs of running down, you may gain from your trees a curious transfusion of courage. Pitch, like blood, is thicker than water.

It is a good thing to have more land for pines than time to plant, for thus you plant a part each year, and each year have new trees making their first thrust at infinity.

Your pines, like your children, are interesting to the extent that they are studied minutely. For example, why did the annual gain in height for 1941 exceed that for 1942? This holds good for almost all plantations, and for wild seedlings as well, throughout the central region.

I don’t know the answer. I do know that the drought year, 1936, registered itself in short growth for 1937. Despite the drought, the 1936 growth was excellent, reflecting the abundant rains of 1935. Pines, in short, deposit their current paycheck from sun and rain, and pay their bills with savings of the year before. Most other trees live from hand to mouth; they are content to let the Lord provide.

Have you ever noticed that the vigor of a young pine registers in the number of buds at the tip of his leader? Show me a leader with eight buds and I will wager on a long climb skyward when they burst next May. Show me three buds, and I see a weak and ailing tree in need of a pediatrician.

Health also registers in needle length. Your newly planted pine may have

grown three-inch needles during his last year in the nursery, but after the shock of transplantation he may do well to grow needles half as long. At this stage his leader looks like the singed tail of a fox; a year later the new growth will show longer needles, deeper color, and more buds.

Why is a pine called evergreen? Does he keep his needles forever? By no means. White pines shed their needles when they are *two* years old; Norway pines when they are *three* years old. Look at your trees to verify this. If you have none to look at, I hope you have something else as good.

The Jack pine is a precocious cousin of the real pines. He starts out in an awful hurry, and then loses his wind. He is useful as a pacemaker in a young plantation. Sprinkle a few Jacks among your whites or Norways, and they will furnish wind-protection by the time the better pines at last decide that they want to grow up. Wind protection is an asset to any tree. White pines, unless planted on low moist soil, may fail to perform well without it.

The Jack pine, like his human counterpart, is not steadfast. He wants to do something quickly; he doesn’t care when or how well. He often puts on two or three separate spurts of growth during a single summer, hence the whorls of his branches do not register his age, as they do in white or Norway. He lays down sappy wood that rots quickly. Altogether he is an amiable four-flusher, but it takes all kinds of trees to make a forest. His usefulness lies in his low standard of living; he plants the green banner on sands too poor to support better trees. After a generation of Jacks, such soils may accumulate enough fertility to support Norways, and perhaps, eventually, whites.

Just so did the swaggering *coureur de bois* prepare the way for the settler, and the settler prepare the way for us.



▲Enamored of cowboys, the young forester in the Arizona Territory dresses the part. Leopold’s affection for wild country led the US Forest Service to set aside the country’s first wilderness area—the Gila in New Mexico.

◀Leopold’s lifelong study was all outdoors—he went equipped to take precise measurements.

Lower left: As a boy, Aldo hunted Mississippi bottomlands with his sportsman father. His early interests in botany and ornithology led to a lifelong habit of recording field observations in a detailed journal.

Lower right: Leopold was an inveterate hunter, which no doubt triggered the interest in game management that resulted in his famous book.





Float trip on the Rio Grande.



◀ Leopold inspects one of the thousands of trees he and his family planted on their sand county farm near Baraboo.



▲ Leopold married Estella Bergere, daughter of a prominent Spanish land grant family in Santa Fe, New Mexico, on October 9, 1914.

WARDENS IN BUSINESS SUITS

John Nelson, DNR Public Information, Milwaukee
Greg Matthews, DNR Public Information, Madison

They were sometimes known as "rabbit sheriffs" and "popple cops." For over 100 years, Wisconsin Conservation Wardens enforced fish, game and recreational safety rules. Sometimes, in the old days, they were called on to enforce a few basic water pollution laws. But not often! Back then, circa 1930, wardens were easily identified by their dark green Canadian Mountie-type uniforms and broad-brimmed campaign hats. Modern wardens, though, not only look different dressed in police gray or business suits, their duties have also evolved. The job of protecting Wisconsin's natural resources has become complex and technical, and DNR's environmental protection responsibilities have grown. Today, the enforcement job requires more and more specialization.

This is reflected in a new kind of warden now working for the department. Besides traditional fish and game violations, DNR can now efficiently investigate infractions of clean air, water, and solid and hazardous waste laws passed in the last two decades. In 1985, two special Environmental Warden positions were created to serve heavily populated areas of the state. Stationed at the Southeast District Headquarters in Milwaukee is 31-year-old Thomas Thoresen; working out of the Southern District at Madison is 37-year-old Stan Schneider.

Thoresen has been a warden since 1979. He took the job because he felt that enforcing environmental laws is critical and important. He also considers it one of the most challenging areas to work in.

"It's mostly detective work," said Thoresen. "Like

A new kind of conservation officer helps protect the environment.

most law enforcement jobs, you need communication skills, have to understand people and use discretion."

For Schneider, a case of groundwater pollution set the stage for his career in environmental enforcement.

"What really opened my eyes, I suppose, was a landfill about three miles from my home suspected of leaching contaminants into the water table. Eventually, they degraded the groundwater within a quarter mile of my home," recalls Schneider.

Both Thoresen and Schneider, so far, have investigated cases that involved illegal dumping or transportation of hazardous wastes, falsified wastewater discharge records, leaking landfills and toxic chemical spills. They work in an arena where DDT, PCBs, solvents, volatile organic compounds, heavy metals and polluted air threaten the environment.

While protecting natural resources is

the bottom line, communicating with people is how the work gets done. Thoresen points out that a good relationship is necessary not only with state citizens, but also with DNR employees and those in other state and law enforcement agencies. "Working together as a team," he says, "is really important to accomplishing overall objectives."

Schneider, who's been a warden since 1974, was formerly stationed at Hudson in St. Croix County near Minneapolis-St. Paul.

"One of the first things I learned from a law enforcement standpoint," he recalls, "is that I wasn't managing resource problems, but people problems, and the best way to work with people is via education in conjunction with local conservation clubs and community groups."

Schneider patrolled the St. Croix River where, he said, "It was not unusual to count 5,000 boats along a 25-mile stretch on a weekend afternoon."

While he concentrated on boating safety at Hudson, Schneider found environmental enforcement taking up an ever increasing amount of his time: illegal discharges from cheese factories and industry; midnight dumping of hazardous waste such as lead-based inks and solvents; and pesticide or manure runoff from farm fields into trout streams, which suffocated and killed fish.

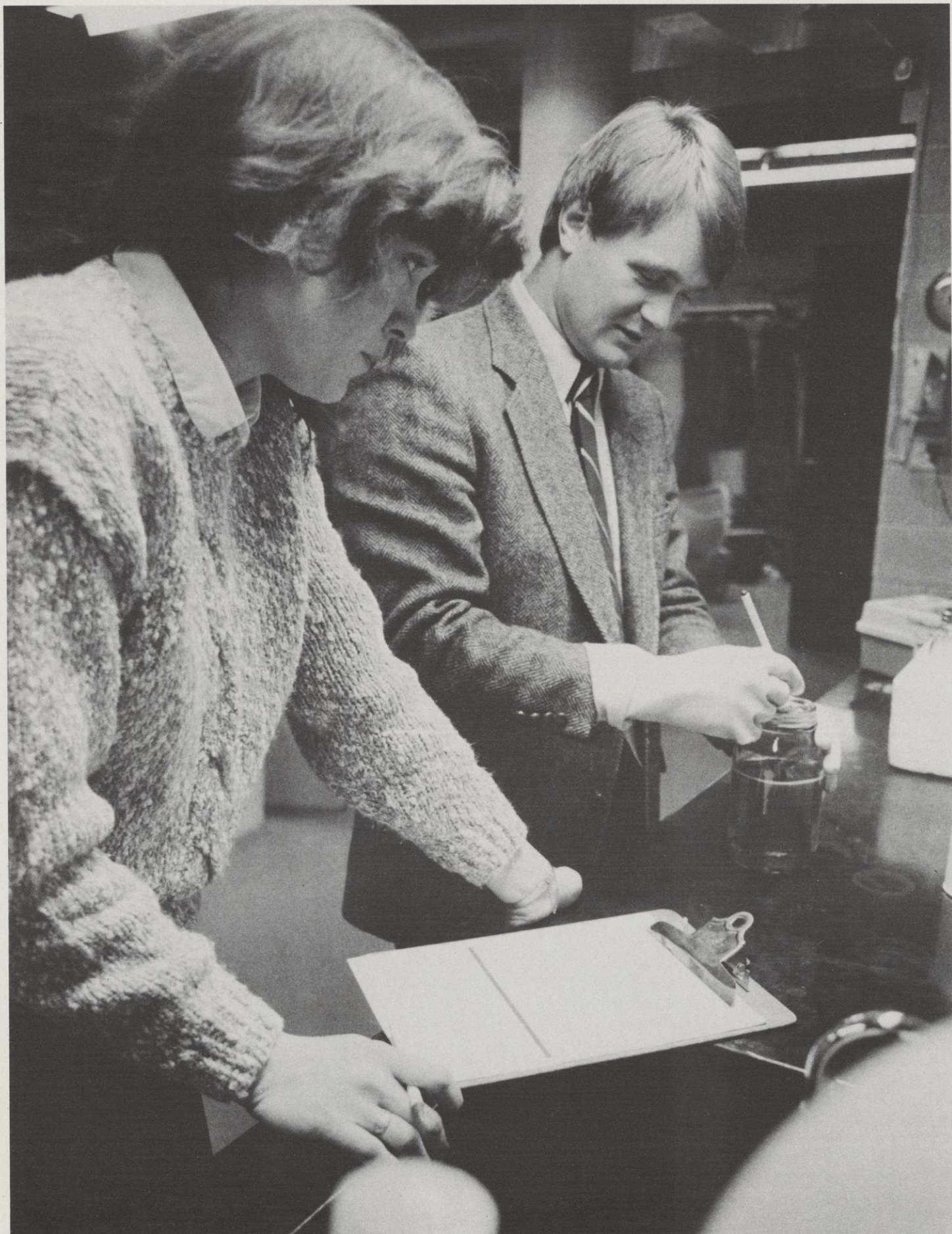
St. Croix County sits astride Interstate 94, the St. Croix River barge route and a railroad track.

"We had every kind of truck related spill... petroleum products, hazardous waste, sulfuric acid, pesticides, herbicides and fertilizer. There were also train derailments.



Environmental Warden Stan Schneider (right) discusses state regulations with Peter Constant, President of the Avganic Corporation, a chemical recycling firm in Cottage Grove.

Photos by Dave Crehore



Environmental Warden Thomas Thoresen and DNR Recycling Specialist Liz Duchelle log in waste samples.

"Once a tanker truck carrying sulfuric acid ran into the St. Croix River and the parent company failed to notify us. A semitrailer load, 5,000 gallons of number 6 fuel oil, ran down a ditch into the St. Croix River near Prescott. Those were busy times."

Cases like these led Schneider to begin giving environmental pollution cases higher priority than many of the more traditional fish and game violations.

"What presents more of a threat," he asks, "5,000 gallons of a toxic chemical polluting groundwater or some angler overbagging crappies? Don't get me wrong, but it's a common sense matter of priorities."

