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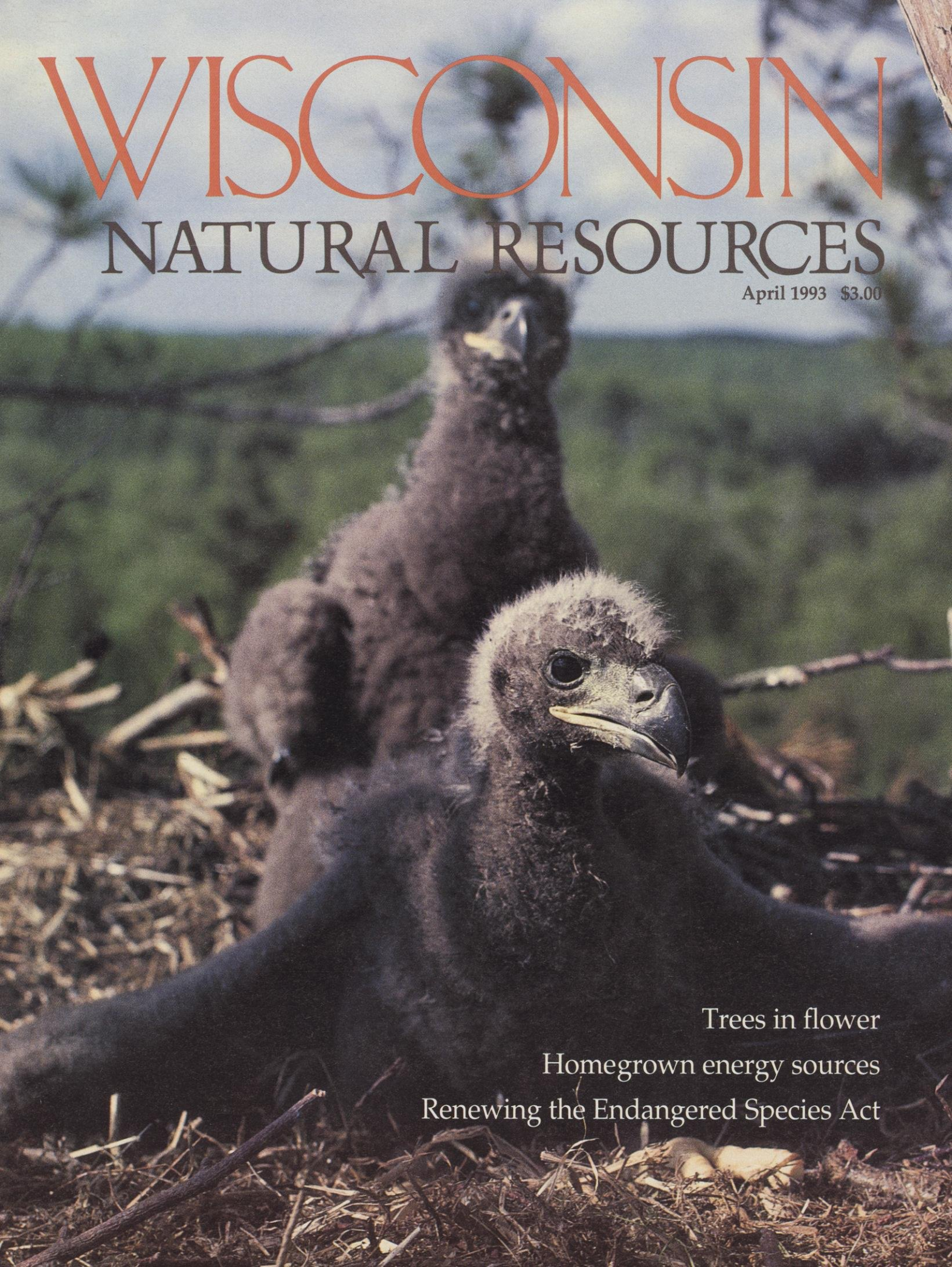


Trees in flower

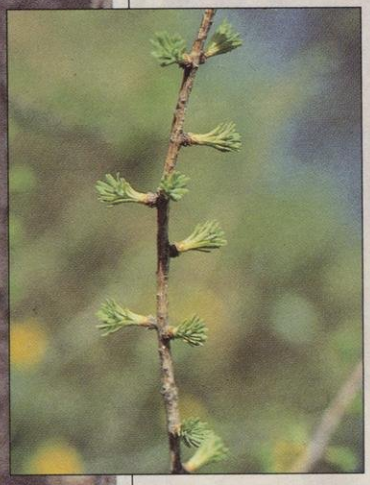
Homegrown energy sources

Renewing the Endangered Species Act

Ambassadors with roots

James C. Bishop, Jr.

Like the people of the region, the trees that grow in the Northwoods are hardy stock. Sturdy enough to weather the long winters, seasoned by summers that can bring heavy rains or drought. Trees that are raised at DNR's Hayward nursery for shelterbelts, timber and habitat have recently taken on a new responsibility: arboreal ambassadors. Seeds and saplings from Hayward are now proving their worth surviving the rigors of Icelandic winds, the dry seasons in northern China and the cold chills in Latvia.



At a multi-national nursery conference in Cable, Wis. in August 1987, then Northwest District Director David A. Jacobson presented 15 pounds of jack pine seed to China's Deputy Consul General, Xie Junzhen. The seed would be sprouted and raised in Chinese nurseries to reforest portions of Heilongjiang Province. Fires in the northern province had destroyed more than two million acres of forest, killing 193 people, injuring another 226 and leaving 50,000 people homeless. The inferno was doubly devastating because logging was the most important economic activity for the region's 33 million inhabitants.

Continued on page 29

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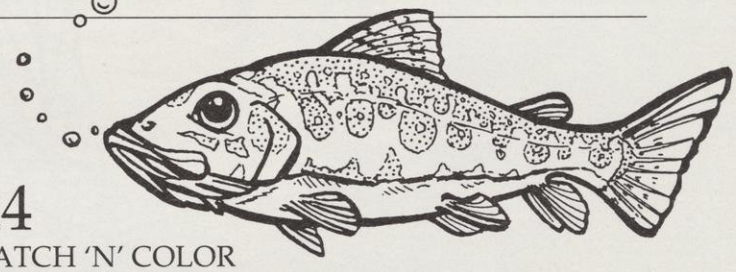
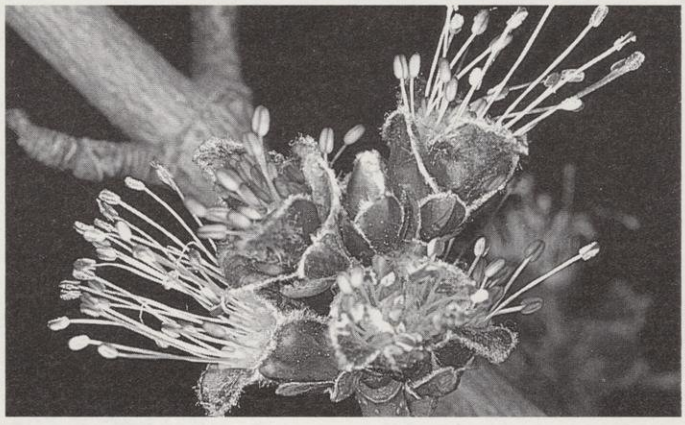
MIDWEST RENEWABLE ENERGY ASSOCIATION





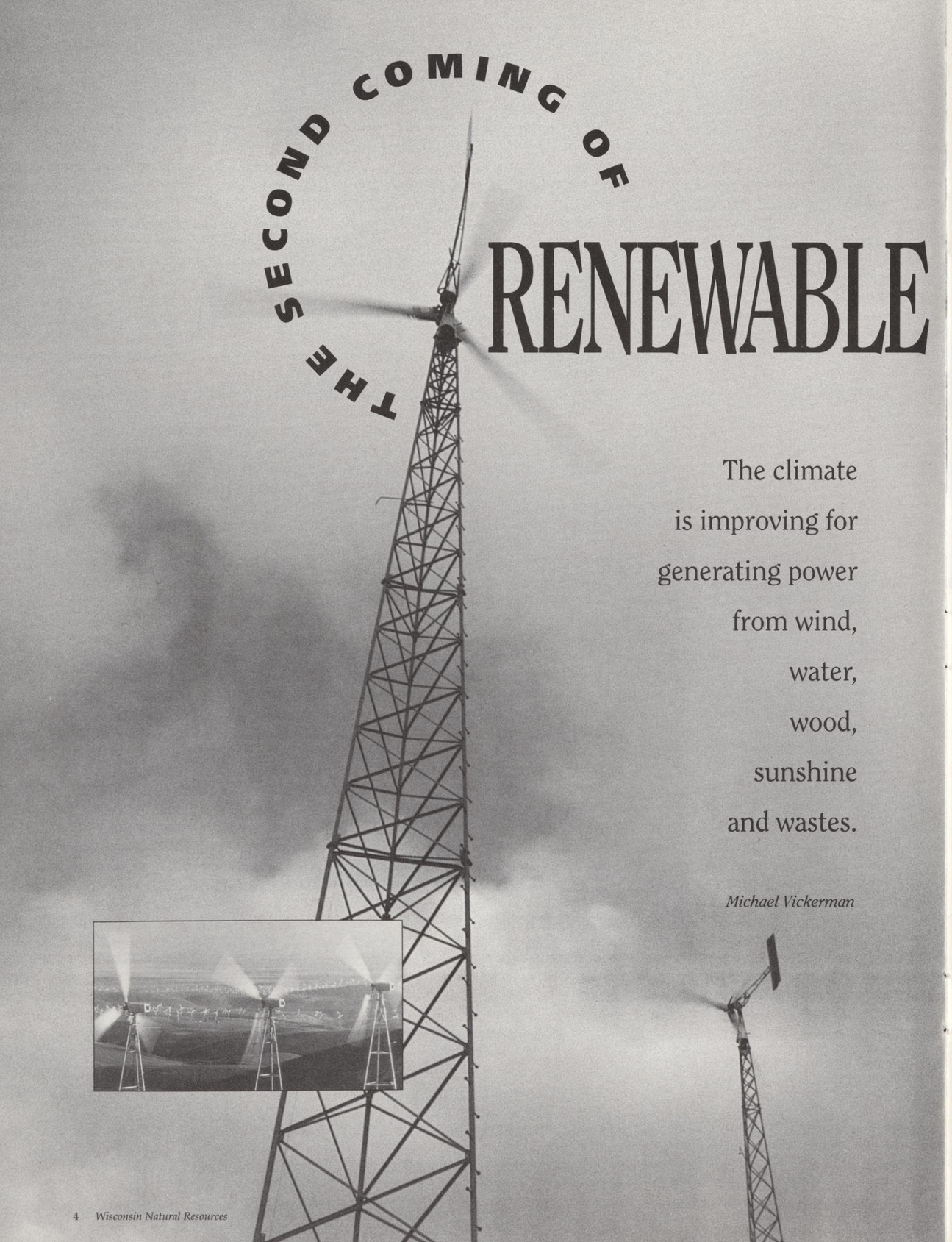
ROBERT QUEEN

BUREAU OF ENDANGERED RESOURCES

FRONT COVER: Nesting eaglets on Keego Lake, Vilas County.
RONALD G. ECKSTEIN, RHINELANDER, WIS.

BACK COVER: Fruit tree in bloom.
ROBERT QUEEN, MADISON, WIS.

Red pine (*Pinus resinosa*). ROBERT QUEEN
(inset) Tamarack (*Larix laricina*) is closely related to the European larch. RUTH HINE



THE SECOND COMING OF RENEWABLE ENERGY

The climate is improving for generating power from wind, water, wood, sunshine and wastes.

Michael Vickerman

Udovich's wind machines. *(inset)* Commercial wind farm in the California desert. ROBERT QUEEN UNION OF CONCERNED SCIENTISTS

Wind: a capricious element of nature that turns home runs into catchable fly balls and backyard picnics into feasts for insects. For Dennis Udovich, the strong breezes from Lake Michigan have meant something else since August 1992: electricity for his rural Sheboygan County home.

Even the gentlest lake breezes can spin the blades on Udovich's two advanced design 10-kilowatt wind machines fast enough to generate electricity for his household. When local wind speeds reach 10 miles per hour, the power produced exceeds his household needs, and surplus electricity is fed into his utility's transmission grid. At that point, Udovich's electric meter begins running backwards and the utility pays *him* under an arrangement called "net billing." Udovich estimates that the sale of surplus electricity will enable him to recoup the cost of the wind turbines in just five years.

Along the Rock River, a small, family-run hydro company is building a powerhouse on a restored dam that hasn't provided power for nearly 60 years. Thomas J. Reiss, Jr. of Rock River Power and Light Corporation, is building a 350-kilowatt hydro plant, enough to supply about 50 homes with electricity.

