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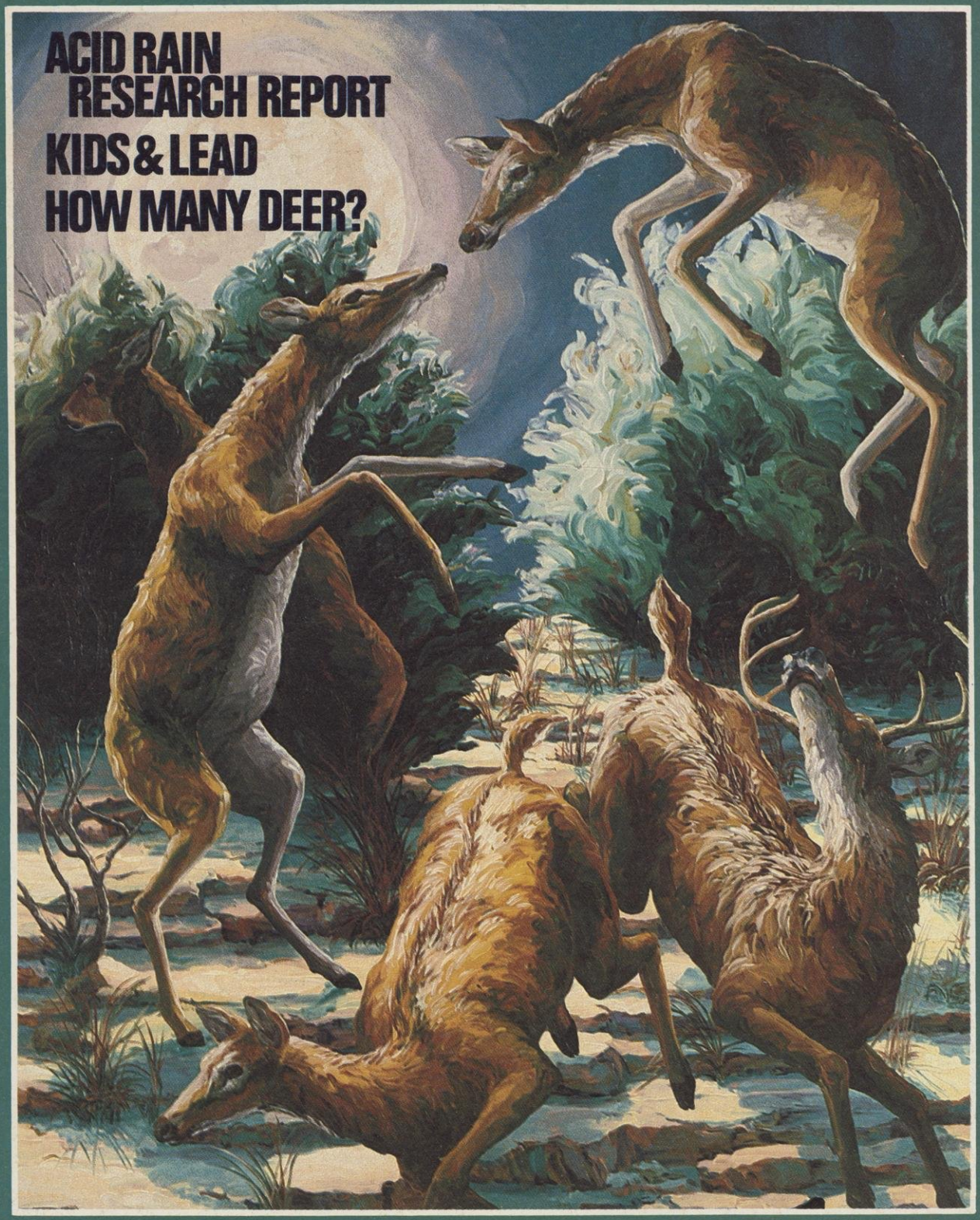
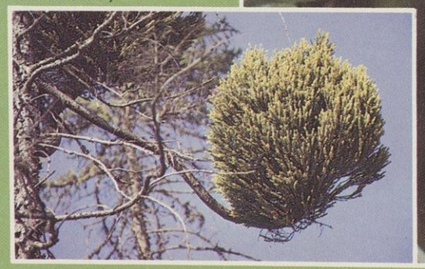


Dwarf mistletoe berries.
Photo by John Kohout.