Thoresen too, puts top priority on environmental enforcement. Cases are usually initiated from the field by environmental protection staff or conservation field wardens. Complaints sometimes come from individuals who have a personal grudge against a company. This means going into every case with an open mind, knowing that some complaints may not have merit. All actions requiring Thoresen's or Schneider's attention involve complex civil or criminal violations where background knowledge in regulations involving air, hazardous and solid waste, water supply, groundwater and wastewater is essential.

Schneider, for example, works closely with the Southern District's environmental enforcement specialists, Ron Curtis and Andrea Domanik.

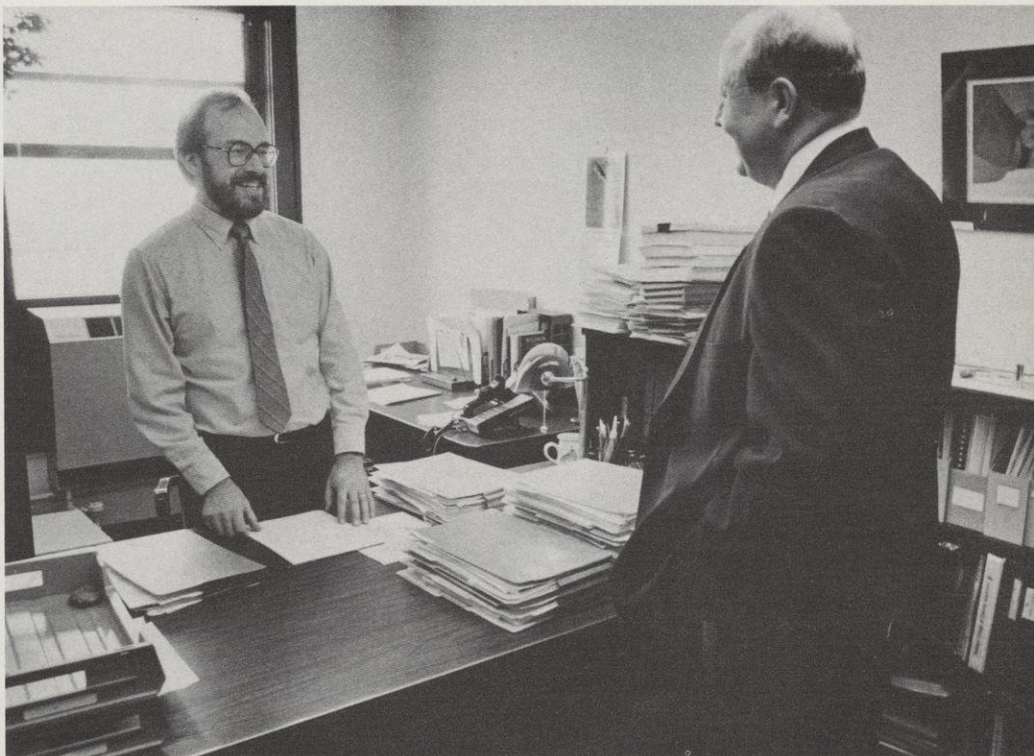
"I perform the investigation, compile a report and then turn it over to Ron or Andy and they put together a referral (to the Attorney General's Office), if needed, along with recommended penalties," says Schneider.

Thoresen operates the same way. Field wardens and environmental protection (EP) staff are their "eyes and ears." Field wardens may also help conduct investigations. Both men credit the press with heightened public awareness about illegal environmental activities.

Duties of the pair include giving paralegal advice to field wardens and environmental protection staff and training personnel in investigation techniques. Thoresen wishes he could devote more time to training, but says that, so far, enforcement demands are too heavy.

Schneider and Thoresen take the lead in conducting investigations, but environmental protection personnel determine technical solutions for cleanup after violations.

The work Thoresen and Schneider do, as opposed to other conservation wardens, deals primarily with corporations, big and small. Their investigations may



Environmental Warden Stan Schneider (right) and Assistant Attorney General Robert Selk discuss an upcoming case.

include fuel barrels or empty warehouses. Both men often spend time consuming hours sifting through files and records. Documentation is paramount for a successful investigation. Details help determine what may or may not have happened, and often only a trained investigator can ferret out the facts.

To date, Schneider has handled 25 to 30 cases. Some have been completed, while others are ongoing or pending in court. Most of his investigations have centered on illegal disposal of hazardous

Joe Brusca, Solid Waste Coordinator

■ "They bring professional law enforcement capabilities to our civil and criminal hazardous waste investigations... Their interview skills and law enforcement training are much needed in our environmental protection program... I've learned so many things from them! Gathering evidence, is it admissible in court?... They are training us to be good civil and criminal investigators."

waste, failure to identify and properly label hazardous waste, falsifying wastewater effluent (discharge) records and permit violations.

Thoresen, so far, has also worked on approximately 30 cases. Two have gone through court and four others are presently at the Attorney General's office for prosecution. He expects four additional cases to be forwarded for prosecution in

Ron Curtis, Environmental Enforcement Specialist

■ "They are expert interviewers. They ask the tough questions. They can read body English and know whether people are telling the truth. Before, we didn't have that extra edge. They've helped us to take that next step, so to speak... now we have much better investigative techniques."

the near future. Illegal storage or disposal of hazardous wastes are the most numerous violations probed by Thoresen.

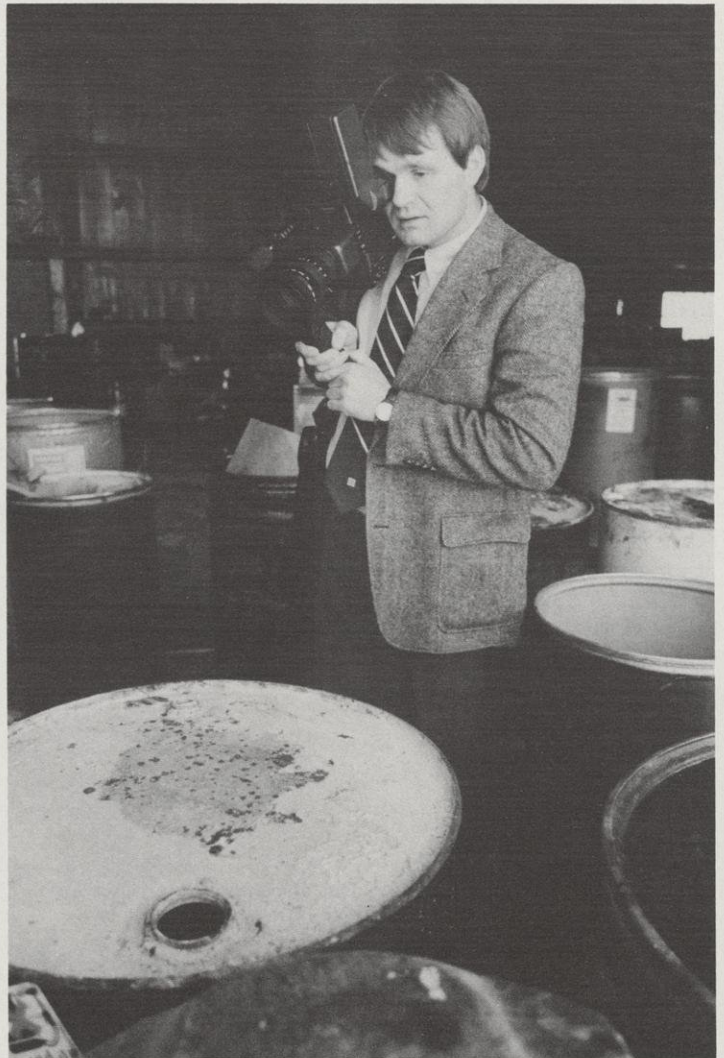
Cases investigated by the two often go back several years and involve bankrupt companies. Even when firms are still operating, investigation may be held up while former employees who may have changed jobs, but have knowledge of a violation, are found.

Since environmental enforcement is a new field, Thoresen says he looks at his job as a learning experience as well as an enforcement tool. He thinks the knowledge gained in each case will be useful in future investigations. "You learn about techniques and about people and both can be most helpful."

Even though the job is new, Thoresen already sees a need for changes in the laws. He believes some penalties should be stiffer to be in line with those of other states and with federal law.



Environmental Warden Stan Schneider looks over the site of the Spectra Chemical Company at Oregon, WI, which was destroyed by fire.



Environmental Warden Thomas Thoresen videotapes evidence during investigation of a Milwaukee area chemical plant.

"Most of the time there is an economic incentive to violate environmental laws, especially where legally disposing of hazardous wastes is costly. I don't feel the punishment these violators receive always fits the crime," he says.

Bob Weber, Wastewater Unit Supervisor

■ "They've helped establish a line of communication between the wastewater program and our field wardens. They've sensitized field wardens to keeping a surveillance on problem dischargers and septic tank haulers."

Thoresen also thinks there needs to be a change in some Wisconsin laws to make them more consistent with federal and other state's laws, especially where the intentional disposal of hazardous wastes would be harmful to both the environment and to public health. Thoresen would also like to see some violations upgraded from misdemeanors to felonies. It would, he believes, make it easier to ex-

tradite someone from another state who is charged with certain environmental infractions.

Thoresen is glad he took the job.

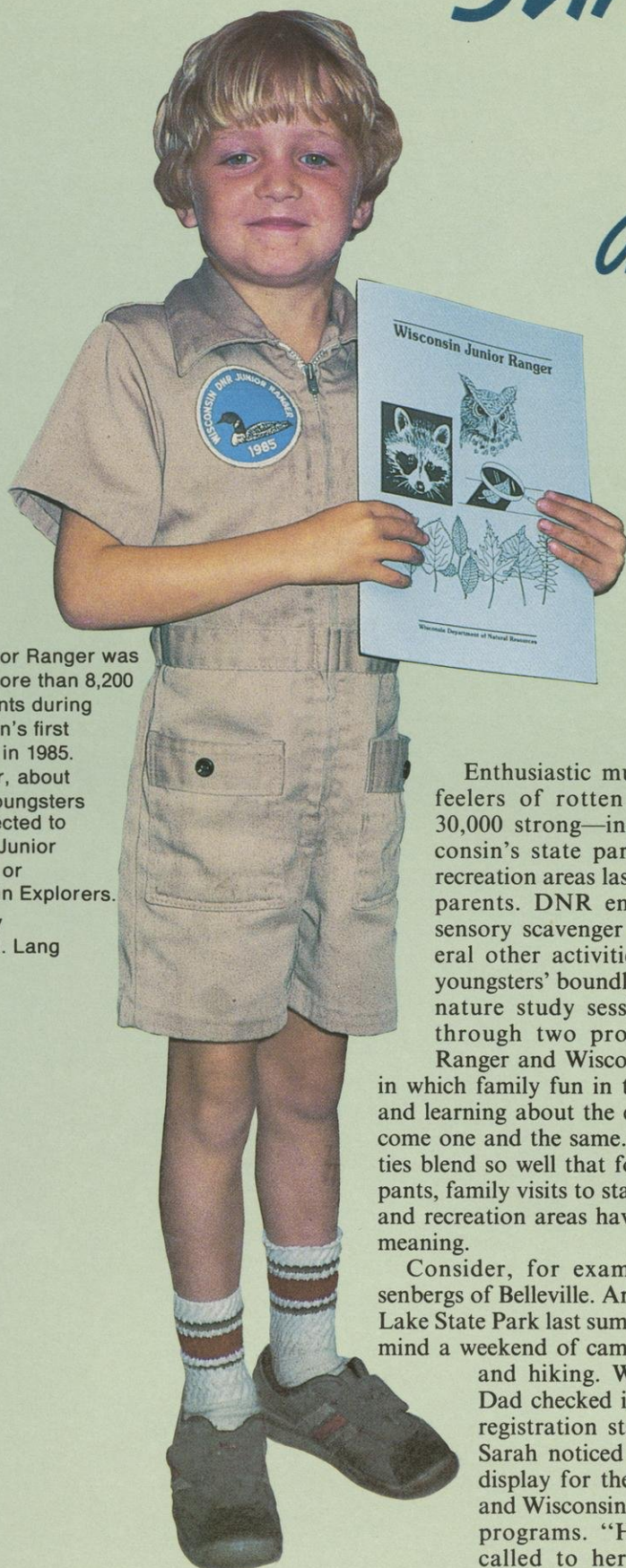
"It is rewarding to know that what I do plays a part in protecting and enhancing environmental quality in Wisconsin," he says.