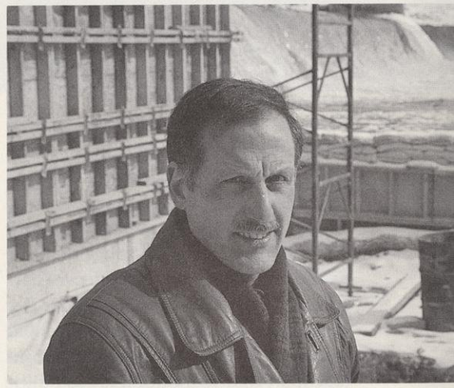
The lower dam at Watertown was originally built in the 1840s or 50s to provide mechanical power to a flour mill and small nearby businesses. Since the flume that channeled water blew out in the late 1930s, the site has been idle, letting the potential energy of water flow over the dam unused. Now, the City of Watertown has rehabilitated the dam and granted Rock River Power and Light a 50-year lease. The small hydro powerhouse was dovetailed into the renovation project.

Another of Reiss' companies rejuvenates parts from aging hydro dams to give new life to this old power source. "We definitely expect to make a profit, but it won't happen just because we flip a switch," Reiss said. "It's a long-term project and a long-term investment to get all the permits, licenses from the Federal Energy Regulatory Commission, the Department of Natural Resources, the U.S. Fish and Wildlife Service, the Army Corps of Engineers and local approval." It's time-consuming and expensive, Reiss said, but necessary to minimize environmental consequences for the river, fish and other organisms. His corporation is also in the process of licensing four other small hydro projects. "We're committed to getting this country to cut its dependence on fossil fuels that are becoming more expensive and less available."

Udovich and Reiss belong to a small but growing segment of Wisconsin business people: renewable energy entrepreneurs. For them and others, renewable energy — defined by the Wisconsin Energy Bureau as energy transfer from nature that can be regularly replenished — provides an attractive opportunity to produce income from harnessing locally available resources like wind, sunshine, flowing water, wood, crops, landfill gases, processed solid wastes, manufacturing wastes and agricultural wastes.

On windy days, the electric meter runs backwards for Dennis Udovich.

PHOTOS BY ROBERT QUEEN



Thomas J. Reiss, Jr., capturing water power on the Rock River.

Renewable energy sources range from the ephemeral (wind and sunshine) to the highly fabricated (refuse-derived fuel) and the concept means different things to different people. It can represent security from volatile prices for oil and gas, the means to be energy self-sufficient, or a practical way to use waste products. Notwithstanding its diverse appeal, renewable energy reflects basic values in sync with the 1990s: home-grown, versatile, low-risk, environmentally responsible, and sustainable energy for the long haul.

"Our piece of land is remote," explains Bob Strous. He and his spouse, Cheryl Rezabek, will use solar panels backed up by an LP-fired generator to provide electricity to their new home in rural Green County. Initial estimates to supply the house with power from the nearest main line were $20,000. An easement along a neighbor's property would lower the hook-up cost to about $5,000. "But it bothers us to spend that kind of money just to have the opportunity to pay a monthly utility bill," Strous says. "We believe in viable alternatives to conventional utilities. The solar panels of photovoltaic cells we're using are not new technology. We don't mind being second-generation pioneers to show this can work."

Pros and cons of renewable energy

What does renewable energy have going for it? For starters, the resources are either inexhaustible (wind, solar, hydro) or can be easily replenished (wood, crops, wastes). Solar, wind and hydro produce no airborne emissions or residues requiring disposal. Combustion

of biomass — wood and other vegetation — creates far less pollution than burning fossil fuels.

Renewable energy sources have tradeoffs: Wind power can change land uses and pose an obstacle to birds. Extensive fuelwood logging can further fragment wildlife habitat and promote harvesting on marginal lands. Like any logging, one must take care to avoid soil erosion and compaction when thinning forests for fuel. Burning wastes creates air pollutants and ash that must be managed. Locating these plants often fosters public opposition. Damming rivers for hydropower can affect fish and other aquatic life. Dam safety near hydroplants is a concern, and water level fluctuations must be managed to protect shorelines, accommodate recreation and appease property owners. All that said, the environmental consequences of renewable energy sources are considerably less severe than those from constructing and operating power plants fueled by oil or coal.

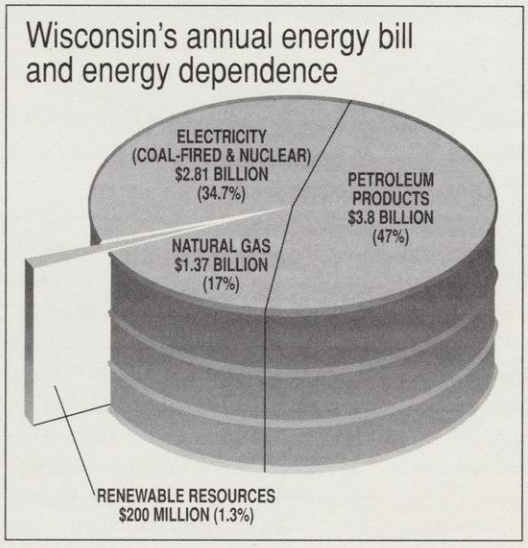
Renewable energy can also be better sized to the needs of the community. Small-scale installations can be added to as needed to meet growing demand without running the risk of creating too much capacity. Moreover, since the energy sources are home-grown, customers are immune to price shocks or supply disruptions caused by wars and international strife, like the Arab oil embargo 20 years ago or the recent Persian Gulf war. Indeed, renewables offer a measure of security against a global energy market which responds instantaneously and without mercy to political turmoil in fossil fuel-exporting nations.

Drawing energy from Wisconsin resources would also keep energy dollars from flowing out of state. Lacking known reserves of coal, oil, and natural gas, Wisconsin imports more than 95 percent of the energy it consumes. The Union of Concerned Scientists estimates that each dollar spent buying imported energy results in only 30 to 35¢ of economic activity within the state. By contrast, each dollar spent on energy conservation and renewable energy systems results in $1.65 of economic activity in the state. The implications are clear: Increased development of renewable energy would provide a shot in the arm to the state's industrial and agricultural base.

Apart from hydropower and wood burning for space heating, renewable resources remain largely untapped in Wisconsin. More solar energy falls on Wisconsin in one day than the total amount of energy its people consume in a year; however, solar energy use is negligible. Forests cover nearly half the state, yet annual wood energy use is less than 15 percent of the fuel supply forests could sustain, according to Wisconsin Department of Natural Resources estimates. In fact, renewables currently deliver only six to seven percent of Wisconsin's total energy consumption. We rank 28th among the states in renewable energy use, trailing leaders like Washington, California, and Georgia by a wide margin. Given abundant resources here, why have renewable fuels been slow to catch on?

Cheap fossil fuels masked the value of renewable energy sources

Fossil fuel producers and Wisconsin utilities are quick to point out that renewable energy sources like wood, wind and solar are still expensive compared with coal, oil and natural gas.



While gasohol (gasoline with 10 percent ethanol) is making inroads as a transportation fuel, ethanol is more costly to produce than gasoline. In fact, the current gasoline price is roughly half the 1980 price, if adjusted for inflation. Natural gas prices plummeted during the 1980s and the cost of coal declined as well. Falling prices for fossil fuels, while welcomed by motorists and utility company customers, created poor market conditions to develop renewable energy.


RICHARD LANE

Packerland Packing Co. in Green Bay, the world's largest use of flat-plate solar collectors to produce hot water.

The marketplace also did little to encourage independent power producers.

Wisconsin utilities got lucky. A moratorium on building new nuclear power plants spared utilities the cost overruns and project collapses that still afflict utilities in other states, who invested heavily in nuclear power in the 1980s. As a result, Wisconsin's electricity rates are among the lowest in the nation. Consequently, the prices Wisconsin utilities pay to independent generators of electricity — known as buy-back rates — are also among the lowest in the nation. The rates are so low that renewable energy projects that are profitable elsewhere, like wood-fired power plants in New England, would not generate a high enough rate of return to justify their construction here. More than any other reason, low buy-back rates explain why Maine produces nine times as much electricity from wood as Wisconsin does, even though

forest resources in the two states are quite similar. And most of Wisconsin's wood-fired electricity is generated by one utility, Northern States Power, at two converted power plants in La Crosse and Ashland.

Federal and state policies created in the late 1970s to accelerate renewable energy use were dismantled piecemeal as fossil fuel prices spiraled downward. The federal government slashed its renewable energy budget during the 1980s and Wisconsin followed suit by repealing tax credits and rebates for those who installed alternative systems like wind turbines and solar water heaters. The steep drop in fossil fuel prices masked impressive savings in the costs of solar and wind systems. Without financial incentives to help consumers overcome the high purchase price, installations slowed to a trickle. Only a handful of alternative energy businesses in Wisconsin have managed to weather the drought in sales.

DON WICHERT

Even old, beaten up pallets can be a source of clean fuel.

Where renewables show their worth

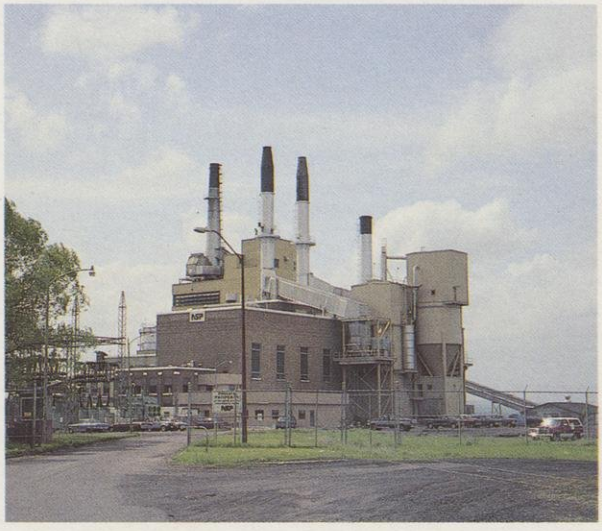
Yet renewables are managing to penetrate commercial markets elsewhere. In California a number of huge wind installations generate one percent of the state's electricity at competitive prices. Because California took steps in the late 1970s to subsidize large-scale development of alternative energy systems, wind generation now costs one-sixth of what it cost a decade ago, and has become Pacific Gas & Electric's preferred method of supplying power.

Advances in materials and design as well as added experience in operating large arrays of wind turbines offer the possibility of large, commercial wind energy operations in the Midwest. In Marshall, Minn., the region's first wind power plant spun to life last June and another began operating this January in Sibley, Iowa. Northern States Power, whose service territory includes much of Minnesota, has received bids to build several large wind "farms" among the fields of corn and soybeans in southwestern Minnesota. By 1999, they should be providing enough electricity on a windy day to power a city the size of Janesville. The rapid emergence of wind energy in Minnesota is attributable to two factors: strong, reliable winds and state laws exempting wind machines from sales and property taxes.

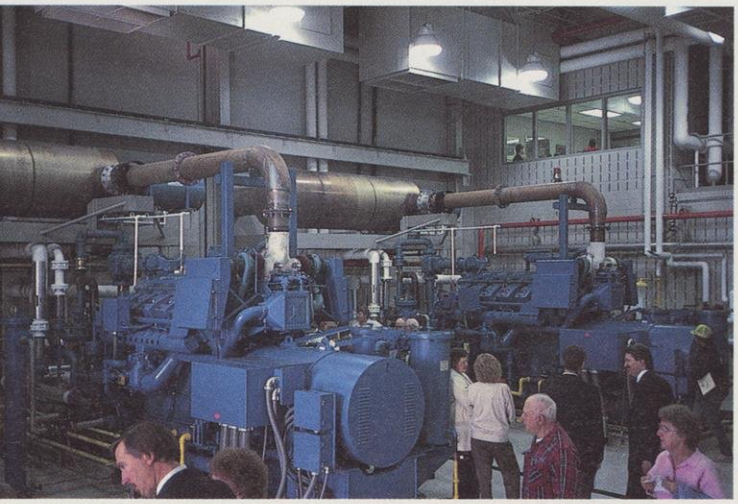
Today, more people understand there are costs when auto and power plant emissions foul the nation's skies, lakes and rivers; damage crops and forests; corrode bridges and buildings; and impair human health. The public wants more protection and Wisconsin lawmakers are answering that call. In 1984, the state enacted an acid rain law to halve sulfur dioxide emissions from coal-burning plants. Meeting the Clean Air Act mandates will make renewable energy projects increasingly attractive as cleaner options for producing electricity.