Christmas Mistletoe.
Courtesy of the Wisconsin State Historical Society.



Witches broom. Photo by Thomas H. Nicholes.

Wisconsin's dwarf mistletoe (*Arceuthobium pusillum*) growing on black spruce.
Photo by Thomas H. Nicholes.

A mistletoe for the Elves

ROBERT H. READ
DNR Ecologist, Bureau of Environmental Analysis and Review, Madison

Yes Virginia, there is a mistletoe in Wisconsin, but it's so small you'd have to be knee-high to one of Santa's elves to find it. Called dwarf mistletoe (Arceuthobium pusillum), ours is related to the traditional plant of the Old World, but in appearance and habit is worlds apart. One of some 28 species of dwarf mistletoes distributed mainly in the western United States and into Mexico, ours occurs as a parasite of black (and occasionally white) spruce in northern wetland habitats. It is among our smallest vascular plant, the entire plant rarely exceeding 12 millimeters tall and therefore usually hidden among the spruce needles. Since it is a parasite on spruce, dwarf mistletoe has no need for green leaves to produce food, and indeed the leaves have been reduced to tiny scales. It appears as hardly more than a bump on a branch.

To the forester, however, dwarf mistletoe is one of the main black spruce diseases. The parasitic nature of the plant weakens normal growth, deforms the tree, and may lead to death in severe infestations. Despite the diminutive size of dwarf mistletoe, one can often tell an infected spruce from afar by its "witches' brooms." Growth of these cluttered masses of spruce twigs and branches is stimulated by the parasite infection.

Dwarf mistletoe's seed dispersal is hard to believe for so mundane a plant. Seeds are ejected from the ellipsoid fruit at about 90 feet per second. That's over 60 miles per hour! At that rate they can travel up to 50 feet. The seeds are sticky and readily adhere to whatever they hit, which may be an unfortunate spruce. Birds have also been implicated in long distance dispersal where the seeds stick to their feet as they fly from tree to tree.

The mythology and folklore connected to the European mistletoe (which has evergreen leaves, white berries, and grows parasitically on oaks) is so extensive it could fill the rest of this magazine. The custom of Christmas kissing under the mistletoe apparently originates in Norse mythology where the Goddess Frigga made it a symbol of love after it caused an accidental death and promised to bestow a kiss on all who passed beneath it. Whoever originated the custom, I like it, although I agree with the late naturalist E. Laurence Palmer, who stated "License to kiss under a mistletoe at Christmas has its possibilities and penalties."

Cover:
"Untitled" (1984) by Artist Melissa Miller, courtesy of the Holly Solomon and Texas galleries, New York City. This modern oil on linen says something about nature very different from customary renderings of deer in the wild.

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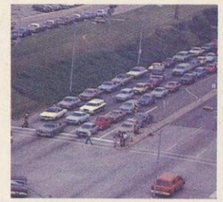

Features

THE ACID TEST

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Deer and the #!$%# DNR

Deer is a fighting word and DNR is usually caught in the middle.

W. JEFFREY SMOLLER, Director, Bureau of Information and Education, Madison

The newscaster had one of those "get ready for bad news" expressions:

"There may be fewer deer for this year's hunting season," she said. "DNR officials say 25 to 30% of the state's population was wiped out by last winter's deep snow and bitter cold."

Oops! Wait a minute! That's not right! Last winter wasn't all that bad. And Wisconsin has more deer than Georgia has gnats!

Turned out there was a mistake, an honest and understandable one, but it sent waves of laughter through rural Wisconsin.

"There goes DNR again!"

The whitetail deer had once more proved that it's a biologist's challenge and a public information nightmare.

The report was accurate, but only to a point, a point about 300 miles north of Madison. In several limited areas of Douglas and Bayfield counties, the winter had been especially tough. The snow came early. The cold persisted. The herd suffered. But for the rest of the state — especially the south — deer were abundant, so abundant that some farmers got the feeling they were spending more feeding the state's official wildlife animal than its official domestic animal.