Schneider reflects this view. "I look upon it as a tremendous challenge, an entirely new program outside of traditional conservation law enforcement. It is an opportunity to develop my own job. How many people have this kind of chance to protect the environment?"

Jon Heinrich, Air Management Coordinator

■ "The environmental wardens are real good at investigating cases involving possible falsification of records, etc... Our staff sometimes didn't feel comfortable dealing with informants and possible criminal violations. They're teaching us how to work comfortably with that aspect of environmental protection."

Junior Rangers and Wisconsin Explorers



This Junior Ranger was one of more than 8,200 participants during Wisconsin's first program in 1985. This year, about 30,000 youngsters are expected to become Junior Rangers or Wisconsin Explorers.

Photo by
Merlin R. Lang

Enthusiastic mud smellers and feelers of rotten wood—nearly 30,000 strong—investigated Wisconsin's state parks, forests and recreation areas last year with their parents. DNR encourages these sensory scavenger hunts and several other activities that channel youngsters' boundless energies into nature study sessions. It's done through two programs—Junior Ranger and Wisconsin Explorer—in which family fun in the out-of-doors and learning about the environment become one and the same. The two activities blend so well that for many participants, family visits to state parks, forests and recreation areas have taken on new meaning.

Consider, for example, the Cratsenbergs of Belleville. Arriving at Mirror Lake State Park last summer, they had in mind a weekend of camping, swimming and hiking. While Mom and Dad checked in at the camper registration station, big sister Sarah noticed an information display for the Junior Ranger and Wisconsin Explorer nature programs. "Hey, Seth," she called to her little brother, "look at this..."

"A child's world is fresh and new and beautiful... If a child is to keep alive his inborn sense of wonder, he needs the companionship of at least one adult who can share it, rediscovering the joy, excitement, and mystery of the world we live in."

*—Rachel Carson, environmentalist and author of *Silent Spring*—*

Meanwhile, the park staffer was telling Mr. and Mrs. Cratsenberg about the free programs. "The two booklets feature several activities, so you and the children can choose which ones to work on together. When an activity is completed, you initial the verification form, and when enough activities are completed, just bring the form back here to receive award patches and achievement certificates."

"Yeah! Can we? I want a badge!" The children had joined their parents at the counter.

What next? Sarah duly received the yellow workbook for fourth to sixth graders called *Wisconsin Explorer*, and Seth got the blue *Junior Ranger* workbook for kindergarten to third graders. After setting up camp, Mom and Dad joined in the lesson planning—"The Masked Bandit" (raccoons), "Animal Autographs" (tracks), "Deer Detectives" (clues to their presence), "Fern Forms" (recognition) and more...

The Junior Ranger and Wisconsin Explorer workbooks are filled with do-it-together activities that encourage family interaction outdoors and promote learning about the environment. Most children visit Wisconsin state parks, forests and recreation areas with parents, grand-



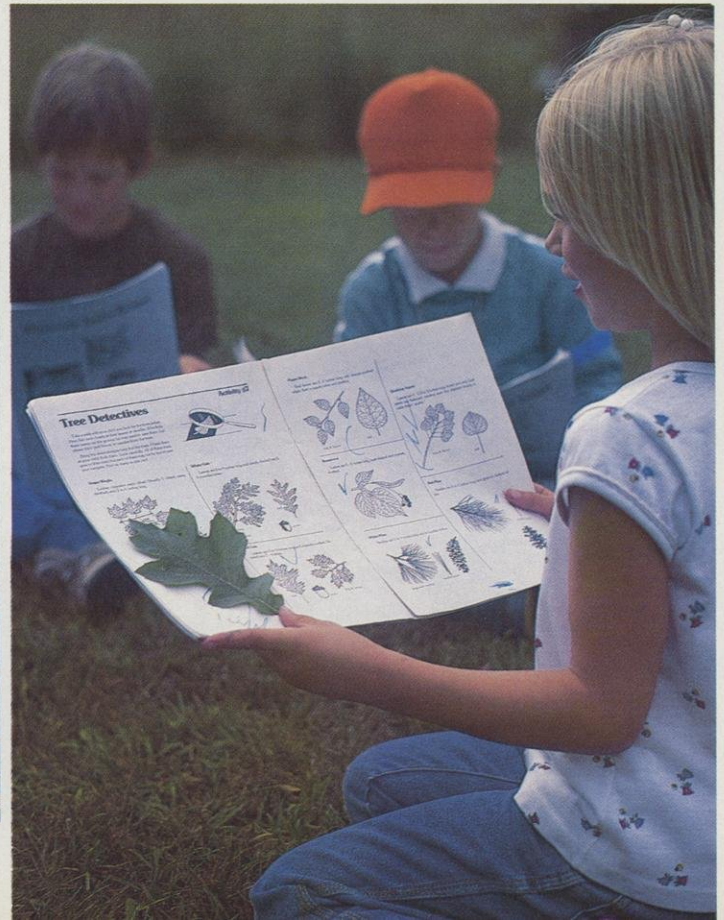
The Junior Ranger program is designed for children from kindergarten through third grade, while the Wisconsin Explorer program is for grades four through six. This year, youngsters can look forward to an all new Junior Ranger booklet. In the future, both booklets will change annually to ensure that no child will repeat the same activities two years in a row.

Photo by Bob Welch

Photo by Barbara Dennis



Photo by Dean Tvedt



parents or guardians. For children to share in the wonders of nature with adults who are important to them, renews the wonder all around.

Many of the programs' activities develop observational awareness of the natural world, along with common sense, a sense of wonder and a sense of humor. "Sensory Scavenger Hunt" in the Junior Ranger series invites parents to take a "sensational" hike with their children—to look for a bird nest or den tree, to listen for a noisy crow or a whispering wind, to touch, to smell, but not to taste. Along with it goes this text: "Mention to your child the danger of tasting anything in the wild—it could be deadly poisonous!" One parent found that such generalized directions stimulated a "spontaneous type of discussion, which doesn't seem forced to the child."

Investigation and imagination motivate older children in an Explorer lesson called "My Special Place." This exercise in personal reflection about nature seems to be a favorite. "Look for a special place that you really like along a hiking trail," say the instructions. "Sit or stand there quietly and think about the things you like about your special place." Then, the children describe in words or drawings the sights, sounds and smells of their special place. They're given key terms—such as forest, marsh or prairie—that can help to specify and distinguish the special place. New words appear in boldface type throughout the booklet and are defined in a glossary at the end.

All activities are designed to advance understanding, appreciation and reverence for the environment among tomorrow's generation. "The children become aware that they are visiting the animals' homes when they camp," commented one parent. "They can begin to really appreciate the different forms of life that share this world with us."

Sarah and Seth certainly appreciated their brightly colored, iron-on award patches—featuring the Wisconsin Explorer's white-tailed deer emblem on hers and the Junior Ranger's "masked bandit" raccoon for him. The official certificates of achievement signed by DNR Secretary Buzz Besadny were okay too, in their eyes. To qualify for these awards, they had completed at least half of the activities in their workbooks and Mom or Dad had initialed their check-off sheets accordingly.

Parents are also asked to complete an evaluation form on the back of the Junior Ranger activities check-off sheets that the youngsters turn in. A similar evaluation form for Wisconsin Explorers is often filled in by the youngsters themselves.

Comments from adults and children alike indicate the importance of recognition. "Patch reward kept up enthusiasm," jotted one adult. "They work pretty hard for their badges," noted another.

And the children's reflections: "There was something to work for (certificate) and you learned a lot about nature."

"You get a badge and it's fun!"

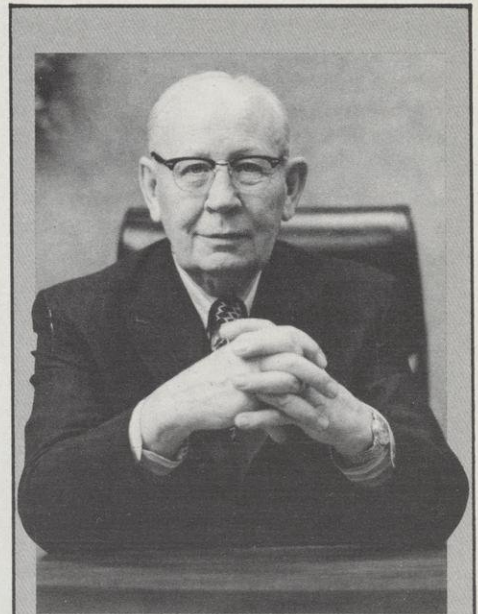
Moreover, the fun and learning doesn't end when a family leaves the park. Both Junior Ranger and Wisconsin Explorer workbooks include activities to do in the car as well as projects to work on at home. Most of all, the impression made by learning in the great outdoors seems to carry over and stimulate children's imaginations and continued interest. "The best part of the Junior Ranger Program is seeing Jason want to learn and want to find further reading materials about animals." "Bonnie really enjoyed the nature hike, collecting leaves, pine cones, etc. She will use them for a science project this school year along with the booklet." And in the words of a child, "I'm going to the library and find out things about different things."

The family field trip approach, with self-guide workbooks to help parents take an active role in teaching their children about the out-of-doors, is a unique method of natural resources education. Wisconsin was the first state in the country to develop this approach. But the idea is catching on fast, and several other agencies have adopted DNR's Junior Ranger and Wisconsin Explorer programs.

These outdoor fun, nature learning programs began in 1985 at 34 Wisconsin state parks, forests and recreation areas. That year Junior Ranger materials for kindergarten to third graders were distributed to more than 8,200 families. Parents' requests for similar materials designed for older children resulted in the Wisconsin Explorer Program for fourth to sixth graders. This was added in 1986.

Altogether last year, the two programs' activities booklets, award patches and achievement certificates were available at 42 state parks, forests and recreation areas free of charge to the visiting public. Almost 30,000 children participated—nearly quadruple the previous year's number! (Vehicle admission fees are required at all state properties where Junior Ranger and Wisconsin Explorer materials are distributed.)