To include the environmental costs of power generation in future plans, several states, including Wisconsin, require utilities to factor in pollution costs when computing prices for new power plants. This allows more accurate comparisons among energy sources today and better prepares utilities to anticipate costs to reduce future environmental concerns. For instance, one national proposal would assess a "carbon tax" on emissions of carbon dioxide and other greenhouse gases. The Public Service Commission (PSC) requires that utilities include a cost of $15 per ton of carbon dioxide emitted in their estimates for future power needs. Costs like that could make wood, the most plentiful renewable resource in Wisconsin, seem more reasonable as an energy source. Although carbon dioxide is emitted when wood is burned, growing forests reabsorb carbon dioxide. So long as the size of the forest is maintained, the net amount of carbon dioxide released to the environment from wood burning is very low. When costs for CO_2 emissions are added to the price

Northern States Power's Bayfront Steam Plant in Ashland. It uses 95 percent wood waste and about five percent tires to produce power.



DON WICHERT



DON WICHERT

Special blue Waukesha Engines can burn methane gas from wastewater treatment plants and landfills to produce heat and electricity.

for planned coal-fired plants, wood-fired units become comparatively inexpensive.

Making a strong case for renewables in Wisconsin

Despite these developments, renewable sources of energy got limited attention in 1991 when utilities submitted their 20-year plans to supply power. To satisfy anticipated demand for electricity, utilities proposed building enough plants to generate an additional 5,000 megawatts (MW) of electric generation — a 50 percent increase over current capacity. Of that total, only 52 MW, or one percent, was proposed to come from new renewable resources.

RENEW Wisconsin, a statewide renewable energy educational group, was one of several groups that challenged the utilities' plans. During a week of hearings before the PSC in December 1991, expert testimony from engineers, scientists, and business people made the case for greater use of renewable resources.

The PSC subsequently raised the 20-year target for using renewable sources from 52 to 811 MW — nearly triple present levels. Commission rulings also boosted renewables by creating an incentive program that rewards utility shareholders for every kilowatt generated by renewable sources. The PSC also ordered utilities to plan a wind farm by 1999 and to extend more substantial rebates for solar water heaters installed in homes that currently use electric water heaters.

A recent report from the state Energy Bureau suggests that the Commission's renewable energy target is achievable. The report concluded that most renewable technologies will be competitive with new fossil fuel power plants by the year 2000. Further, the bureau predicts renewable resources could produce an additional 279 MW of power within seven years and 789 MW by the year 2010.

All told, the climate for developing renewable energy sources in Wisconsin improved dramatically last year, raising hopes that several larger-scale projects will start soon. The federal Energy Policy Act, enacted last October, will provide 1.5 cents per kilowatt-hour credits for power plants that use wind or crops specifically grown to produce electricity. Credits and a host of other tax breaks taking effect this year are designed to stimulate private investment in renewable energy technology. The Energy Bureau has funded 60 grants to state businesses, organization and utilities to stimulate renewable energy projects.

One by one, the barriers that historically slowed the advancement of renewable energy are being lowered. A growing number of government officials in Washington and Wisconsin are recognizing that renewable energy sources are important foundations for sustained economic and environmental revival. As the PSC stated last year in its 20-year energy outlook: "Increasing the use of renewable resources is in the public interest." Proponents of renewables couldn't have said it any better. □

Michael Vickerman is executive coordinator of RENEW Wisconsin, a statewide educational organization that promotes a wide range of renewable energy options.

Renewing interest in renewable energy

How much fuelwood can be harvested from Wisconsin's forests without degrading water quality and depleting soil nutrients? Does energy cropping threaten species diversity and wildlife habitat? Are there environmental hazards from producing and disposing of solar energy equipment? What can be done to minimize bird deaths from wind power installations?

These are a sampling of the questions to be discussed and debated at an April 20-21 conference, titled "Renewable Energy in Wisconsin - Working With the Environment" to be held at The Edgewater hotel, 666 Wisconsin Avenue in Madison. In revising its energy policies to encourage greater use of renewable energy resources, Wisconsin has attracted a good deal of national attention. Many authorities on energy and environmental policy will be on hand to offer perspectives on how Wisconsin can increase renewable energy use without compromising the environment.

Among the featured speakers are Christopher Flavin of Worldwatch Institute, Michael Brower of the Union of Concerned Scientists, and Scott Neitzel, Public Service Commissioner of Wisconsin. In addition, several national and state political leaders, including U.S. Energy Secretary Hazel O'Leary, have been invited to share their views on the changing political climate for renewable energy use.

For enrollment information, write to CALS Conference Office, 620 Babcock Dr., Madison, WI 53706 or call (608) 263-1672 for a brochure. For program information, call RENEW Wisconsin at (608) 255-4044.

HERBERT LANGE

New risks for a rare act

Every five years the Endangered Species Act is re-authorized and refinanced. This year, "the Act" is on the Congressional table again.

David Kunelius

One of my favorite fishing spots in northern Wisconsin is at the mouth of a channel connecting two large, clear lakes. The current here carries food and bait fish into the waiting mouths of walleyes. If I time it just right, I can intercept a walleye or two. This place has all the right stuff for me — tall pines; a beautiful, irregular shoreline; a pleasant breeze that keeps insects away and carries the aroma of pines and land into the boat. All the right stuff, including wildlife. Waterfowl, herons, loons bask here, but for me, the crowning jewel in the whole experience is the occasional sight of a bald eagle swinging down the channel, also fishing.

BUREAU OF ENDANGERED RESOURCES

One key to saving species is building equal empathy for insects and mammals.

(*above*) The regal fritillary *(Speyeria idalia)*, threatened in Wisconsin.

(*below*) Canada lynx (*Lynx canadensis*), endangered in Wisconsin.

The bald eagle is a magnificent bird, impressive in size, in bearing and in flight. It's equally impressive as a symbol of our efforts to protect and restore endangered species nationwide. Like other raptors, eagles fell prey to a food web contaminated by pesticides. Public action banned DDT in 1972 and spawned the nationwide program to prevent the extinction of wildlife species. The eagle's widespread recovery in Wisconsin, even beyond goals in state recovery plans, is living testament to that will.

How quickly we will preserve other species will again be debated this year. The Endangered Species Act (ESA) enacted in 1973, was the final jewel in a charmed decade that brought federal protection to wilderness, wild rivers, clean air, drinking water, lakes and rivers.

The ESA sets a framework for studying and protecting plants and animals threatened with extinction. The law has to be re-authorized every five years, as the costs to protect rare species are weighed against changing social and economic interests. The act was up for re-

LYNN ROGERS

PAUL KIVLIN

Should property owners be compensated for maintaining habitat critical to the survival of endangered species? Forster's terns (*Sterna forsteri*) colony on Lake Poygan.

newal last year, but fall electoral campaigns and rancorous controversy that erroneously pitted northwestern logging interests against the forest-dwelling spotted owl stalled a decision until this year.

The debate will center in Congressional committees that oversee both business and biology. The Endangered Species Act is administered by the U.S. Fish and Wildlife Service (USFWS) in the Department of Interior, and the National Marine Fisheries Service (NMFS) in the Department of Commerce.

Among the act's strategies to protect rare animals and plants:

1. Natural resource agencies and the public can petition to add or remove species from official lists of endangered or threatened species.

2. Land and waters critical for maintaining a listed species can be designated as "critical habitat."

3. Governmental agencies are required to consult with the USFWS or the NMFS before proposing activities — from big projects like road-building, dredging, development or water diversions to small projects like building nature trails — that might affect a listed species. This provision applies to all federal agencies, state agencies, local government and private interests that receive federal funds to carry out the proposed activity.

4. Habitat conservation plans must be filed with the feds before permits will be issued. The plans must outline options and proposals to mitigate damage if habitat where endangered species reside may be altered.

5. State agencies receive funds to survey the status of rare species, conduct research and propose strategies to recover endangered and threatened species. Other researchers may be funded by the USFWS recovery teams for similar work.

When we protect the threatened Calypso orchid (*Calypso bulbosa*) what else do we save?

KITTY KOHOUT

Issues on the table

Recovery plans alone can't protect species. Funds are limited, a lot of species need help, and recovery efforts evolve slowly.

While the jobs-and-owls crowd will certainly be heavy hitters in lively congressional hearings, there are equally weighty issues to debate as the Endangered Species Act is renewed.

Too long on the queue — Extinction is forever, but it won't wait forever. As of last November, 749 species in the United States have been listed as endangered or threatened. Another 600 "candidates" await listing, 529 foreign species warrant protection in this country and 3,700 species await field research to determine populations, habits and habitat needs.

Recovery plans to increase endangered populations can recommend such diverse strategies as buying habitat, breeding the species in captivity for future release or limiting human activities that contribute to the species' demise. Costs, effects on private landowners and environmental needs are included in these estimates. Draft recovery plans are discussed at public meetings and are reviewed by Congress. The process typically takes years. Small wonder that recovery plans have been completed for only one third of the species currently listed as endangered.

Who foots the bill? — The Government Accounting Office estimates $4.6 billion would be needed by the year 2000 to conduct research and recovery work on 2,286 critically rare species. Current budgets are tiny, comparatively. The U.S. Fish and Wildlife Service spent $42.3 million on endangered species last year; $8.2 million at the National Marine Fisheries Service. It's a lot of money, but it's paltry compared to other national interests. We spent more than that on price supports for mohair goat raisers last year.

Tight federal budgets mean the most endangered "resource" may be funding. Congress will not only weigh endangered species protection against rising health care costs, better education and aid to cities. The competition for scarce dollars will also force choices among national parks, endangered species, historic landmarks and other preservation/conservation issues.

Compensating landowners — Private landowners worry that government's plans for recovering endangered species will limit what a person can do on private property. As long as a landowner doesn't kill a threatened or endangered species, recovery plans haven't limited a property owner's actions. That could change. Courts in Texas recently ruled that critical habitat destruction in a national forest constituted killing the endangered animals that lived there. Applying that same standard to critical habitat on private land could limit an owner's options and the courts might rule they are entitled to just compensation for lost property rights.

Removing the spotlight from glamorous species — Mammals and birds have garnered more attention and dollars than either invertebrates or plants. Nationwide, 60 species of mammals got $30 million while 81 species of invertebrates got $3 million and 239 plant species got $2 million. Of all listed species, 45 percent are vertebrates, 41 percent plants and only 14 percent are invertebrates, despite the fact that less than one percent of the world's species are warm-blooded.

States similarly have highlighted warm-blooded species for a practical reason. States rely on voluntary contributions to fund their endangered species work. Until an awareness and appreciation of all species builds a large environmental constituency, more people will choose to invest in programs to restore eagles, swans, wolves and falcons than frogs, mussels, dragonflies and plants. Yet it's important to get past this societal bias.

Save individuals or preserve communities — Limited financing has forced some tough choices. Guidelines from the Fish and Wildlife Service stress helping rare species that stand a good chance of recovery. That philosophy has led to outstanding work to recover single species. But this piecemeal approach means that other rare plant and animal communities are still being lost; communities which could keep several species from becoming endangered.

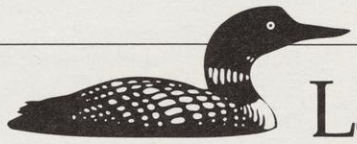
Save the worst or save the most — Others suggest the triage method of emergency medical care be applied to endangered species. Some species may not need extensive intervention to survive while others may be beyond the point of recovery without expending great sums of money.

Adding scientists to The God Squad — When the Tellico Dam project pitted the two-inch snail darter against a massive hydroelectric project on the Little Tennessee River, President Jimmy Carter appointed a panel of respected politicians to sort out myriad environmental, recreational and economic issues. That concept of a panel of experts to resolve disputes was included in the 1987 amendments to the ESA. Nicknamed "The God Squad," the Endangered Species Committee consists of political appointees who determine if certain provisions of the ESA should be set aside to resolve a specific conflict.

	Endangered *Species at risk of extinction throughout their ranges*		**Threatened** *Species facing severe risks in the future*		
GROUP	U. S.	Foreign	U. S.	Foreign	Recovery Plan Written
Mammals	56	249	9	23	33
Birds	73	153	13	0	71
Reptiles	16	64	18	14	27
Amphibians	6	8	5	0	8
Fishes	55	11	36	0	55
Mollusks	47	3	8	0	41
Crustaceans	9	0	2	0	5
Insects	14	1	9	0	13
Arachnids	3	0	0	0	0
TOTAL ANIMALS	279	489	100	37	257
TOTAL PLANTS	298	1	72	2	150
GRAND TOTAL	577	490	172	39	407

U.S. FISH AND WILDLIFE SERVICE

THE EASTERN SAND DARTER, SIMILAR TO TWO RARE FISH IN WISCONSIN.



Look for the loon

The federal government provides Wisconsin about $102,000 annually to conduct field surveys and carry out recovery plans for endangered fish, wildlife and plants. The vast majority of funding to protect endangered resources, approximately $656,000 a year, comes from state taxpayers who contribute to the Endangered Resources Fund on state income tax forms. Please remember to "Look for the loon" on state income tax forms this year and donate.