The news story got straightened out, but not without some loss of DNR credibility. The next day newspapers reported DNR under attack in the legislature for allowing rifle deer hunting in Buffalo County. It also reported DNR in the middle of the Indian hunting and fishing rights controversy.

Deer and DNR it seems are everybody's favorite topic!

The "good old days" of deer management in Wisconsin where the state simply set the season and hunters sat back to enjoy the hunt are long gone. Today it is a complex, controversial, sometimes no-holds-barred biological-socio-economic and political Olympics where interests and experts vie for position and reward. And DNR, whether it wants to or not, enters each event.

Keeping the public informed about deer management in Wisconsin no longer amounts to merely a pre-season forecast and post-season tally. It is a 12-month a year contest of ideas, biases, traditions, perspectives and beliefs — scientific and unscientific. DNR is involved, right in the middle, whether it wants to be or not, taking shots from all sides.

Nationally, Wisconsin's deer management program is recognized as the best and its researchers are looked to for advice and counsel nationwide. Yet, much like prophets in their own time, here at home DNR people and DNR as an organization are often unrecognized. They are caught in the controversial winds of the Wisconsin deer mystique. Opinions are nearly as numerous as the state's 4.7-million citizens and hardly anyone, it seems, hesitates to express them.

Take the number of quota permits, for example. You might want to keep the antlerless kill down if you're a hunter. "Don't jeopardize the future." If you're a farmer, the more the better. If you're a farmer-hunter. Well...

Then there's hunter's choice preference. If you applied and failed to get a hunter's choice permit last year, the law says you have preference. But in some units the number of applications is so great you may never get a permit. It's hard to explain — hard to accept, for some.

Or take landowner preference for antlerless permits. Many hunters don't like it. Deer are for all the people, they say. But farmers generally favor preference. Who feeds the deer they ask? The farmers! But what about urban hunters who own a 40? Preference? You bet! But make sure the farmers aren't the only ones who get it.

And the list goes on:

GROUP HUNTING — Controversial in DNR, among the people and in the legislature. It's a new law and must be enforced. Its impact on behavior: unknown; impact on the herd: uncertain.

TROPHY HUNTING VS. MEAT HUNTING — Traditional pursuit of the big buck that is hard to find vs. the antlerless animals and young bucks that are almost too abundant. If there are fewer of both, what will the satisfaction level be?

ETHICS AND HUNTER CONDUCT — Seemingly many complaints but few solutions. And with the hunting public

Some farmers get the feeling they spend more time feeding the state's official wildlife animal than its domestic animal. Cartoon by Virgil Beck, Box 66, Stevens Point, WI 54481.

ostensibly increasingly removed from the land — there are a lot of two-day hunters in Wisconsin — how can ethics and outdoor respect be instilled?

INDIAN RIGHTS — DNR is required to implement an important court decision and, in keeping with past practice, is attempting to work with all sides. Yet many find the extended hunting rights and related safety issues difficult to accept.

BOW-GUN — DNR will find itself, sometime in the not-too-distant future, in the middle of a controversy over the rights of the bow hunter vs. gun hunter. This could become especially bitter if the southern herd is knocked down and the past abundance turns to more reasonable (but lesser) levels.

MANDATORY TRAINING — With DNR support, the legislature has enacted mandatory hunter training. How will new hunters take to that? Will there be enough instructors and will some prospective hunters be turned away by the requirements?

CROP DAMAGE — How bad is it? How can it be documented? Who pays for it and how can the hunter's interest in access be pursued? Does DNR pay?

SHOOTING PERMITS — How is need defined? What should the relationship be between granting a permit and deer numbers, access to land, local hunters, local officials, mitigation practices, etc.?

NEW TRESPASS LAW — DNR doesn't enforce trespass laws; that's a local law enforcement responsibility. But trespass is a problem and the new law will result in some unhappy experiences. Will DNR be blamed?

THE TYVAC DEER TAG — Never mind that the metal tags were expensive duds, and that other states have successfully used tyvacs. There still is opposition. And what will happen this year when the new law on tagging is enforced?