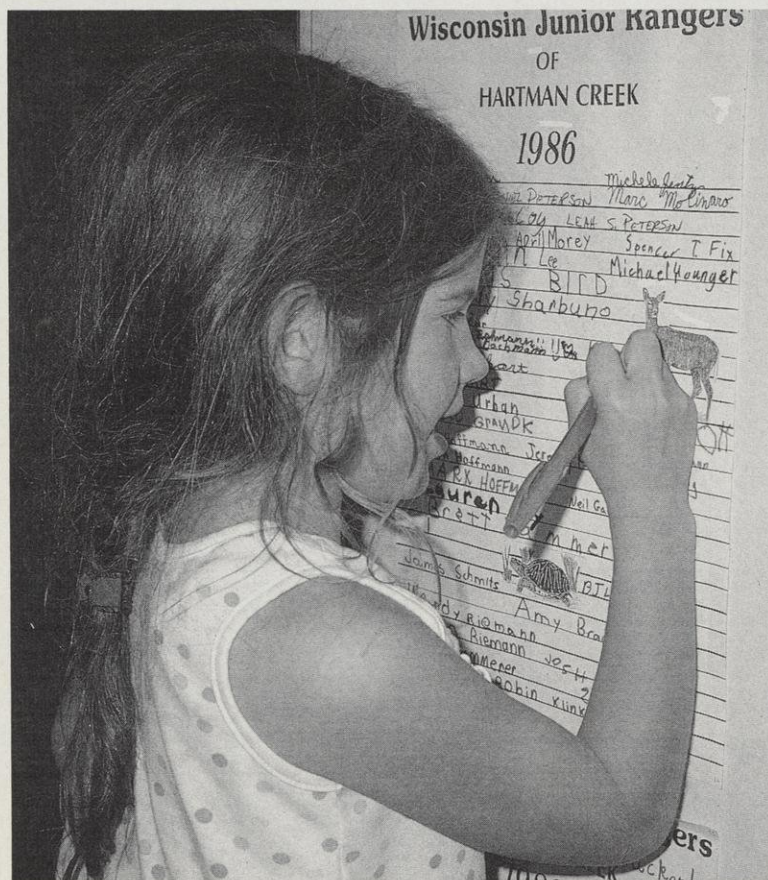
Further information about the Junior Ranger and Wisconsin Explorer programs is available from the Bureau of Parks and Recreation, Box 7921, Madison, WI 53707 (phone: 608-266-2181). As



The man behind the legacy—
Raymond D. Peters.
Photo courtesy of
Harold J. Wolf, Brillion Iron Works

The R.D. and Linda Peters Foundation

They're both deceased now, Raymond D. Peters and his wife Linda. Field and stream days have passed for them, but the strong interest they shared in nature and their abiding concern to cultivate that natural interest in children lives on. He was founder of the Brillion Iron Works, and they were leading citizens in that small northeastern Wisconsin community. Throughout their lifetimes, spanning much of the current century, they were known and appreciated for their generosity and philanthropic activities. The R.D. and Linda Peters Foundation, which they established, makes possible the Junior Ranger and Wisconsin Explorer nature programs for children in Wisconsin state parks, forests and recreation areas.



The future's in their hands: today, recognition as Junior Rangers and Wisconsin Explorers; tomorrow, stewardship of the state's natural resources. Photo by Beth Goeppinger

the programs become more successful and popular with the public, DNR plans to provide enough different workbooks for children to begin the Junior Ranger program in kindergarten and finish the Wisconsin Explorer program in sixth grade without repeating the same workbook twice.

The programs' costs would be prohibitive except for continued support from the R.D. and Linda Peters Foundation of Brillion, which has provided a grant for this year of \$22,583. Perhaps the true beneficiary of their funding for environmental education of children will be the wonderful world of natural resources that the children learn to know. For "being in the woods and learning..." "looking for the deer and other animals..." "makes the children more aware of life around them..."

A new Junior Ranger proudly signs the roster. Photo by Merlin R. Lang

Readers Write

■ Congratulations on the Aldo Leopold piece in your January/February issue. Clay Schoenfeld has done a masterful job with his interesting and thoughtful review for the Leopold centennial year. I knew the Leopold family in the 1930s and '40s, and it is good to see this recognition of Aldo.

**Winston A. Elkins,
Trempealeau**

■ I am responding to letters in the January/February "Readers Write" column about women hunters.

I have hunted deer for 11 years, and judging from my experience men do not have negative attitudes against women hunters. If you hunt like they do and really enjoy the sport, you will belong.

As to husbands being all learned about the sport—if he is, listen to him and let him teach you. Then, get baby-sitters when you go hunting.

And there's always room for women and girls in hunter education classes—go and sign up. I went with my youngest son and really learned how to respect a weapon of any kind. There are classes for bowhunting now also.

The clothes I will admit are a problem, but not one that we can't figure out. The jackets and pants can be altered to fit—somewhat. Buy boots in the boys department—and gloves/mittens in the same place. After all, we aren't going to a fashion show anyway. All we have to do is keep warm and dry.

I am a 51-year-old woman who now lives on the edge of a woods and hunts. And just because I'm a hunter, doesn't mean I don't appreciate Nature at her finest. Many shots have been

passed by just to watch a bit longer.

I gained my love of the woods and hunting from a friend and his father. They were the two that paddled my canoe and taught me to respect the animals I now hunt.

I have hunted nine of the eleven years with my youngest son. During those times we have shared experiences that, no matter how old I get or how far he goes, we will never ever forget. Those hunts should enable him to pass on to his children the love of good hunts together.

**Patricia R. Fisher, New
London**

■ Well once again we are treated with another one of those kind of letters. I refer to Carla Jensen's diatribe against hunting and trapping printed in the "Readers Write" section of the 10th anniversary issue.

How does one talk to Carla? She has her mind made up. All the arguments have been stated and rehashed time and time again—and there will always be Carlas.

To her, and all like her to come, I offer this old saw: "To those who understand, no explanation is needed. To those who do not understand, no explanation is possible."

And by the way, *Wisconsin Natural Resources* is like a diamond. It has as many facets as DNR has the skill to put upon it, which up to now has made for a multifaceted gem.

Larry Grzegorek, Milwaukee

■ In regard to your article on turkey planting in Wisconsin, you stated that it was 1974-1976. In the mid-30s turkeys were released in Waupaca County, between Marion and Big Falls, near the Keller Dam area.

I was working on a road construction project near there and saw the turkeys, nests and eggs. Some of these never hatched because of the blasting and noise in the area.

Bernard Clavette Sr., Berlin

■ The first time I read WNR was last July/August. I was very impressed. Since then, I have been receiving my own subscription, becoming more impressed with each issue. The magazine is educational, interesting and enjoyable. Thank you for a job well-done in showing the beauty and mystique of Wisconsin.

Larry Prael, West Bend

■ I enjoyed the deer count article in November/December and will be more patiently awaiting the numbers after future seasons. But how about sharing some of the additional data collected with WNR readers? I am particularly interested in graphs charting the dates and hours of antlered deer kills or other statistical information that could be useful for planning hunts and settling arguments around the camp stove.

Tom Vonasek, Rice Lake

■ As Ducks Unlimited is celebrating its 50th Anniversary in 1987, we noted with a great deal of interest the outstanding article in the November/December issue about our programs and history in the badger state. We particularly enjoyed some of the fine photographs of Ducks Unlimited activities in Wisconsin. On behalf of our officers, trustees and staff, we extend our deep appreciation for this highly enlightening article.

**Kenneth V. McCreary,
Executive Secretary
Ducks Unlimited, Inc., Long
Grove, IL**

■ I have been very impressed over the years with your fine publication. The pictures and articles have been very good. But how about the raptor photo on page 14 of the November/December issue? Perhaps the non-game department has outdone themselves by protecting a new species, but we call this a Northern Goshawk on this side of the border!

**Alan M. Singer, West St.
Paul, MN**

**Ecologist Eric Epstein,
who is with DNR's Bureau of
Endangered Resources, con-
firmed your correction for us.**

The editor would like to address an oversight from the January/February issue: Several of the photographs used to illustrate "The Trilobite" story were courtesy of James P. Kostohrys, avid fossil collector and trilobite promoter. Thank you for your willingness to share your interests with WNR readers. Without contributions such as yours, too often unheralded, this magazine could not be published.

Regarding the same story, the Milwaukee Public Museum reports that its booklet entitled *Silurian Trilobites of South-eastern Wisconsin* is out of print.

BUFFLED

The January/February special report, "Wisconsin: Grateful for the Great Lakes," featured one of our most popular all time errors on page 27. We heard about it immediately in-house, and letters still continue to arrive from around the state and even beyond state borders. Because the mail on this is so voluminous, we are running only brief sample excerpts. Now, here's the gist of it:

■ A duck by any other name is still a duck—but a hooded merganser can never be a bufflehead! Love your magazine!

Susan Foote-Martin, Arlington

■ Couldn't help but see the bufflehead goof under the hooded merganser photo.

Don Follen, Sr., Arpin

■ I imagine you will receive many letters about the improper title of the duck on this page. It would be great in the next issue to show and identify both a bufflehead and a hooded merganser. Keep up the good work on turning out a fine magazine.

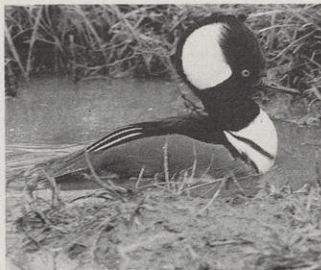
Russell Mitchell, Berlin

■ Both the bufflehead and the hooded merganser show a white patch on the head, but other than that they are not very similar. It is always a treat to see this bird in Wisconsin. It is quite colorful and not common enough to be taken for granted.

Ellen R. Gald, Viroqua

■ There is no way a hooded merganser can be mistaken for a bufflehead or vice versa. I have enjoyed reading your magazine since its inception. It is a credit to our state of Wisconsin.

Fred A. Rawson, Waupaca



The universally recognized hooded merganser.
Photo by Herb Lang

■ Some months ago *Audubon* magazine ran an ad with a sculpture labeled "screech owl." The bird depicted was patently a barn owl.

Well, history has repeated itself. Your page 27 shows an excellent photo of a hooded merganser. Even so, yours is a tremendous magazine, and at age 71 I intend to renew my subscriptions for at least another 20 years.

Harold T. Arpin, Madison

■ I am sure all avid waterfowlers will immediately recognize this.

Michael Shannahan, Madison

■ I have hunted ducks for 54 years and have never been lucky enough to see a bufflehead as shown—all these years I thought that bird was a male *Lophodytes cucullatus*.

Arlo Turner, Madison

■ Couldn't believe my eyes! Maybe this is some kind of gimmick.

Bill Strickler, Mukwonago

■ Although the caption did not directly state that the photograph was a bufflehead, the implication was certainly there. Perhaps someone needs to brush up on their waterfowl identification.

Maureen E. McCloskey, Rhinelander



The real bufflehead.
Photo by Steve Lang

■ We have subscribed to DNR's fine magazine for a long time and look forward to each issue.

In the November/December issue, Herpetologist Dick Vogt stated that "green snakes are absent from southwestern Wisconsin." We disagree. Last summer, we saw a small, bright green snake, which lived under a building in Sauk County.

Ken & Sally Sailing, Lone Rock

If environmental conditions are appropriate, snakes may inhabit an area well before humans notice. Human records of wildlife ranges depend on our knowledge—and as we know more, the records change.