Over the last 13 years, this combined help has been used to conduct field surveys, determine life histories, try experimental management and re-introduction practices, contact landowners whose properties are home to these rare species and develop educational materials.

The members include the Secretary of Agriculture, Secretary of the Army, chair of the Council of Economic Advisors, Administrator of the Environmental Protection Agency, Secretary of the Department of Interior, Administrator of the National Oceanic and Atmospheric Administration, as well as one politician from the state affected by the issue at hand. Proponents of the act call for replacing this committee with a committee of scientists.

BOB HAY

Should scarce funds protect the endangered Blanchard's cricket frog (*Acris crepitans*) or the wetland habitat that supports it?

Weighing costs of endangered species protection — The 1983 renewal of the ESA clarified that economic and social aspects should not to be considered in determining if a species is in danger of extinction. Some critics think that makes the act unworkable. Proponents counter that costs of recovering endangered species are considered at every turn. Economics are weighed in the designation of critical habitat, in inter-agency permits, in recovery plans, and by the Endangered Species Committee. Proponents believe that requiring a detailed economic analysis prior to listing a species as endangered or threatened would cause much longer delays, greater backlogs and might be impossible to adequately assess.

Toughen enforcement — Enforcement of the act is currently limited to flagrant violations. Most cases are prosecuted as misdemeanors with fines as low as $500. Only 220 federal agents work on endangered species violations in the country and most focus on trade and imports of exotic species. They work with customs inspectors and a network of regional special agents. Accidents or shooting of individual animals is more often investigated by state conservation officers responding to community complaints. State costs for such investigations are borne by state hunting and angling fees, not federal endangered species funds.

The issues are weighty, but they are worth waging. Twenty years ago eagles and osprey were a rare sight in Wisconsin. There were only 100 active eagle nests statewide. Now observers have located 424 active eagle nests; at least 54 pairs in the northern Wisconsin county where my favorite fishing spot is located. It sure helps the wait when the walleyes turn off, the weather turns raw and only the eagles are out to see who else is fishing. □

David Kunelius communicates wildlife, fisheries, forestry, recreation and land use issues for the Department of Natural Resources in Madison, Wis.

Species endangered or threatened nationwide that live in Wisconsin

PLANTS
- prairie white-fringed orchid
- Fassett's locoweed
- dwarf lake iris
- Pitcher's dune thistle
- northern monkshood
- prairie bush clover
- Mead's milkweed**

MAMMALS
- eastern timber wolf (or gray wolf)
- Indiana bat**

BIRDS
- peregrine falcon
- bald eagle
- Kirtland's warbler*
- piping plover*

MOLLUSKS
- winged mapleleaf mussel
- fat pocketbook mussel*
- Higgin's eye pearly mussel

INSECTS
- Karner blue butterfly
- giant carrion beetle**

** Species recently observed in Wisconsin but no breeding documented.*

***Species federally listed as endangered and possible extirpated from Wisconsin.*

Book 'em

It takes a lot of teamwork to bag a poacher.

Byron J. Goetsch

10:00PM

At 10 p.m. last April 20th a Poacher's Hotline (1-800 TIP-WDNR) call came into Warden Supervisor Dennis Jones' office in Oshkosh. A fish trap containing many walleyes had been found by a concerned citizen in the backwaters of Carpenter's Bayou, north of Shiocton. The information was relayed by secured phone to Warden Rick Herzfeldt (Shawano). He intercepted me, wardens John Krull (Shiocton) and Patrick Warner (Two Rivers), while we were floating the Wolf River several miles south of the reported scene.

It had already been a long day and a very long spring of field work, but we quickly discussed the tip, and used past experiences and knowledge to plan a strategy. Warden Trainee Boyd Richter and I were dropped off in the immediate area. We traveled on foot, taking occasional vantage points to surveil the immense, black marsh, just in case the poachers arrived. Later, we joined a search with the rest of the team. We had recruited Warden Todd Wippermann (Clintonville) and Trainee Matt MacKenzie to lend a hand. Using a couple of river boats, push poles and 12-volt spotlights, we devoted the next several hours to looking for a small, illegal wire trap hidden somewhere in the vast cold waters beneath us.

The Wolf River is synonymous with walleyes to area anglers who venture onto this extensive and pristine part of Wisconsin's natural heritage. Each spring, thousands of walleyes migrate up the Wolf River from Lake Winnebago and the upriver lakes of Poygan, Winneconne and Buttes des Morts to carry out an annual spawning ritual.

Walleyes in the Winnebago System act unlike those found in many other parts of the state. These walleyes seek out shallow, grassy areas that are seasonally flooded with a constant flow of water during the spawning season. While on these shallow marsh beds, the walleyes are vulnerable to unscrupulous people who throw hook-and-line fishing techniques by the wayside. These poachers, with deliberate forethought and malice, illegally spear, dip net, snag and trap these highly prized fish. Many poachers also illegally resell their fish. In fact, some poachers used to set up pens in the marshes to hold fresh fish until they could be sold.

Poaching has been around as long as walleyes have been running the Wolf River. Although wardens and anglers seem to be winning the war, there are a select few poachers who continually try to outdo their predecessors in this reprehensible age-old tradition.

2:00AM

After a four hour search, at 2 a.m., Warden Wippermann located the fish trap in a narrow cut near the upper end of Carpenter's Bayou. The trap, a wire mesh box about two feet square, had a single funnel-like throat that allowed fish to enter, but not exit. The trap had been carefully placed next to some flooded trees. It contained many walleyes including a female that wardens believe had been placed in the trap to attract males.

As the trap was lifted, we marked each fish so they might subsequently be traced and used as evidence, should a legal case develop. The other wardens were notified, potential suspects were discussed and a plan devised. The trap was carefully replaced to ensure

that everything was exactly as it had been found so the scene would not tip off the poachers.

Warden Warner wedged himself into a nearby clump of trees. He would watch the trap for the next seven hours as two other boats waited nearby to pursue the would-be poachers.

Nothing happened. Surveillance ceased at 10 a.m.

Later that afternoon, after some shut eye and a warm meal, the wardens again took their concealed positions on this remote stretch of river. Maybe this would be the night.

Wardens Jim Horne (Shawano), Carl Mesman (Chilton), and Special Wardens John Prickette and Ed Whealon provided additional surveillance and assistance in case the alleged violators entered or exited the bayou via an unexpected route. We were well prepared because this kind of poaching typically involves several individuals armed with well-thought-out plans to reduce their chances of getting caught. Given the cold and calm conditions, it would be difficult to move silently through the marsh this night.

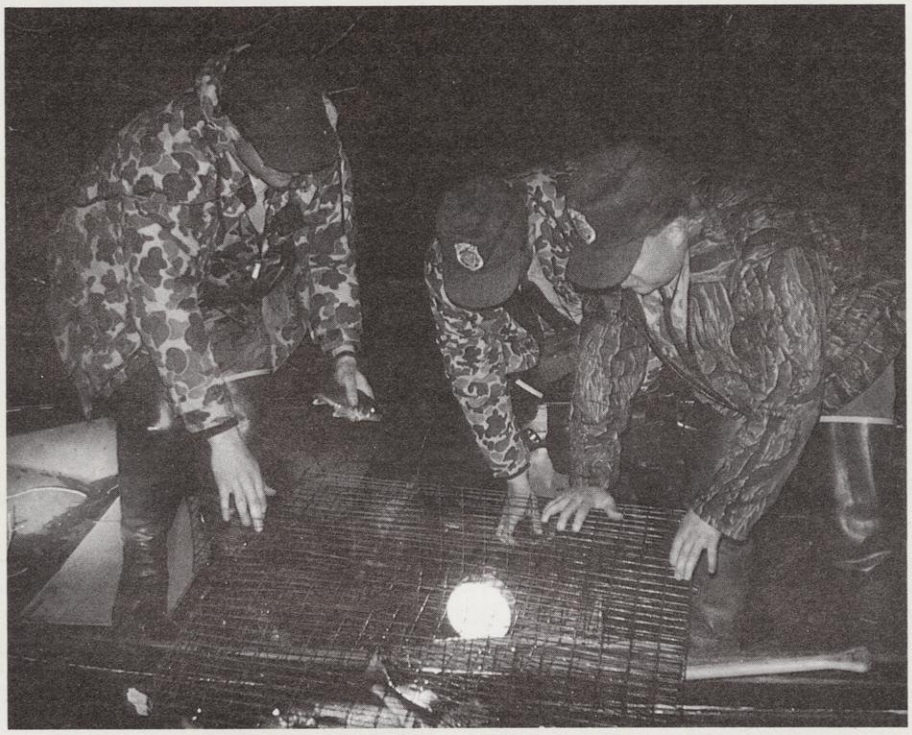
The sun set and darkness cloaked the marsh. Six hours passed.

At 9:30 p.m., the wardens heard a vehicle bumping down the road as it approached from the south. It sounded like a truck with an unsecured boat shifting in the back. It stopped. Then everything got very quiet again.

Nearby, wardens strained to see or hear if the fish trappers had arrived.

Several minutes passed. Warden Krull and I saw a glimpse of light held near the water just over the side of a small boat. The craft moved silently in the direction of the trap. Warden Warner saw two occupants and identified parts of their clothing as the trap was lifted from the water in the darkness. Warner contacted the other wardens via portable radio. After a few minutes, the small boat started moving back toward shore, veering in a slightly different course from its earlier route.

We had previously decided it would be difficult to confront the poachers on water and end up with evidence. We planned to apprehend the individuals on land.



DNR LAW ENFORCEMENT PROGRAM

Finding a needle in a dark, wet haystack. (*left to right*) Wardens Byron Goetsch, Patrick Warner and John Krull locate the illegal fish crib full of walleyes.

A short time later, Wardens Horne and Whealon heard the boat being loaded into a vehicle, then observed the vehicle moving toward them from the bayou. Only a single parking light illuminated the vehicle's path.

The wardens stopped the vehicle. Only one person was inside. The second individual along with the fish had been dropped off along the way.

Despite denials and an uncooperative attitude from the alleged violator, the wardens found evidence in the boat: The side of the boat and much of the equipment inside was stained with fresh walleye spawn. Our collective observations would later convict this individual of fish trapping and possessing walleyes in excess of the daily limit. As a result of the conviction, this offender, well known by area wardens, was sentenced to pay $939 in forfeitures and lost his fishing privileges for 2½ years.

As you can appreciate, these types of cases require a great deal of time and cooperative efforts by wardens and the legal system charged with enforcing the state's natural resource laws. Although one of the individuals got away this time, it was worth the effort. In presenting her case, Assistant District Attorney Cathleen Huber said of marshes and walleyes, "It's a finite resource. If you don't protect it, you are going to lose it." Outagamie Judge Harold Froehlich agreed. He sent a clear message that this type of behavior would not be tolerated. □

Byron J. Goetsch is a DNR conservation warden stationed in Appleton, Wis.

THOMAS MEYER

A sight for winter-weary eyes, the large yellow lady's-slipper (*Cypripedium pubescens*).

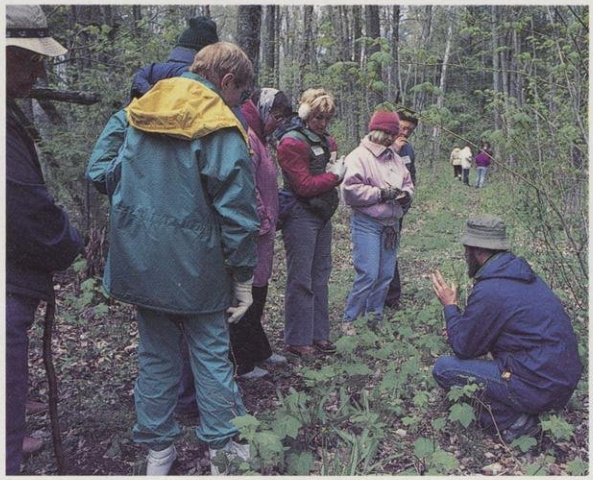
Wildflower PILGRIMAGE

Spring is the time to search woodlands for the small treasures of our floral heritage.

Coggin Heeringa

From all walks of life they come, walking into wild places on the quintessential spring excursion: a wildflower pilgrimage. Some flower watchers, like birders, are "listers" — hoping to find as many rare species as possible. Others don't care what flowers they find. They just need to be outside as the woodlands come alive in spring. Most come in search of beauty, and they're not disappointed.

"Our Wildflower Pilgrimage in Door County is more than a fundraiser…in fact, it's more than looking for wildflowers. It's about preserving habitats," said Paul Regnier, chief naturalist/administrator of The Ridges, a nature sanctuary just north of Bailey's Harbor on Highway 57.