DNR Nongame Biologist Mike Mossman knows of other green snake sightings in Sauk County, as well as sightings in Vernon County that were not mentioned in Dick Vogt's book, Natural History of Amphibians and Reptiles of Wisconsin. Nonetheless, if Vogt considered Grant, Lafayette, Iowa, Richland and Crawford counties as southwestern Wisconsin, then his comment that green snakes are absent from that part of the state is in accord with current DNR records.

Observations by readers can contribute to DNR records on uncommon wildlife species' distributions statewide. Send reports with detailed descriptions, dates and localities to Holly Kuusinen, DNR, 101 S. Webster St., Madison, WI 53703.

■ I noticed an article about the Bluebird Restoration Association of Wisconsin in the November/December issue's endangered resources report. How can I contact this organization? I would like to make some bluebird houses for them.

Phil Bourget, Sheboygan

It's generous of you to volunteer and it's our pleasure to put you in touch with: Harvey Halvorsen, DNR, Bong Recreation Area, 26313 Burlington Rd., Kanasville, WI 53139; (414) 878-4416.

■ The Jan/Feb issue arrived this week, and is lying on my lap like a much loved warm kitten. We are fortunate to have an editorial staff of planners such as your group at DNR.

The "Grateful for" section was especially appreciated, for I live exactly on the shore of that beautiful inland sea. Today it is totally benign, sending small mists of vapor swirling from its surface into the sub-zero air like tiny grey clouds.

I think this section is a good in-depth primer for your readers. It certainly explains the myriad of forces attendant upon Lake Michigan. I am a little disappointed though, in Robert Sonntag's article on the lake levels. While most of his research was well done, he did neglect to read many of the Army Corps of Engineer's reports, for he didn't even allude to the most obvious and sensible solution to the high water. ***Lower the lake level and then control it.***

Don McCreedy, Sheboygan

NEXT ISSUE

Women and fishing.

Fish Wisconsin 2000: a plan for better fishing into the next century.

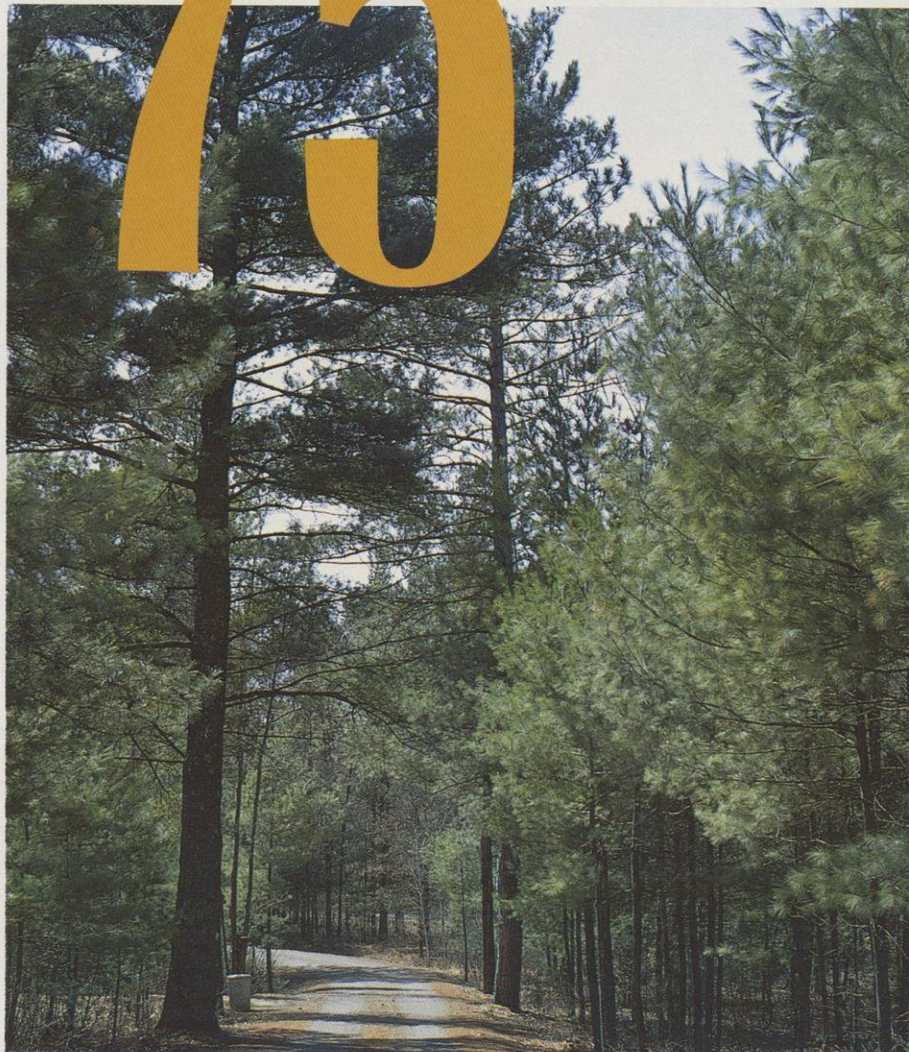
The Jim Falls Dam.

Wisconsin Badgers: the critters.

Scientific fish management.

And more!

YEARS OF 75 WISCONSIN FORESTRY



*Rick Mulhern,
DNR Public
Information*

The Black River State Forest, gem of Jackson County, observes its 30th anniversary this year. Commemorative activity includes a celebration at Castle Mounds recreation area July 25th. On tap are logging demonstrations, a bus tour and exhibits.

Old problems have been solved and new ones loom ahead, but the anniversary of forestry in Wisconsin this year celebrates the thriving rehabilitation of an important state resource.

Wisconsin forestry, like the legendary phoenix, drew its life from the ash of a formidable woodland that covered the state in presettlement times. Early loggers had cut their way west to Wisconsin where at the turn of the century they led the globe in lumber production.

But across the cutover, fire threatened. Vast, unbroken areas of "slash," the waste branches and twigs trimmed from the big trees, caught fire and set the North ablaze. In the mid-1860s, the St. Croix, Black, Chippewa, Wisconsin and Wolf River pineries were sometimes de-

scribed as "raging seas of flame," and in 1871 more than 1,500 people died in the infamous Peshtigo fire.

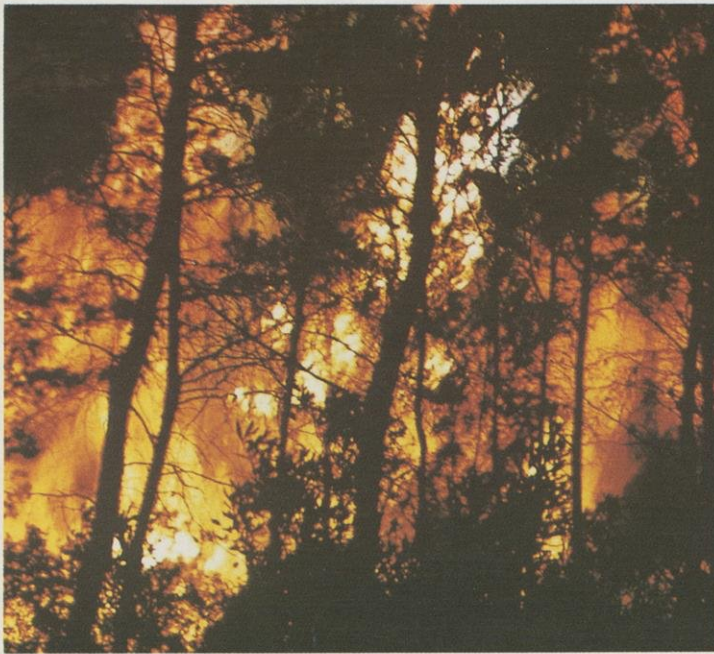
Out of these tragedies came organized fire control and eventually modern forestry. This year, as Wisconsin observes the 75th anniversary of these programs, DNR foresters are reminded of the pivotal issues state woodlands and forestry continue to face in the 1980s.

"We've come a long way," says Joseph Frank, DNR's Chief State Forester. "We've helped the state face some stiff forestry challenges through the years —

big fires in the 1930s, insects, disease, land management and equitable tax laws.

"But as we head toward the 100th birthday, challenges remain, both for forestry administration and for the woods themselves."

In fact, Frank says, the very existence of Wisconsin's forestry program as we know it is threatened. Two bills in the 1987 legislature would repeal the small, but dependable mill tax on property that has funded Wisconsin forestry ever since 1929. The change would make forestry compete with other state programs for



At the turn of the century, Wisconsin led the globe in lumber production—but fire raged across the cutover. Its spectre spawned scientific forest management in the state. Photo by Duane Dupor



Reforestation was one of the answers to fire. This is a Marquette County Christmas tree plantation graded for cutting. Photo by Dean Tvedt

revenue and with only so much to go around, would probably result in cutbacks.

The question, Frank says, is not so much the size of the mill tax — only 20 cents per \$1,000 of equalized real estate valuation. “It’s more a concern by some county boards, chambers of commerce and legislators about the ‘appropriateness’ of funding forestry with a state tax on property.

“They see the trees up north, the population centers to the south, and they wonder,” Frank says. “What they may not realize is that forestry today is much more than lumber. Population centers to the south have closer ties to the forests than many realize, especially in the form of jobs that depend on forest products and in recreational use of these lands. For example, in the Fox Valley counties alone forest industries last year provided 28,900 jobs and an \$829-million payroll.

“Also involved is land management. Recreation, wildlife, watershed management, soil conservation and other benefits besides timber harvest accrue to state citizens because of Wisconsin’s forestry program.”

The important point about the forest mill tax is that it guarantees financing for a long-range program that can function properly only with a consistent source of income. Forestry’s biennial budget is reviewed by DNR, by the Natural Resources Board and by the Department of Administration, then submitted to the legislature, which can fund all or part of it through the mill tax. Funds left over are kept in a reserve. Because the tax has

been a steady, reliable source of revenue, state forest products industries view it as a sort of “vote of confidence” in their operations.

“Take away the tax, and you jeopardize the presence of those industries, now and in the future,” Frank says. “You also jeopardize statewide forest fire control, and insect and disease protection.”

A look at the history of forestry here can put some of the present problems in perspective.

Some 70 years ago, in 1915, opposition to forestry in the state reached a critical stage. Wisconsin was buying cutover land to use as a forest reserve at an average of \$2.50 an acre. But towns were losing valuable tax revenue and land companies wanted to sell to settlers, believing that agriculture would replace logging as an economic base for the North.

A state Supreme Court decision followed, declaring “improperly adopted and void” a constitutional amendment that had made forestry a legal activity for the state to engage in. Then in 1915, the first state forester — E.M. Griffith — resigned and left Wisconsin, never to return.

But after five years of inactivity, forestry in Wisconsin revived. This happened because the land-for-farming movement failed and planting trees seemed like a way out. In 1924, a new amendment passed legalizing forestry. Then, in 1925, Wisconsin established its largest state forest, the Northern Highland in Vilas County. And in 1927, the

public passed for the required second time an amendment legalizing forestry.

Following up on this favorable vote, the legislature enacted a series of laws that still guide the state forestry program: the Forest Crop Law responded to Griffith’s concern for equitable forest taxation that would prevent a repeat of the “cut out, get out” philosophy; counties were given authority to create their own forests from tax delinquent lands; and lastly, the US Government was authorized to acquire Wisconsin land for forestry. The Griffith plan for forestry in the state at last became a reality.

Today, two of every five acres of land in Wisconsin are commercial forest and support a substantial segment of the state’s economy. The forest products industry has become the state’s second-leading employer with more than 280,000 people working in timber-related jobs. The annual payroll is more than \$1-billion and product shipments exceed \$8-billion.

The last 40 years have seen major advances in forest research, management and control of fire, insects and disease. Cooperative effort with universities, the public and various organizations funded with mill tax dollars has increased. Emphasis on county and state forests has gradually changed from planting trees to management and harvest.

Griffith’s responsibilities, on being named chief state forester in 1904, were to control forest fires and to examine 40,000 acres of trust fund lands in several

northern counties. Duties of today's foresters range from computer-aided fire weather forecasting, to genetic research on tree seeds.

The mill tax, due to undergo hearings and possible legislative action by June 30, brings another concern into focus. Frank explains:

"Because the tax keeps pace with property values, it's historically served as a hedge against inflation for the forestry program. Last year, however, agricultural land values in Wisconsin dipped, and the mill tax dropped for the first time in 55 years.

"The drop was 2%," Frank says, "and it showed very dramatically what fluctuating operational funds could do. We had to respond with severe cutbacks. Loans to county forests were reduced, 26 full-time positions were eliminated, needed equipment replacement was postponed — and on and on.

"You can imagine how difficult it would be to maintain operations if we had to compete for varying amounts of general purpose revenues every year. To this point we're still uncertain how to make up that lost 2% and don't know whether we ever really can."

Forestry faced a different kind of problem at the turn of the century when Wisconsin's once mighty pinery began to fail. Logging companies moved out, stranding the towns that had sprung up around their operations. Farmers working the cutover stump farms went broke and deserted the unproductive land. Unemployment and tax delinquency plagued the North.

The stage was set for what was then a new idea — forest management.

"They'd tried everything else," Frank says, "and nothing had worked. The land was outwardly hostile to other types of ventures, but it could grow timber well. The state forestry board and key members of the legislature all felt that forest management would be the North's salvation."

That was when — about 75 years ago — Wisconsin hired forester F.G. Wilson and 11 forest rangers. Soon thereafter, a forestry headquarters was established at Trout Lake in Vilas County. That same year, 1911, the state began a nursery there.

Wilson scouted out a secluded peninsula jutting westward into Vilas County's Star Lake as the site for an experimental pine plantation. Today each of the tall "Star Lake pines" has a carefully noted history. L.A. "Jack" Vilas brought his Curtis Flying Boat north from Chicago to Trout Lake in 1915 and proceeded to hunt down forest fires from the air, making Wisconsin the first state to do so.

The state, meanwhile, was buying the cutover land for a forest reserve. But at this point the opposition to organized forestry peaked and it would be almost 10 years before the tide turned. By 1925 though, fire danger had become serious enough for the legislature to divide the state into fire control districts.

Tax delinquent lands continued to burden counties into the late 1920s. Actually, the lands were of no more use to the counties than they were to the people who abandoned them. In response, the legislature passed the first forest tax incentive program — the Forest Crop Law — which treated lands as capital but timber as income. People with large tracts of land could now afford reforestation because timber was not taxed until harvested.

A special, but important addition to the Forest Crop Law came the following year, in 1928. It allowed counties the option of using tax deed lands to set up county forests, provided the people agreed in a referendum. Langlade County stepped forward to create the first county forest.

Today the county forest program includes 2.29-million acres in 28 northern and west central counties, the largest segment of public lands in the state. Sweeping changes from the 1928 law, made in 1963, created a continuing state-county partnership for



Dropping tree seed by plane is a new technique. Balloon is a row marker for the pilot. Photo by Dean Tvedt

development and management of these lands to produce wood, wildlife, and recreational opportunities.

Funds from the state's forest mill tax are loaned to the counties for development and operational costs and repaid from a 20% severance tax on all timber products harvested. The state's commitment as a partner in management of county forests is essential to those who work, hunt, fish or partake in other recreation on the county lands.

Chief Forester Frank points out that some of the counties have been earning good money off their forests. Since 1981, for example, Marinette County has taken in more than \$4-million.

However, a few counties think some county forest lands should be withdrawn from the program and used for other purposes — agriculture for example.

"While the counties think it's largely a matter of getting the land back on the tax rolls, we may be seeing something more serious here — the issue of public versus private land," says Frank.

"Initially, a lot of the lands became public because they'd been cut over and proved poor for farming, ending up tax delinquent. Wisconsin's Forest Crop Law stated that forestry is recommended on lands deemed less useful for other purposes. And



Hordes of gypsy moth caterpillars can sometimes threaten the forest. Photo by Dean Tvedt

forestry was determined to be the best use. Now some question whether forestry is still the best use."

From 1980 to 1985, more than 3,500 forest acres were withdrawn by the counties for commercial purposes. Since the 1960s, though, overall figures have been on the plus side and there has been a total statewide increase in county forest lands of about 1,000 acres per year.

"You can see the bond between the early years and Wisconsin forestry today," Frank says. "Some of 'today's' forestry concepts — multiple use management, recreation, water quality protection — were already in vogue in 1905. Aerial fire protection is still a viable force, when used together with fixed fire towers. There are a lot of Johnny-come-latelys out there who think these ideas are brand-new.

"The Northern Highland Forest still brings in big visitor numbers 60 years later. Today, more than one-million people visit the forest yearly.

"Star Lake continues to demonstrate the potential for intensive plantation management. From the early studies, we've branched out in many directions since the first trees were planted."



Foresters battle an isolated gypsy moth outbreak by aerial spraying. Photo by Dean Tvedt

In 1959, an experimental forest near La Crosse was established with mill tax funds and has served as a study area for forest soils, water management and siltation. Research there has led to recommendations on erosion control techniques for use around the state.

"These days, one of the big things on foresters' minds is the privately-owned woodlot," Frank says. "About 60% of the state's wooded acreage belongs to private landowners, and we've been trying to strike up a working relationship with them. Since 1953, forest mill tax funds have provided a statewide network of professional foresters who work with 10,000 private forest landowners yearly.

"Their land amounts to about nine-million acres and provides 65% of all the timber cut in Wisconsin. We're urging landowners to enter into a long-term land management program that can enhance their property. Not only timber management, but scenic management and wildlife enhancement are among the options open to them. The owner can really help the state meet some needs here. Timber management provides one really good export."

The problem is in getting woodlot owners to commit to some long-term management. "It's a tremendous task," Frank says. "Many doubt us, fearful that, just maybe, the 'big cut' will come again.

"We remind them that forest management made the beautiful trees possible in the first place."

In Wisconsin, the average private woodlot measures about 38 acres. Frank points out that around 220,000 individuals own

Continued on page 24

A chronology of "firsts" in Wisconsin forest history

1807 ● First forest fire law applicable to Wisconsin is enacted while the area is still a part of the territory of Michigan.

1809 ● First sawmill is built by Jacob Franks on the Fox River near present-day DePere.

1840 ● First fleet of lumber rafts goes down the Wisconsin River from the Francis Biron sawmill at Biron.

1841 ● First law is enacted regulating construction of dams on navigable rivers for log-driving purposes.

1842 ● First rafting of logs is done by Mormons on the Black River, to their settlement in Nauvoo, Illinois on the Mississippi River.

1848 ● Wisconsin becomes 30th state, with Nelson Dewey as the first governor. Forest fire law of 1836 appears in State Statutes under title of "Offences Against Property."

1858 ● First modern gang saws are put into operation at the sawmill of Dole, Ingram & Kennedy near Eau Claire.

1867 ● First forestry commission is authorized by the legislature, to study forest destruction in the state.

1871 ● Peshtigo fire claims between 1,200 to 1,500 lives, destroying the town of Peshtigo and 1 1/4-million acres of forestland. It is the greatest loss of life ever reported for one forest fire.

1887 ● First integrated pulp and paper mill begins operations as a result of the conversion of a sawmill to the Central Pulp & Water Power Company near Wisconsin Rapids.

1891 ● Comstock fire burns over 64,000 acres in Barren County.

1892 ● First official state observance of "Arbor Day," following the adoption of the custom that had been established in Nebraska 20 years earlier.

1894 ● Phillips fire burns over 100,000 acres and takes 13 lives.

1911 ● State hires forester F.G. Wilson and 11 forest rangers.

- First state operated nursery is established at Trout Lake.

- State forester E.M. Griffith sets up headquarters at Trout Lake.

1913 ● Wilson plants the state's first forest plantation near Star Lake (Vilas Co.) with seedlings grown at the state tree nursery.

1915 ● Pilot Jack Vilas flies his plane over northern forestlands, marking the first time an aircraft is used to detect and locate forest fires.

- A bill passes, consolidating the forestry, conservation and game commissions into a single conservation commission consisting of three members. P.B. Moody is appointed by the governor as the forestry member.

1924 ● US Congress passes Clark-McNary Act extending operation of Weeks Law and providing more federal aid for fire control, promoting farm forestry and enlarging the federal forests.

1925 ● State sets up first state forest, the Northern Highland in Vilas County, after the 1924 second forestry amendment to the state constitution.

- State authorizes federal government to purchase land within Wisconsin for national forests.

1927 ● Legislature passes the Forest Crop Law, the first forest tax relief program.

- Legislature enacts law providing for special taxation on forested land (Forest Crop Law) and a plan for a complete overhaul of the state's fire protection system, allowing an additional \$100,000 annually.

1928 ● Goodman Lumber Company enters first industry-owned land under the Forest Crop Law.

- US Forest Service begins the Nicolet National Forest after purchasing the land from Rhinelander's Thunder Lake Lumber Company.

- Laona and Crandon school districts establish the first school forests.

- Langlade County establishes the first county forest.

1930 ● Marinette County establishes the first county forest under the Forest Crop Law.

1933 ● First Civilian Conservation Corps camps constructed in the state.

- Oneida County passes first rural zoning ordinance in the nation.

1936 ● Land purchased for Kettle Moraine State Forest.

1944 ● First mechanical tree-planting machines used for large-scale reforestation.

1980 ● First seeding of hardwoods by helicopter in the US at the Flambeau River State Forest.

1981 ● Wisconsin leads nation in paper production.

1983 ● Timber industry employs more than 75,000 people.

1985 ● Wisconsin timber shipments total more than \$8-billion.

1986 ● 40% of Wisconsin is still forested.



Early reforestation relied on primitive equipment.

these lands. Incentives for them to produce timber include the Managed Forest Law, which provides a tax deferment until income is generated from their woods, plus federal cost sharing for planting and timber stand improvement.

A related challenge is what Frank calls "fire prone property."

"You have more and more people buying smaller acreages in rural settings," Frank says. "In the course of building, they're leaving the land as natural as possible. The fire risk takes shape when trees are left packed around a house, branches practically scraping the roof. The risk is compounded when the driveway is built too narrow to accommodate a fire vehicle. It becomes grave when the house is part of a surge of rural development in a county with heavy pine cover and droughty, sandy soil. We have such a situation in counties along the Wisconsin River.

"If a fire ever got started and began to move, there's the potential for a tremendous amount of property damage."

While he expresses a range of concerns, Frank maintains there are bright things in store for Wisconsin forestry.

"We're actually on the cutting edge of some exciting advances," Frank says. "We're looking at the possibility of using satellites in fire prevention and detection. There's tremendous potential here for increased protection.