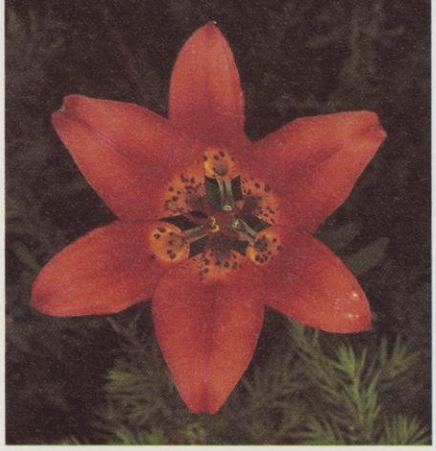


PAUL REGNIER

Wildflower walks draw warm crowds on chilly days.

"Wisconsin's floral heritage has no future unless the habitats for these plants have a future," according to David Kopitzke, Landowner Contact Specialist for DNR's Bureau of Endangered Resources. His mission is to encourage property owners to protect rare plants growing on their lands.

Regnier says that's also the Pilgrimage's primary purpose. "We want participants to gain a better understanding of their environ-



THOMAS MEYER

(above) Wood lily (*Lilium philadelphicum*).

(below) Grass pinks (*Calapogon pulchellus*).

ment so they can be better stewards."

On the third weekend each May (the 15th and 16th this year), small groups led by volunteers — professional botanists, university professors, naturalists and area citizens with special knowledge of local flora — travel to state parks, state natural areas, Nature Conservancy lands, sanctuaries, and private land on the northern end of the Door Peninsula searching for flowered signs of spring.

Wildflower habitats are by no means unique to Door County. Wherever there are undisturbed woodlands spring flowers have their day in the sun. And native plants are among Wisconsin's loveliest treasures.

In her book *Journey in Green Places*, Virginia S. Eifert described these uncommon plants as "the haves and the have-nots. They are the ones which manage to live with too little water or with too much water, in too much sun or in too much shade, in too much acidity or with too little nitrogen, in too much heat and too much cold, in too long a winter and too short a growing period, in too much wind or in too little air."

Many other wildflower species are now uncommon because the habitats where they thrived have been altered or destroyed.

A number of uncommon native plants are found in the spire-like stands of spruce and balsam fir that form the northern boreal forest. Here on northern Wisconsin shorelines off lakes Superior and Michigan, cool breezes create the kind of climate we might expect to find in northern Canada.

"The boreal plants are the strange ones," according to Eifert. "They are the carnivorous ones, the saprophytes, the parasites, the plants which depend for life upon the presence of soil fungi, on cold, and on acids that would destroy many other kinds of plants."

Eifert says these plants make the most of meager allotments of food, water, warmth and light. They not only survive but thrive gloriously. Spring arrives late here, but visitors can delight in what Eifert calls "the Canadian carpet...a splendid array richer than any Oriental rug, ornamented with orchids and colored sea blue with dwarf irises, purple-rose with gaywings, scarlet and gold with paintbrush and gloriously deep green with compact evergreen leaves."

THOMAS MEYER

Canadian dogwood (*Cornus canadensis*). (*inset*) Gaywings (*Polygala paucifolia*). THOMAS MEYER

Shoreline habitats, while beautiful, are inherently hostile to plants. In their book *Wildflowers and Weeds*, Booth Courtenay and James H. Zimmerman explain: "The sandy shore of our lakes, living waterways, grow or diminish as climate and water levels vary. The basic struggle here is not one plant with another, but with the ceaseless shifting sands and the drying of the sun."

Tenacious plants, such as the deceptively delicate Arctic Primrose (*Primula mistassinica*) are souvenirs of the Ice Age. That these tiny pink flowers have survived since frigid times is cause for wonder. Today, they are more threatened by shoreline development than weather.

The conifer-hardwood forests of northern Wisconsin and the open deciduous forests in the southern part of the state may appear more hospitable to wildflowers than other natural areas, but they have one common, seri-

Dutchman's breeches (*Dicentra cucullaria*). (*inset*) Sharp-lobed hepatica (*Hepatica acutiloba*). THOMAS MEYER

ous limiting factor — *shade*.

Though woodland wildflowers seem to materialize overnight, their buds, leaves and abbreviated stems were formed during the previous growing season. Through winter, they remain hidden underground beneath the snows, waiting. In spring, these woodland flowers grow rapidly by necessity. They have just a few weeks to bloom, get pollinated and set seed. Furthermore, their leaves must gather enough solar energy to fuel next year's growth before tree leaves open and form a dense canopy of perpetual shade.

Many woodland plants require a surprising number of growing seasons to gather enough energy to bloom. Any disturbance during the developmental process can thwart blossoming or destroy future generations.

Throughout Wisconsin, thanks to people who cared, wildflower habitat with a rich floral diversity have been preserved in parks, natural areas, sanctuaries and on private lands.

As Eifert says: "It is for us to guard the wild places, to hold on to them as something eminently precious, never to be truly regained, once they are lost...State parks, small back-country preserves, the clean brook through the meadow, the big woods in the river bottoms, the ancient plants of old dunes along the lakes, they are all part of [Wisconsin's] background and possessions, part of our personal heritage." □

Writer and naturalist Coggin Heeringa lives in Ellison Bay, Wis.

For more information about the Wildflower Pilgrimage event, phone (414) 839-2370 or write The Ridges Sanctuary, P.O. Box 152, Bailey's Harbor 54202.

TAKING

Tech teams provide the expertise to tackle complex issues,

THE TEAM

examine new environmental technology and provide better customer service.

APPROACH

ROBERT QUEEN

Bacteria at work. Sheboygan River muds tainted by PCBs are placed in containers and treated to test how well microbes digest contaminants.

Jack Ferreri

Nature spurns neat categories. And people must deal with nature on its own terms. Often enough, environmental problems and solutions cross the traditional boundaries of science we use to study nature. As state custodians of the natural world, DNR staff must look at these situations in the same way nature does — organically.

During the past five years, the department has tested a new approach for regulating industries that affect the environment in complex ways. The same concept helps evaluate new technology for cleaning up the environment. That concept is the Tech Team, and it allows DNR to tackle issues and work with industries that affect air, water and soil. Without such an integrated approach, single-minded regulations from one program might merely chase pollution from one medium into another: waste incineration can move contaminants from soil to air; landfilling can transfer dangers from soil to groundwater.

From industry's standpoint, dealing with different DNR staff for each of its potential environmental effects creates an untenable business climate, especially in light of differing requirements and changing environmental laws. The Tech Team concept, promoted by Division For Environmental Quality Administrator Lyman Wible, pulled together small groups of experts to manage broad environmental challenges.

Since 1989, DNR has established seven Tech Teams:

- incineration technology
- pulp and paper industries
- asphalt paving industry
- agricultural technology and policy
- salvage yard technology
- bioremediation technology
- energy

Each team included four to a dozen DNR staff members driven by a team leader who has technical background in the area.

The purpose of the teams was to serve as advisors to the DNR as a whole. They were to develop a network of expertise on their industry or business group, develop department positions on problems the different industries raise and serve as DNR outreach to targeted industries.

A sampling of Tech Team activities shows how they work.

Asphalt paving technology

The asphalt industry in Wisconsin provides the raw material for paving highways, runways, driveways and parking lots. Asphalt plants take the remainder from petroleum refining called asphalt cement, a dark, tarry material, and combine this with "aggregate" — any solid, bulky material, often gravel — to make asphalt. Aggregate can include such diverse materials as ground glass, ground tires or contaminated soil. So the final product varies in composition. Ninety five percent of our roads here in Wisconsin and across the country are made with asphalt, which most of us call blacktop.

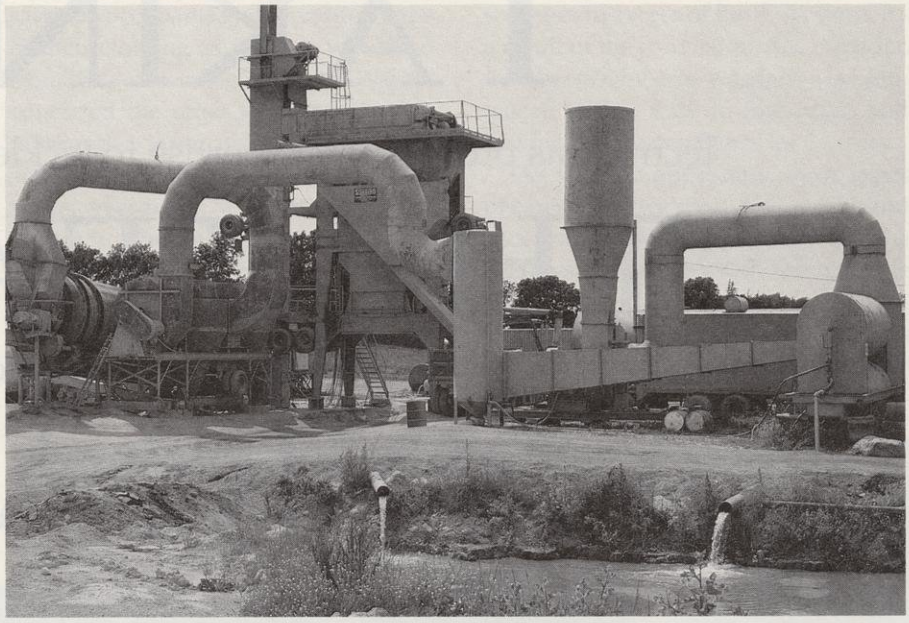
Asphalt manufacturing raises regulatory concerns for air quality, water contamination and soil contamination.

Asphalt manufacturers quickly organized a work group for a meeting of the minds between industry and regulators in January 1989. The Wisconsin Asphalt Pavement Association (WAPA) perceived it was suffering from a flurry of regulatory surprises. The association wanted to work with DNR to meet environmental requirements more easily. The industry had some apprehension about going to the Department of Natural Resources, says Jerry Waelti, WAPA executive director.

"WAPA and the department had been adversaries in the past," he pointed out. "The association's Board of Directors didn't take its approach to the department lightly, but we decided we couldn't bury our head in the sand any longer."

The Asphalt Paving Tech Team includes four members from DNR's air management, solid waste management and environmental analysis staffs. The team serves as an educational outreach arm of the department, working with industry to forewarn when new rules are coming from state and federal authorities and explaining how rules will affect the industry. It's a two-way relationship: the industry can help make rules that are more realistic, will garner higher compliance and will be enforceable; the department provides technical support to help industries better understand complex environmental laws and can draw on the paving industry's experience. For instance, asphalt pavers are adjusting to recent changes in Superfund hazardous waste law, the Clean Air Act amendments and new requirements to control stormwater from industries.

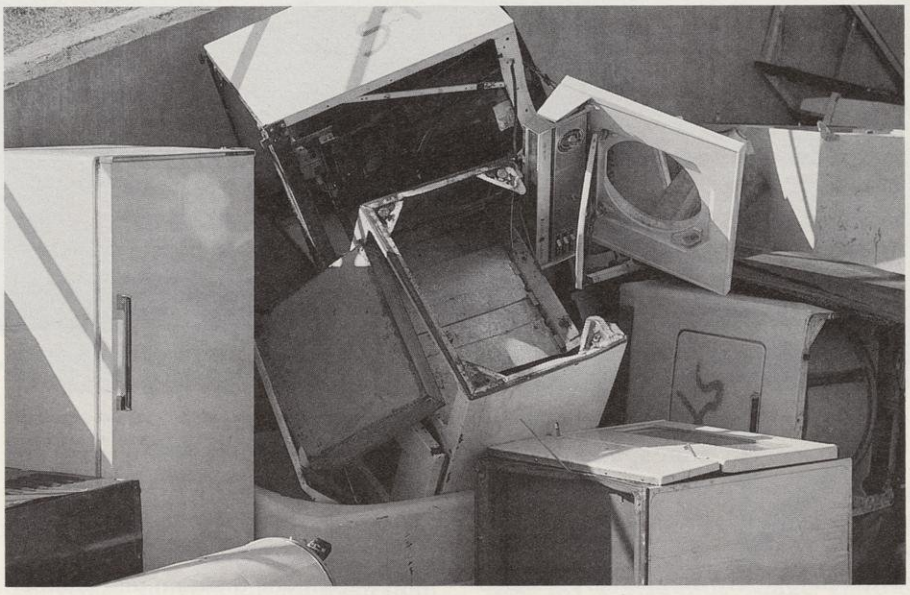
Before the team was established, says Team Leader Lynda Wiese, "the asphalt industry was constantly reacting to new regulations. Our interactions from the Tech Team approach have reduced the



LYNDA WIESE

A batch mix asphalt plant for street and road repairs in Fond du Lac. Both the binders and aggregates vary in blacktop for differing applications. Air and waste emissions vary too, making environmental management tricky.