"In 1989, you'll begin seeing the fruits of a tree improvement program funded with forest mill tax funds. It used to be you'd select seed for tree nurseries without a lot of attention to its genetic properties. In the 1960s, though, we picked up on some work being done in the south. Researchers there were studying

seed genetics. They were ferreting out seed from trees that showed superior qualities in areas like growth rate, tree form and disease resistance. Researchers planted these special seeds in nurseries, and got fascinating results. Entire orchards were growing healthy, hearty trees at a rate 20% above normal.

"We now have 21 of these orchards around Wisconsin producing seed. You can imagine the resource potential down the road for recreation, wildlife and industry."

Meanwhile, DNR expects to follow through on its strategic plan for state forests. The plan was developed at the request of the US Forest Service, and its focus is on eight pages of recommendations that cover a dozen subject areas. The planning process, which wrapped up in 1983, was guided by an 18-member committee made up of diverse forestry interests. The committee has singled out six of the plan's current recommendations for special attention:

1. The need to increase wood fiber production to help meet current and projected shortages.
2. The importance of forests for dispersed recreational activities.
3. The value of wood fiber to the state's jobs, economy and social well-being.
4. The need for better ways to assess the effect of the myriad management decisions on wildlife, recreation and timber values.
5. The need to manage forests more intensively for all their values and to stimulate all forest landowners to do this.
6. And the need for better public understanding of the forest resource and its best management.



A pine nursery worker with modern equipment lifts seedlings for eventual planting elsewhere. Photo by Dean Tvedt

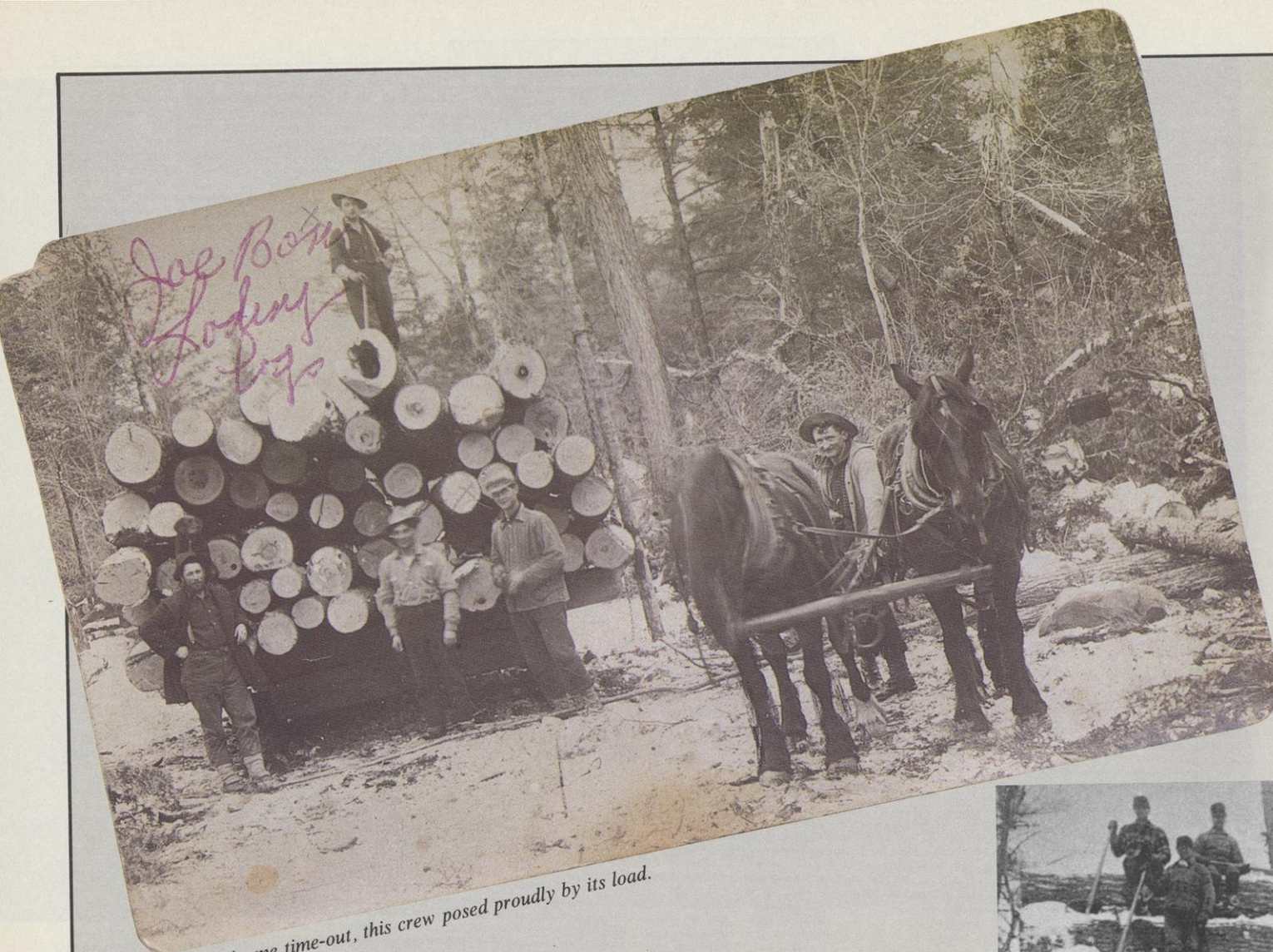
Richard Lindberg, planning specialist for the Forestry Bureau, says an updated plan will probably be implemented in 1990.

"In just four years, the plan has meant some significant advances for Wisconsin forestry," Lindberg says. "Tree nurseries are currently planting up to 22-million seedlings per year, an increase of about 10 million. Annual timber-related income has jumped about \$3-billion. Along the way we've developed a better market for lower quality wood and wood that's in low demand.

"We're at the point that, with some really good management thinking, we could probably double our timber production in the state. For now, it's safe to say that following through on the strategic plan will ensure that Wisconsin wood fiber production will increase to help meet demand through the year 2030."

After 75 years, forestry in Wisconsin has gone full circle — from an industry decimated by overharvest and fire to a rehabilitation so complete it is once again a mainstay of the state's economy. DNR foresters are proud of these achievements and look forward to a 100th birthday that will count similar accomplishments.

"Down the road, people will still admire the wisdom of Griffith's plan for Wisconsin forestry," Frank says. "And they'll look back with admiration to the 1927 state legislature that made it all possible by creating a forestry mill tax to fund the protection and management of this valuable, renewable resource."



A welcome time-out, this crew posed proudly by its load.

Early Wisconsin loggers.



Two men and their crosscut saw took a white pine down to size.



Dinner outdoors at 35 below. Legend has it that loggers like these also stirred their coffee with their thumb.



Oxen moving a huge load of logs near Shell Lake. The picture was taken in 1885.

◀In the late 1800s, this single load of logs from the Wisconsin pinery went on display at the World's Fair in Chicago. It filled nine railroad cars.

FOREST BIOTECHNOLOGY

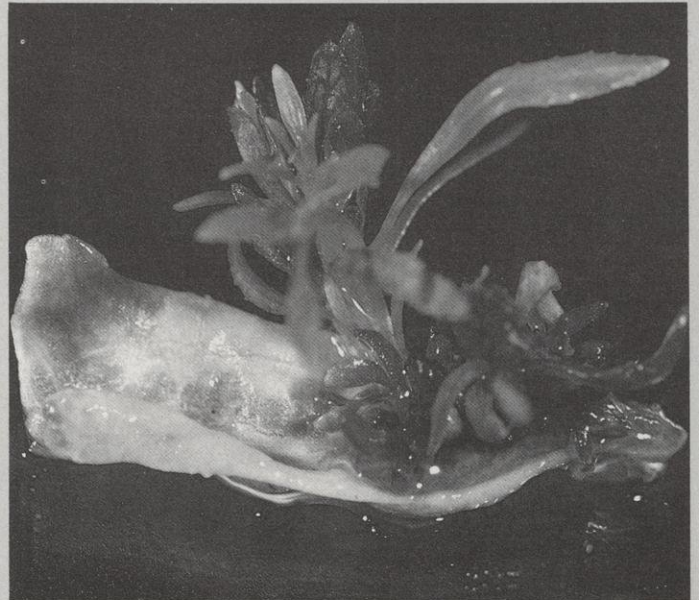
Neil D. Nelson, PhD, President of Forgene and of Insti-Trees Nursery, Rhinelander

Wisconsin is a world leader in the new high technology genetic science devoted to producing better, more productive, forests.

A quiet revolution in forest improvement has been underway in Wisconsin over the last five years, with the state playing a key role. The new science of forest biotechnology, popularly equated with genetic engineering, is now being applied to important forest tree species worldwide, and Wisconsin is among the leaders in this exciting and promising new field.

Forest biotechnology can be defined as the genetic improvement of forest trees through newly developed, unconventional biological techniques. These new methods emphasize manipulations that are carried out using cell and tissue culture and include such futuristic-sounding procedures as micropropagation, somaclonal selection, protoplast culture, direct DNA transfer and recombinant DNA.

Micropropagation is a method for reproducing (cloning) thousands to millions of exact copies of a single genetically superior tree, starting with only a small piece (even an individual cell) of the tree, using sterile tissue cultures.



Tissue culture cloning (micropropagation) of trees—a small piece of tree put in sterile culture is made to produce many identical treelets. Rhinelander Forestry Sciences Laboratory research photos by Ed Bauer

WISCONSIN PIONEERS

In 1983, the US Forestry Sciences Laboratory at Rhinelander, formerly called the Northern Institute of Forest Genetics, was selected to do research on biotechnology for forest trees. The US Forest Service chose its Rhinelander lab because the facility has an international reputation in basic forest biology research. This was one of the first major research programs in the world devoted to genetic engineering of forest trees. The biotechnology project at the Rhinelander Laboratory uses somaclonal selection and, in cooperation with other research groups, recombinant DNA to develop useful new trees. One of their goals is to produce poplar trees resistant to herbicides, and they are already greenhouse testing trees that contain a gene resistant to the herbicide, glyphosate.

The University of Wisconsin at Madison has been represented through the innovative work of Professor Brent McCown of the Department of Horticulture whose research group is one of the first in the world to regenerate complete forest trees from single protoplasts.

The Institute of Paper Chemistry in Appleton has been a national leader in developing advanced micropropagation systems for cloning genetically superior loblolly pine, Douglas fir and some Lake States' tree species in a tissue culture program supported by the pulp and paper industry.

And a private company, Forgene, Inc., the first independent firm in the worldwide biotechnology industry to focus on forestry applications, started operations in Rhinelander in January 1986. This company joins two prominent plant science biotechnology operations in Wisconsin, Agracetus and Agrigenetics, to add to the state's strength in the fledgling agricultural biotechnology industry. Forgene plans to use the new genetic engineering processes to develop, produce and sell unique high-value forest tree planting stock as well as the technology in major markets worldwide. The Insti-Trees Nursery Division of Forgene, also located in Rhinelander, currently sells hybrid poplar planting stock throughout the northern half of North America. Their hybrid poplars are some of the fastest growing trees known in the Lake States and other temperate areas of the world. Growth rates are two to five times better than those of native aspen and hardwoods.

BENEFITS OF BIOTECHNOLOGY

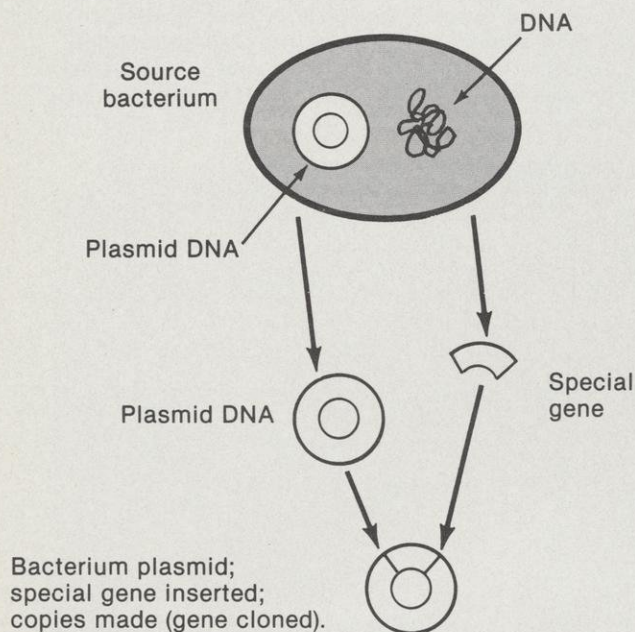
One of the most important benefits is much faster genetic improvement than was previously possible with trees. Several recent major studies concluded that biotechnology may produce greater payoffs in forestry than in any other agricultural crop because of this timesaving feature. Another attribute of forest biotechnology is the great potential for dramatic productivity increases — trees that grow up to 150% faster and take half as long or less to reach harvest size. Another advantage is that new traits can be introduced into important tree species. For example resistance to insects, disease, pollutants, herbicides and even the ability to produce valuable chemicals. Such traits translate into greatly increased survival and growth of tree plantings, new types of tree crops previously precluded by weed, disease, or insect problems, reduced production costs to tree growers, increased profits from forestry enterprises and less use of chemical pesticides in the environment.

Somaclonal selection is the capture of new genetic combinations which are expressed in trees regenerated from cells in tissue culture. In other words, individual cells showing special properties (for example, resistance to herbicides or a disease) can be selected from the tissue culture and thousands of whole trees having this special trait can then be grown from these original selected cells.



Selection for herbicide-tolerant hybrid poplar using tissue culture. Cells in tissue on the left were killed by exposure to the forestry herbicide, glyphosate. Some cells in tissue on the right survived and produced green shoots. Rhinelander Forest Sciences Laboratory research photo by Ed Bauer

TREE GENETIC ENGINEERING: THE RECOMBINANT DNA PROCESS



Direct DNA transfer and recombinant DNA are the most powerful biotechnologies for making specific genetic improvements in trees. When these procedures are used the change in the tree is called a genetic transformation. Both methods require isolation of the special gene or piece of DNA to be introduced into the tree. These special genes or genetic codings are usually genes that will provide a critically valuable trait, for example, resistance to damaging insects. The gene or DNA can be isolated from any living organism — bacteria, fungi, algae, higher plants or animals. After the DNA is isolated, it is multiplied (cloned) through special methods involving microorganisms. After the gene cloning step, the rest of the transformation process varies depending on whether direct DNA transfer or recombinant DNA is used. In direct DNA transfer the DNA is introduced directly into the tree cell without a bacterial vector through a variety of techniques, including microinjection, incubation with the DNA, and electrically-stimulated cell entry (electroporation). In recombinant DNA, the cloned gene is first introduced into a transformation vector such as the soil bacterium, *Agrobacterium tumefaciens*, which has the ability to enter the genetic code of the tree. The bacterial vector is then incubated with the tree cells which transfers the special gene to the tree tissue.

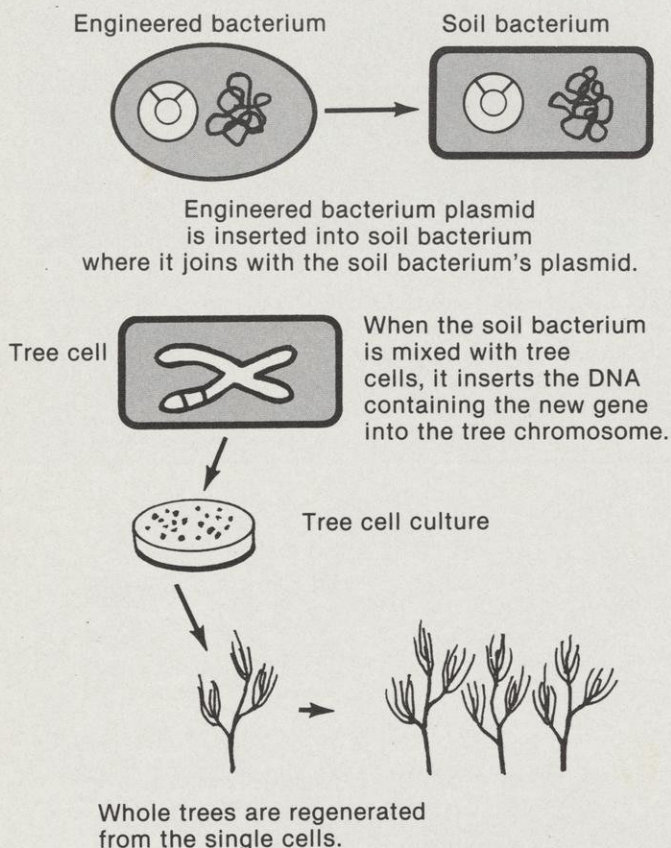
THE FUTURE

What can we expect in Wisconsin forestry over the next five to 20 years from the new research and development at Forgene Corporation, the Institute of Paper Chemistry, UW-Madison, the Rhinelander Forestry Sciences Laboratory and other new biotechnology groups around the world?

In the short term, five to 10 years, we can expect one or more of the following: spruce that grows 30 to 80% faster than currently available planting stock; a conifer substitute for red pine that can be grown to harvest size in one-fourth the time required for red pine; herbicide and disease-resistant hybrid poplars that will grow up to 10 times faster than native aspen and that can be grown as an effective substitute for aspen on growing cycles of five to 10 years; clonal genetically-superior, high value hardwoods that can be rapidly grown in plantations; pine, spruce and hardwood planting stock with special microorganisms added to their root systems that result in higher survival, much faster initial growth, less need for fertilizer and greater tolerance of weed competition; and improved, specific, environmentally safe, non-chemical biological pesticides that can be used to control diseases and insects on important Wisconsin trees.

Over 10 to 20 years we can envision even more dramatic possibilities: red pine and white pine genetically engineered to produce their own toxins to protect themselves against insect attack; somatic or "synthetic" pine hybrids that will greatly outproduce native pines; Christmas tree planting stock that will require less shearing, and therefore, lower labor costs in production; planting stock that is unpalatable to browsing mammals; new cash crops for Wisconsin farmers based on the production of oils and high-value chemicals from shrubs and trees; planting stock (allelopathic) that kills or retards the growth of competing weeds; and pulpwood species with radically improved pulping and papermaking characteristics.

The brief history of biotechnology has taught us that improvements will come faster than predicted and that some advances will be unexpected. The future looks bright for forest biotechnology, and Wisconsin is on the fast track ready to reap the benefits.

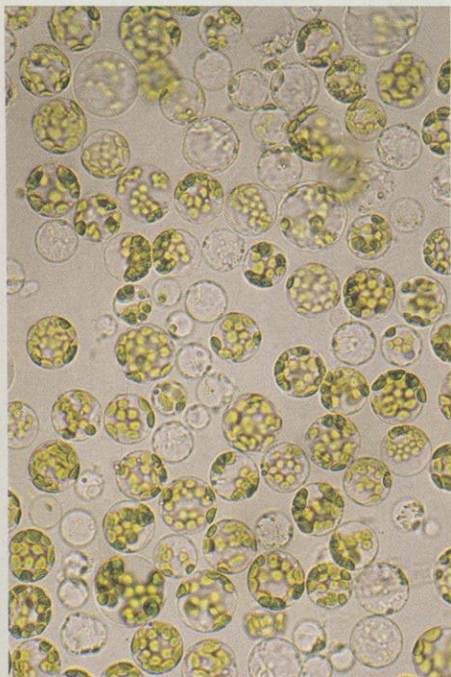


Regenerated whole trees carry the special gene. In this case the source of the special gene is a bacterium. Modified from Monsanto Company publication CORP-5-061.

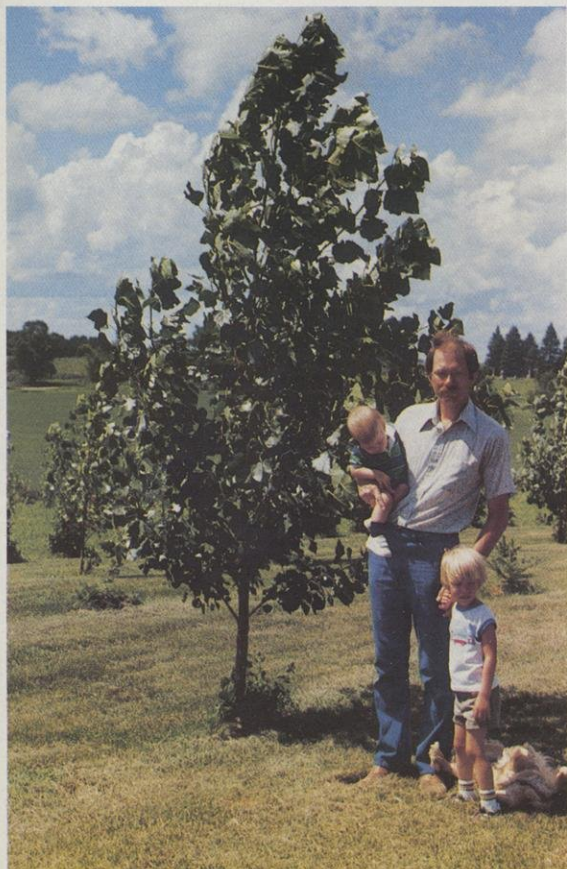
CELL WALLS REMOVED

Protoplasts are individual cells with their walls removed. Removing the walls permits biotechnologists to more readily perform genetic engineering. For instance, new pieces of the genetic code or DNA can be injected into a tree cell with a microscopic needle (microinjection) or can be carried into the cell with a specially

modified bacteria called a vector. Another approach is to fuse protoplasts, theoretically permitting the production of hybrids between entirely different tree species. Such manipulation is only possible with healthy protoplasts which are kept alive and viable in a special protoplast culture.



Started from a single protoplast in a lab, a hybrid poplar develops into a microscopic speck, then a visible blob, then a sprout — University of Wisconsin research. Photos by Brent McCown



A four-year-old hybrid poplar plantation in northern Wisconsin.

This rapid-growth hybrid poplar variety is only a year-and-a-half old—a product of Forgene, Inc., a Wisconsin biotechnology company.

WE ALL NEED TREES



There was just an overall inconsistency in the game, it's not as objective as you get. But we don't know why." When asked if it was up the offense to what we do, he Maryland average. "You as quarterback completed 62 percent gained 137 yards." Stan Gelbaugh named," Ross said.

Courtesy of the American Forestry Foundation