Some salvage yards only accept metal scrap like old appliances. Others take in automobiles, batteries, electrical parts, liquids and materials that need careful handling to protect the environment.



ROBERT QUEEN

confrontational aspect of our relationship as industry is better informed and better prepared to meet new requirements."

This cooperation led to more informed legislation by the state and better compliance by the industry.

This isn't a matter of compromising standards or short-changing public input, Wiese says, it's simply an issue of developing practical, enforceable, clear legislation.

Wiese even makes presentations at trade meetings of the asphalt industry group, previewing upcoming legislation as well as highlighting the timetable and process for creating new rules.

Jerry Waelti says his member companies feel much more comfortable with DNR staff since Tech Teams were introduced, even though there are more regulations now. "We have a communications link we never had before, and not just with the top people. Now we're able to show the rulemakers 'the other side of the rule.' It makes our lives much easier, and it's really better for everyone."

Energy team

Working with the state's electrical utilities means working with the Public Service Commission. The Department of Natural Resources has a long history of advising the PSC on the environmental tradeoffs in siting proposed power plants and transmission lines, but that doesn't mean the going has been easy. Considering how new plants and lines affect wetlands, floodplains, endangered resources, stormwater and land use, as well as pollutants emitted from power generation, takes a big, broad team of expertise. DNR experts have to focus their skills on complex environmental interactions. Moreover, power companies bring their own experts to the table and their companies are equally deep in staff. At times, the department's answers were incomplete and didn't satisfy the DNR evaluators themselves.

What was needed was on-going, current expertise. People needed to be familiar both with the technologies involved in generating power and the effects each option could have on different portions of the environment. Such a technical team would better present issues the public should consider and provide more comprehensive answers to complex energy questions posed.

The Public Service Commission is charged with projecting and planning state energy needs, guiding the power-producing industry and assuring Wisconsinites of a steady, affordable supply of electrical power. The PSC regulates public utilities and electric operations of many large businesses, like paper mills, that generate their own power. The PSC's latest projections for the 1990-2010 period, dubbed Advance Plan 6, prompted the formation of DNR's Energy Tech Team. The plan anticipates large increases in electrical demand. Specifically, the PSC foresaw the need for seven large power plants and several smaller plants, in addition to energy conservation measures.

The Department of Natural Resource was asked to help forecast how such development might affect the state's environment, including effects on biodiversity — maintaining a diverse mix of plant and animal species.

Since several of the power plants were proposed for northern Wisconsin, merely clearing land to locate plants and power lines could bring enormous changes. The DNR's guidance is aimed at choosing the least intrusive ways to accomplish the goal.

There are also new technologies in play. The DNR, PSC and electric utilities are evaluating whether large scale wind power, solar power and other alternatives are feasible in Wisconsin.

"We view the DNR and the PSC as having complementary authorities," says Team Leader Steve Ugoretz. "We deal with fish and wildlife issues, and environmental quality, so there's truly an interdisciplinary approach. The PSC is more dollars-and-cents oriented, Ugoretz says. "They look at regulatory issues, but they rely on DNR for advice on how options for providing energy may affect the natural world."

DNR staff also have keen interest in some of the alternative fuels being considered. The PSC placed a moratorium on constructing traditional pulverized coal-fired plants, largely because of the Tech Team's recommendations. The team is promoting cleaner fuel options, renewable sources of energy and greater energy conservation.

"Our relationship with the utility companies has become more cooperative, more like a partnership than head-to-head adversarial stances. Over the years, as we collectively reduced sulfur emissions to curtail acid precipitation, we've developed better working relations, Ugoretz says. Mutual respect grew and issues can be discussed more openly now. In fact, the DNR ethic increasingly pervades utility companies from the inside. A number of DNR staffers have taken jobs with the utilities. Their expertise and sensitivity to environmental concerns bode well for the future.

Salvage yard technology

Another area ripe for team action is salvage yards. Regulated by state officials until the late 1970s, salvage yards have been a crucible for the recycling and scrap business for decades. A wide range of activities and businesses carry the label "salvage yard". Some are informal dumping sites. Others are more like warehouses for rare car parts. Currently, the Department of Transportation inspects salvage yards to check on car registrations. Their main regulatory concern is red-flagging chop shops, not environmental protection.

A Tech Team was established because so many kinds of activities and transactions occur under the salvage yard sign. Recycling vehicles and other large scrap can be a messy toxic business: PCBs in electrical transformers need special handling. Cars can release fuels and oils. Electrical parts can leak coolants. Air conditioners can release CFCs. Batteries can be cracked and drained leaving acids and smelting lead cores.

These days, a salvage yard could be "doing business" with DNR's hazardous waste, air management, leaking underground storage tank, waste oil and tire recycling programs, to name a few.

Communities across Wisconsin that are developing recycling programs often rely on salvage yards to market their recyclable materials. In many instances, salvage yard owners are ill-equipped to store and market the large volume of goods the community collects. Too often, these collected materials are stored in the open, exposed to weather or mixed with other scrap, which lessens their value. Other salvage yards accepted large quantities of waste solvents speculating that these materials would become valuable. Then state and federal hazardous waste laws toughened up. Hazardous wastes had to be stored in leak-proof areas and protected from sun and precipitation. Some salvage yard operators couldn't afford to meet these requirements, closed the gate and abandoned these sites. Tax dollars are currently spent recovering these environmental emergencies in the making.

Wisconsin has about 600 licensed auto salvage yards and perhaps 400 other salvagers who take in old appliances, demolition residues and other goods. Rural areas of the state contain many "off the books" salvagers.

Just as nature needs decomposers, society needs to foster a strong salvage industry. Mobile lifestyles and convenience promote lots of dead cars and appliances. We've all seen rural property with cars and castoffs slowly rusting in fields and along fence rows. If we want to move those rusting hulks from the landscape, nearby salvage yards can do the job. They play an integral part in the recycling and scrap business across the country. It's commerce that most citizens never see.

Larger salvage operations generally handle their business and wastes in a reputable manner. But it's a business with a slim profit margin and there are a lot of fringe operators who cut corners. They carefully extract a few valuable parts from large hunks of junk. Since many salvage yards are located on the fringe of development, some operators pour unwanted chemicals and fluids onto the ground, sight and site unseen.

Last November, Len Polczinski, DNR hazardous waste specialist in Green Bay, was part of a four-person team investigating dumping and burning at a salvage yard. The site was a nightmare of spills.

"Generally, when we confront [these operators] with the damage they've done, they calmly reply that they've always done it that way: 'What's the problem?' Then they tell us there are lots of people in the area who are doing exactly the same thing," Polczinski says.

There are plenty of chilling stories. One individual purchased land in northeastern Wisconsin during the winter while it lay deep under a snowy cover. Come spring, the new owner realized he had purchased a salvage yard that was grandly polluted by the previous owner. The former owner had purchased parts of derailed trains and drained a damaged tank car of its tarry contents. He let the material soak into the ground. The water table at this site was a mere 24 inches below the surface. When the new owner started some earthmoving, he discovered another surprise. The former owner had buried an entire tanker truck next door to his business. A simple underground pipeline carried wastes from the shop to the buried tanker and all the wastes simply flowed out of sight.

One way the Salvage Yard Tech Team gets a statewide view of problems is by monitoring tire disposal. As DNR staffers watch how old tires are handled by recyclers, staff keep an eye on more general issues of environmental safety at salvage operations.

Jack Eslien, team member from DNR's Western District says "We generally try to get the operator to handle any cleanup. If not, we can turn to the Attorney General's office to force cleanup. In practice, however, many of these small sites just sit there forever."

DNR receives complaints about salvage operations all the time. While the popular press talks of the hazard of mosquitoes breeding in standing water in tire piles, there are far more important problems looming. The operator at one eastern Wisconsin site visited by DNR staff has been indiscriminately dumping chemicals for years — right across the street from a school.

The Tech Team is looking into diverse recommendations to improve standards at salvage yards. These include cleanup requirements for problem sites, stricter regulations and inspections, and pollution prevention measures that would be required through permits.

Another concern for the team? Burn barrels at rural homes. The mix of home papers, plastic and packaging often produces hazardous waste ash, not to mention air pollution. Backyard barrels don't burn as hot or clean as controlled incinerators, and they concentrate pollutants within a few feet of residences.

Bioremediation tech team

Bioremediation is an exciting concept that has the environmental world buzzing about its future uses. Bioremediation is a managed system for adding biological organisms, usually bacteria, that can consume pollutants and reduce environmental contamination. For instance, some organisms can digest petroleum-based oils leaving water and carbon dioxide as the only residues. The toxic contaminants aren't just moved, they are eaten and transformed into harmless, natural products. In many cases, these bacteria are naturally found at a spill site, but the population of microscopic bugs needs to be nurtured to clean up a spill.

We can't resolve all contamination with natural organisms, but many troublesome pollutants are surprisingly attractive as food for a wide range of bacteria. The problem is getting the bacteria within eating range and keeping the air and temperature levels at ideal conditions.

Spills normally leach into the ground beyond the ability of bacteria to pursue them. So the technological challenge for bioremediation has less to do with manufacturing exotic pollutant-eaters than with standard technologies like evacuating contamination or injecting

substances underground.

Due to the breadth of issues, the Bioremediation Technology Team is DNR's largest. Its 19 members include almost every DNR discipline, state environmental health officials as well as three UW professors from the Bioremediation Environmental Contaminants Consortium.

Team Leader Terry Evanson from DNR's Hazardous Waste Management program points out that the team has a highly-focused goal. "We deal with the regulatory environment. We ensure that regulatory issues don't forestall the innovative use of bioremediation in cleaning up pollution. Companies faced with cleanups were commonly rejecting bioremediation as an approach because its use was burdened with additional regulations. We help businesses understand the regulations at play and suggest regulatory revisions. That's not the same as offering operators carte blanche use of this new technology."

DNR PHOTO

The environmental price of building new power plants should include construction site concerns, effects from transporting fuel to the plant, emissions and the consequences of routing transmission lines to customers.

Bioremediation has become a hot topic as industry and government search for more economical methods of treating pollution. Current technologies have proven extremely expensive and time-consuming. And tough federal regulations, like the Superfund amendments, ensure thousands of cleanups will be needed in future years.

Bioremediation appears more cost-effective, because pollutants may not have to be moved to be controlled, but it's too soon to tell. Experts worldwide are just ascending the learning curve on the capabilities of bioremediation. Large companies like General Electric and Exxon have spent millions in bioremediation research. And former EPA Administrator, William K, Reilly, actively promoted the promise bioremediation may bring.

Bacterial grime fighters are not a panacea. Many technical problems remain unsolved in bringing bacteria into actual contact with pollutants. And bacteria are fragile; they die easily in the wrong environment.

Some environmental consultants have touted bioremediation so highly that it has led to false optimism. Potential users are led to believe you just need to pour the bacteria over a contaminated site and move on to the next problem. The technology is nowhere near that simple or that inexpensive.

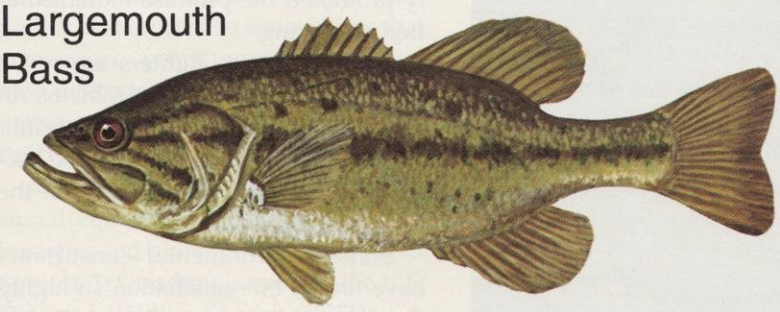
As people continually learn new ways to appreciate the interconnectedness of the natural world, so too we must recognize that safeguarding our world requires the close interaction of diverse specialties. Versatile, compact and technically-skilled DNR Tech Teams represent an innovative attempt to harness our knowledge to improve the state of the environment. □

Jack Ferreri is a free-lance writer living in Verona, Wis.

Fish to tempt your palette

Enjoy this coloring poster. On one side you can trail a largemouth bass common to our lakes. On the other, a native brook trout nearly leaps off the page. Will it be caught on the tempting fly? Let your imagination fill in the scene and the story.

Largemouth Bass

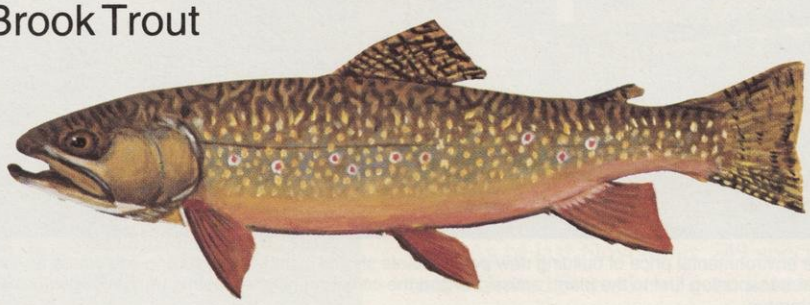


VIRGIL BECK

Whether you color with paint, pencil, crayon or marker, reach for the golds, yellows, greens and browns. Toss in a few iridescent colors, too.

The largemouth's eye is golden brown with a dark center surrounded by a golden halo. Its back is arrayed in patterns of darker green and olive to whitish just under the pectoral fins. The lateral line, back and stripes near the eye are all dark brown to black. Fins and tail are olive to brown with darker rays. Tip the lower fins, gill plates and jaw with a silvery white highlight.

Brook Trout



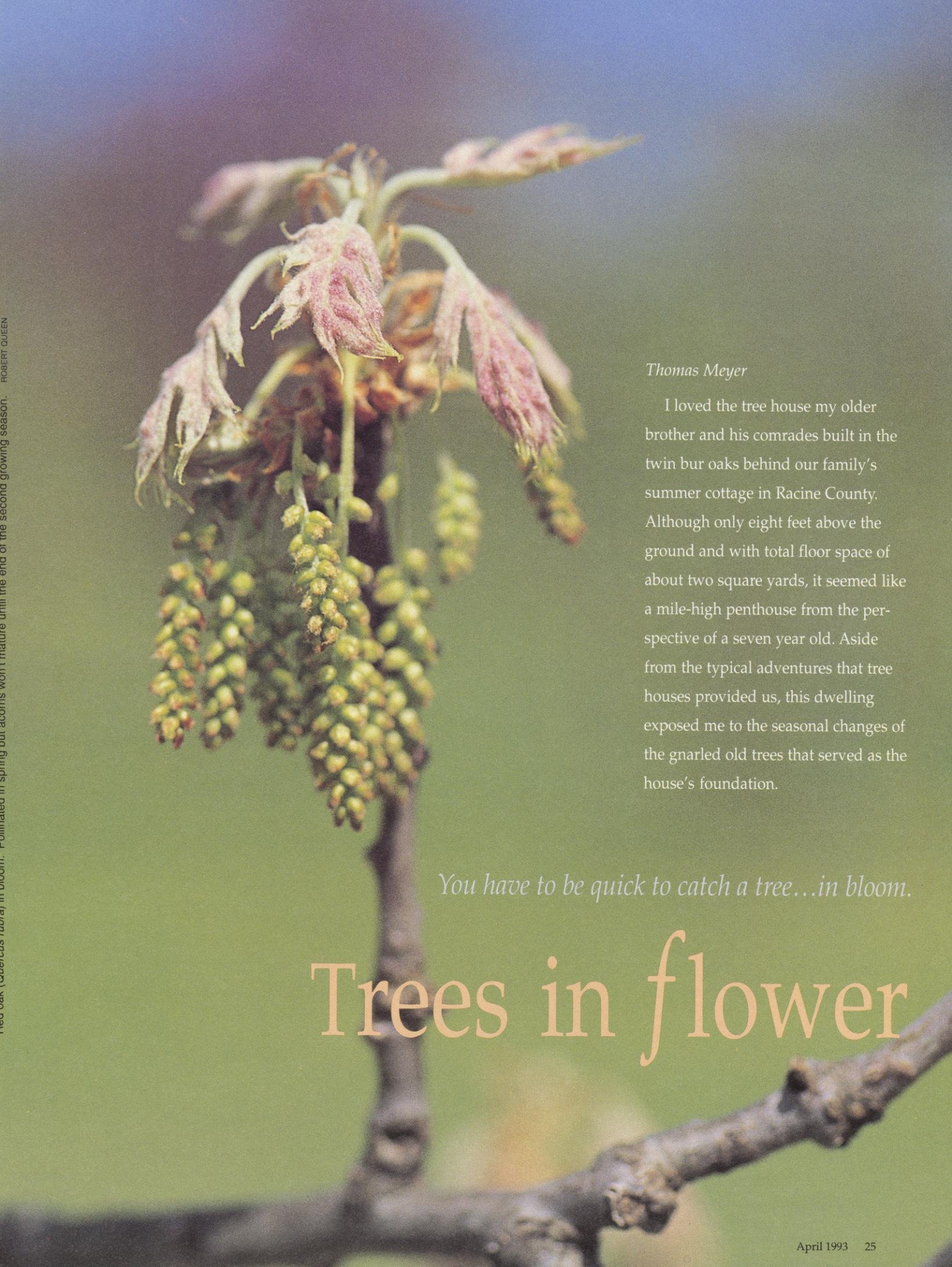
VIRGIL BECK

The brook trout, our native stream trout, has a brownish to dark-green back that grades to medium green, then brownish-red, then a white, almost silvery, belly. The back has squiggled golden patterns. The sides have beautiful light splotches of color, some red encircled with a pastel blue. The lower fins are red with a white leading edge trimmed in black.

These two fish species grow in very different environments, yet they share the same basic need for food, shelter from predators, habitat and clean water. Fish encounter many obstacles and hazards on their way to adulthood. Predation, disease, and changing environment claim most fish before they reach spawning age. Good fishing depends on mature fish to reproduce and sustain the population. You can help care for our fisheries by practicing catch-and-release fishing. The fish you put back *can* make a difference.

On Sunday, June 6, join us as the Department of Natural Resources offers free admission to all state parks and free fishing all day. Fishing clinics and demonstrations will be offered at many parks throughout the state. Children can also share their artistic talents by joining in a Fish & Fun Coloring Contest at Lake Kegonsa, Council Grounds, Pike Lake, Lake Wissota, Rib Mountain, Merrick, Whitefish Dunes, and Kohler-Andrae state parks and the Bong Recreation Area. (Other sites may be added between now and June 6th.) Children under the age of 12 who visit these parks will receive crayons and copies of this fishing poster to color between 9 a.m. to 1 p.m. Prizes will be awarded at 2 p.m. at each participating park.

Call (608) 266-2272 for more information about Free Fishing Day activities at the park nearest you.



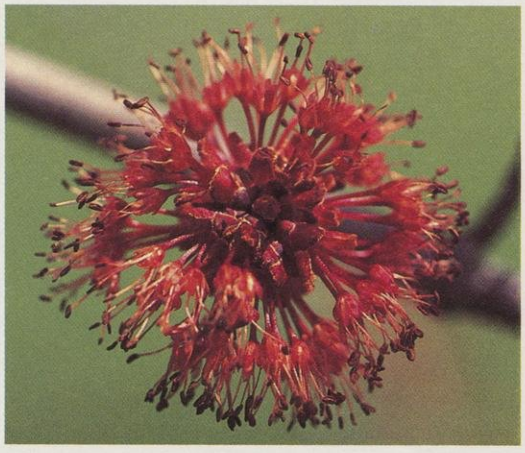
Red oak (*Quercus rubra*) in bloom. Pollinated in spring but acorns won't mature until the end of the second growing season. ROBERT QUEEN

You have to be quick to catch a tree…in bloom.

Trees in flower

Thomas Meyer

I loved the tree house my older brother and his comrades built in the twin bur oaks behind our family's summer cottage in Racine County. Although only eight feet above the ground and with total floor space of about two square yards, it seemed like a mile-high penthouse from the perspective of a seven year old. Aside from the typical adventures that tree houses provided us, this dwelling exposed me to the seasonal changes of the gnarled old trees that served as the house's foundation.



PHOTOS THIS PAGE BY ROBERT QUEEN

THOMAS MEYER

The elegant inflorescence of the shagbark hickory (*Carya ovata*).

From mid-May to October, the corky-barked twigs jutting in the windows and through gaps in the floorboards yielded small lessons in the life cycle of the oaks. In spring, I watched the first buds break open, followed by unfolding leaf blades and acorn formation. In autumn, I enjoyed the changing leaf color and playing in the fallen leaves.

What fascinated me most were the feathery structures that emerged in mid-May and then soon fell off. I didn't really know what they were. I sure knew what they were not — not large, not colorful, not sweet-smelling. No wonder I didn't associate those greenish, scraggly things with flowers, but that's what they were.

Even as adults, I suspect many of us remain unaware of the reproductive frenzy that trees engage in each spring and summer. We mistake the first soft pastels of April's trees with young leaves, but we're likely seeing flower-adorned twigs.

(clockwise from upper left) Sugar maple (*Acer saccharum*), weeping willow (*Salix babylonica*), tamarack (*Larix laricina*) and silver maple (*Acer saccharinum*).

Tree flowers make for interesting study and are an excellent feature to note when identifying different species; the flowers are less variable than leaves, twigs, bark or growth habit. One drawback to studying tree flowers, however, is that it can be tough to get a close look!

The purpose of tree flowers, of course, is to produce seeds and reproduce. No one species has the perfect strategy, but many are tried to successfully transfer pollen by weather, animals and insects. Some trees bear millions of seeds over their lifetimes in an attempt to produce at least one offspring to carry on the parent tree's lineage.

Trees typically flower when they are older, following the first active spell of rapid growth. A tree's first few years are spent growing quickly in an attempt to dominate its competitors. Then it diverts energy to produce seed and sustain its species.

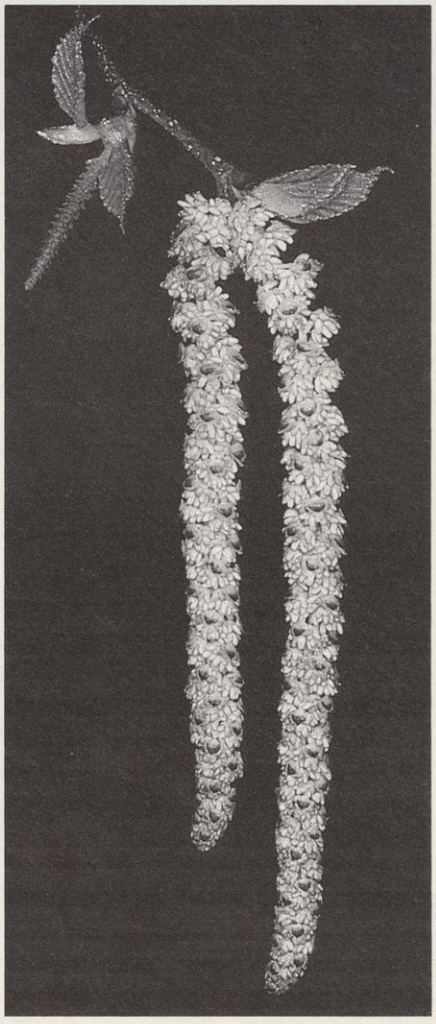
How vigorously a tree flowers often relates to growing conditions during the previous year when flower buds formed. Sometimes heavy flower and seed production is periodic. For example, a white oak may invest a great deal of energy and nutrients in a given year producing abundant flowers and a large acorn crop. It builds up its reserves in intervening years, producing smaller crops. (A year of heavy acorn production is known as a "mast year" and is a boon for wildlife!)

The flowers of Wisconsin's street and forest trees can be categorized by the strategy they use to accomplish pollination. Some cast their fate to the wind, some rely on insects, and a few (the willows, for example) use both.

If you recall the wall charts in your high school biology classroom, in or-

(*above*)The ornamental flowering crabs are bred for their beautiful, relatively long-lasting flowers and sweet aroma. They keep the bees busy.

(*below*) Long catkins of paper birch (*Betula papyrifera*) wait for a breeze to shower pollen.



THOMAS MEYER

der for a flower to produce a seed, pollen produced from the male flower part (the stamen) must be received by the female part (the pistil). The fertilized female flower develops into a seed, or seeds, encased in a fruit such as an acorn, apple, hickory nut or the helicopter-like samara of a maple.

Wind-pollinated tree flowers aren't very attractive. They don't have to be. They use the "shotgun" approach to pollination; the pollen hitches a ride on the wind and is scattered over a wide area. Among Wisconsin trees that use this strategy are the oaks, elms, ashes, hickories, aspens, birches, walnuts and most maples. Since these trees don't have to attract insects, their flowers are rather drab in appearance, and lack nectar or a sweet smell. Several species bear their flowers in long, slender clusters called catkins, which hang from twigs fully exposed to the spring breezes. The catkins typically emerge before or at the same time as the leaves. Male flowers are often produced in greater number than female flowers and, in turn, produce a large amount of pollen. Those who suffer from tree pollen allergies are good barometers of when and how much pollen is flying.

All conifers — the spruces, pines, etc.— are also wind-pollinated. Some produce huge golden clouds of pollen visible to the naked eye. However, the reproductive structure of conifers, the "cone", doesn't really fit the botanical definition of a flower because the seed is not enclosed in an ovary and other flower parts are absent.

In contrast to the shotgun approach, insect-pollinated species use a "sharpshooter" strategy. Species such as black cherry, Norway maple, black locust and basswood attract insects by visual displays — large, showy flower petals — or alluring fragrances. These flowers depend on insects (usually a bee, fly, butterfly or moth) to directly deposit pollen. The insect typically gets a reward of nectar, then moves to the next flower, spreading pollen as it goes.

It's all a fascinating but short process that's over before most of us know it started. The tree moves on to making leaves and collecting sunshine that will fuel further growth.

Although my brother's tree house long ago collapsed from neglect, I still visit our family retreat, marveling at the changing seasons and keeping an eye peeled on those twin bur oaks for those darn feathery things each spring! □

Biologist Thomas Meyer helps compile the state Natural Heritage Inventory of rare plants, animal and natural communities for DNR's Bureau of Endangered Resources. He and his family occasionally climb trees near their rural Mount Horeb home.

Continued from page 2

In accepting the seed, Junzhen expressed gratitude for "your deep concern over the disaster." Wisconsin, he said, had friendly relations with the province and "the forest that grows from these seeds will be a lasting symbol of our friendship." A five-year exchange of natural resources expertise grew with those seeds.

Foresters from the United States consulted with Chinese foresters on the tree types that would grow best in the province. The Society of American Foresters helped organize the seed gift from many American states.

"Based on their (Chinese foresters) evaluations and our best educated guess, we sent them jack pine," said John Borkenhagen, superintendent of the Hayward nursery. "Jack pine closely resembled the pine type destroyed by the fire. In this mountainous region with a cool climate and about 28 inches of rainfall each year, jack pine was expected to do well. In the long run, we hoped this gift would improve their forestry program," he said. "In the short run, it was a good will gesture between countries."

Researchers in Latvia wondered if certain tree types from the United States would take to Latvian soils and climatic conditions as well as Latvian trees have done here. European larches (a close relative of our native tamarack) and Norway spruce have both been introduced from Latvian forests for landscaping in Wisconsin. On some soil types, the larches grow faster and are more drought-resistant than tamarack.

A quarter-pound each of seeds from Wisconsin red pine, white pine, jack pine, white spruce and Norway spruce were sent for field trials to the Latvia University of Agriculture in Jelgava. Studies will measure growth rates and hardiness. Such experiments are commonplace in the forestry and agricultural business, Borkenhagen said. The end product could be new tree varieties that grow well in the country.

Species diversity improves the overall health of the forest, limits the spread of insects and disease, and provides economic benefits. Borkenhagen said it will take several growth rotations before the Latvian plantings can be fully evaluated. "Even in Wisconsin, we're experimenting with Southern Appalachian White Pine," he said. "They grow faster than our native white pine." He added that state foresters don't aim to displace native tree species, only to add to and improve the existing forest base.

DNR Conservation Pilot Fred Kruger took a special interest in Icelandic forestry while on military duty at Iceland's Keflavik Naval Air Station. Kruger was part of a team that wanted to plant trees on the base as part of a beautification project. Iceland's young volcanic soils lacked nutrients to support a wide variety of trees. Growing conditions in Iceland were quite different, too. At the military base, temperatures fluctuated in a narrow range from an average 32°F in January to a high of 51°F in July. This northern clime receives almost 24 hours a day of sunlight in July and very little sunlight in winter. Moreover, wind blows at a nearly constant 20 mph.

Kruger worked with his contacts at DNR to forward soil samples from the base for analysis by soil scientist Jaya Iyer at UW-Madison. Eventually, 500 seedlings each of hard maple, red oak, white ash and green ash were forwarded with more than 300 pounds of phosphate, potash and nitrogen fertilizer. One-pound bags of red pine, white cedar and white spruce seeds were donated for good measure. The seeds alone could grow half a million trees in Iceland, Borkenhagen said.

Seeds and seedlings got a send-off at the DNR nursery as part of Hayward fourth-grade Arbor Day celebrations. Prior to the send-off, students studied Icelandic culture and geography. Along with the trees, students sent a scrapbook depicting drawings of Wisconsin forests. In turn, they were later treated to a video of the Icelandic students planting the trees and seeds.

In Iceland, fourth graders from the naval station school planted 450 trees on the grounds. On the Fourth of July, officers and enlisted personnel distributed seeds and planting instructions to Icelandic visitors at an open house. Remaining seeds will be nurtured at the base greenhouse which is warmed by volcanic heat. This spring, seedlings will be given to Icelandic fourth graders to transplant trees as well as the American custom of Arbor Day.

Tree gifts and exchanges are part of the state's program to promote public awareness of forestry. Amid the billions of seeds and millions of seedlings produced annually at the nursery, only a small fraction go to the program. In his 35 years in the forestry and nursery business, Borkenhagen has consistently encouraged using trees as a medium for good will and education, as well as reforestation. Part of that program offers each fourth grader in Wisconsin the chance to plant a tree in a back yard or woodlot on Arbor Day.

JIM BISHOP

John Borkenhagen, Hayward Nursery superintendent, used spare seeds and seedlings to foster diplomacy in China, Latvia and Iceland.

"As opportunities arise, we take similar steps with other countries or states, just as we encourage technology transfer between countries and states," Borkenhagen said.

Who knows. A few years from now Wisconsin tourists in northern China, central Latvia or Iceland could remark "You know, those trees look a lot like the trees back home." □

Jim Bishop is DNR's public information specialist for the Northwest District headquartered in Spooner, Wis.

Readers Write

OVERPOPULATION AND OVERCONSUMPTION

Most articles on the environment never mention growing population as a problem. Thank you for doing so in *Assignment Abroad* in the December issue.

True, we are hypocritical in telling Third World countries to slow their population rates when we use and waste so many resources. But I think for anyone to equate overconsumption with overpopulation is ridiculous. We can more easily cut our consumption in half. Having four children instead of two [has more serious consequences]. Overpopulation is a more direct cause of creeping deserts and disappearing forests.

Fern Hammond
Menomonie, Wis

INDEX FOR OLD ISSUES?

I just received the February 1993 issue and was talking to my father about it. It came to our attention that I'm the third generation in our family to receive the magazine and the former *Wisconsin Conservation Bulletin.*

When I started college at Stevens Point, my dad donated his early issues to the U.W. Then and now, we consider the magazine an excellent resource. Maybe the Department of Natural Resources could print an index of all the published articles for reference use.

Tom Gustin
Amherst Junction, Wis

We have a subject/author index for our issues of Wisconsin Natural resources since 1977. A complete subject/author index of the Wisconsin Conservation Bulletin (1936 - 77) and its predecessor Wisconsin Conservationist (1929 -35) would be quite an undertaking. Anyone who has either completed this or is interested in taking on the task is encouraged to contact us at the editorial office.

EXPLORING CLOSE TO HOME

We received our first issue last June and are most pleased with the magazine. In years past we've visited each of the 50 states, most Canadian provinces and have toured in Mexico, Israel, Germany and Switzerland. Now comes your publication with articles on interesting spots to visit in our own Badger State!

Isabel Hintzman
Menomonie, Wis.

A FURY OVER FURBEARERS

The series on *Furbearers of the Northwoods* has been a treat to read. However, the term "fur-bearing mammal" is anthropocentric and redundant. We don't discuss "feather-bearing birds" or "scale-bearing fish"! I find it ironic that the cover shows a mammal that is not trapped for its fur. Is it a non-fur-bearing furry mammal? Let's stop thinking of animals in terms of what we can kill them for, and start thinking of them in terms of their unique roles within the communities they inhabit.

Eric Ribbens
Ecology/Evolutionary Biology
University of Connecticut
Storrs, Conn.

MALARIA'S REIGN

I found your August article "Plants that heal" very interesting, but the portrayal of malaria disturbed me. I would like to inform your readers that malaria's reign has definitely not ended. Each year between 200-300 million people are affected by the disease and it remains the number one killer in the world.

Anti-malarial drugs, such as chloroquine, are not foolproof as more and more malaria parasites are becoming resistant to them. These drugs also have a wide range of side effects and are not recommended for long term use. Thus, temperate region travelers may feel satisfied with their reduced risk of infection, while millions in the tropics continue to die of malaria every year.

It's easy to be unaware of problems outside of your own back yard. One can only hope scientists are not overlooking this persistent tropical disease.

Jean V. Adams
Menyauya Morobe Province
Papua, New Guinea

PARKS BOOK

I noticed a few of the December writers were interested in having an article on state parks in every issue. This brought to mind the May/June 1984 issue that devoted its entire contents to all state parks. I still have my copy and think it would be a good idea to update it or make a booklet out of it.

Frank Hodge
La Crosse, Wis.

Frank, our parks folks are pleased to have another opportunity to tell readers that the 128-page Traveler's Guide to Wisconsin State Parks and Forests *was updated, bound in book form and printed in 1989. You can order a copy for $10.95, including shipping charges, from DNR Bureau of Parks and Recreation, P.O. Box 7921, Madison, WI 53707.*

CLEARING THE AIR

Your December article, "Clearing the air," was well written and informative, but it dwelt a great deal with the pollution caused by cars. Nothing was pointed out about the pollution from heavy equipment and vehicles. Many times I see 18-wheelers, road building equipment and other diesel-powered vehicles spewing out black clouds of smoke. These big diesel engines should be monitored the same as cars are.

George M. Adams
Waupaca, Wis.

Most people find diesel smoke more offensive than auto exhaust. However, federal laws first restricted the pollutants in car exhaust because these pollutants were linked to more serious health problems. Also, trucking, manufacturing and urban bus interests successfully convinced Congress that it was more important to clean up exhaust from widely-used cars than emissions from a relatively smaller number of trucks, buses and heavy machines.

Both cars and truck exhausts are restricted under the Clean Air Act, but they meet different rules because they contain different products.

Diesel truck exhaust primarily contains particulates (carbon), unburned hydrocarbons and nitrogen oxides. The inky exhaust we see and smell is primarily carbon particles coated with small amounts of unburned fuel and combustion by-products. Some of these polyaromatic hydrocarbons (POH) are indeed toxic, but the amounts are relatively small. Health experts get concerned over how deeply pollutants penetrate sensitive lung tissue if inhaled. Diesel fuel particles are relatively large and get trapped in the nose and throat before they are deeply inhaled.

Auto exhaust from burning gasoline is higher in lightweight hydrocarbons, carbon monoxide and nitrogen oxides. Carbon monoxide is poisonous and the

other compounds contribute to ozone pollution.

The technology for containing pollution in car exhaust has been improved five or six times during the last 20 years. On the other hand, pollution controls on diesel engines have received much less attention. The new Clean Air Act revisions we discussed in our last issue start to balance out controls on cars and trucks. Fuel manufacturers will have to reformulate diesel fuel to reduce sulfur content. That important step will prompt engine modifications and better tuning that should lead to better emission controls and more complete combustion in diesel engines. New buses, for instance, emit far fewer visible pollutants than older models.

Subsequent revisions to air pollution controls will seek national limits on air toxicants, the kinds of compounds more prevalent in diesel exhaust. Meanwhile, we are unlikely to see further restrictions on diesel exhaust until the 1992 law is carried out. If diesel engines are subsequently tested, regulators will be interested in cutting nitrogen oxide emissions more than particulates. States surrounding Lake Michigan could require tailpipe tests on diesel trucks as a strategy for reducing ozone.

Your December article "Clearing the air" makes me optimistic about cleaner air in Wisconsin's future. Even though the Clean Air Act hits close to home, it doesn't hit close enough. We still have people faithfully getting their car emissions tested, returning home and breathing foul air from being downwind of a neighbor's woodburner or burn barrel.

If clean air is the issue, the time has come to deal with these pollution sources as well.

J.E. Billmann
West Bend, Wis.

CLARIFICATIONS AND CORRECTIONS

We've got a little air clearing to do here from the editor's desk, too. Our December discussion on trading sulfur dioxide pollution credits needs clarifying. The system designed to limit sulfur dioxide emissions through the reduction and sales of pollution credits only applies to utilities that provide power to businesses. Individual businesses will not directly find their sulfur emissions capped and subject to pollution trading requirements.
*Page two. The February story on fishers (p.20) unfortunately carries a photo of a pine marten (*Martes americana*) at the top of the page. Below is a photograph of an adult fisher (*Martes pennanti*). Rest assured that the biologists who study these animals and contributed to this series know their fishers from their pine martens. It takes an editor to mix up his weasels. We apologize to the researchers and our readers.*
Page three. Traveler mentioned Free Fishing Day and State Parks Open House as falling on Saturday, June 6, but Saturday is June 5th. On which day can you enjoy free fishing and admission to State Parks? Sunday, June 6th.

Fisher (*Martes pennanti*).

LYNN ROGERS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