EARLY NORTHERN SEASON — Someone should do a public relations case study on the abortive zone concept floated in 1975-76. A how not-to study. With some nice bucks stalking several northern units and the desirability of an early hunt, especially for people familiar with the local area, this is probably a good idea. But not without pitfalls.

CAR KILLS — Every dead deer along any highway is a statement about DNR. Under an encouraging, new system that has contractors pick up the deer, the length of time the carcass lies there has been cut; but not long enough for some; and DNR gets criticized.

SHOTGUN-RIFLE — This year it was Buffalo County, but there have been and will be others. Safety, esthetics, tradition: all points are argued; facts are confused; tempers short. With an increasingly populated (diffused) state, the prospect for rifle?

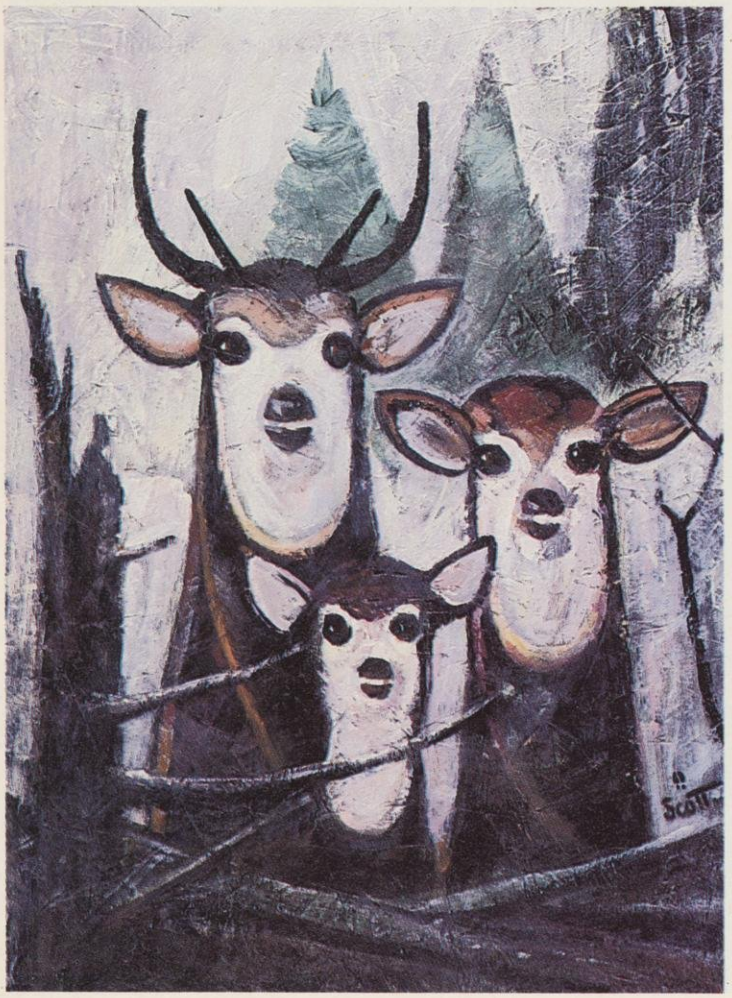
REVENUE — The hunter has paid; the hunter pays. The deer are managed and conservation laws enforced by highly trained wardens. Yet the need far outstrips resources. So how will the herd be managed in the future and what will be the hunter's feeling about continued financing of his or her sport?

COMPLEX RULES — Harder to understand than the 55 mile per hour speed limit, but slightly less complex than corporate tax law, deer regulations are drafted in perhaps the most public and participatory process known to state government. Yet, get caught breaking one of those laws and it's the [%$#&@ DNR.

FOREST CROP CHANGES — The state pays money to landowners to raise trees, which can provide deer habitat. If a landowner receives state funds, does he or she have the obligation to allow hunting? Different and strong views, and DNR in the middle, again.

WINTER MORTALITY — No winter is the same; climate changes. Deer die. Sometimes many. Artificial feeding is controversial. Public emotions are involved. It's not easy to say "no!"

LONG TERM HERD OUTLOOK — There will be fewer deer. Not a shortage, but fewer. So how many meat hunters and how many esthetic hunters are there? And if satisfaction means meat in the freezer and Wisconsin hunters are not satisfied, who's to blame? Guess.



Problems all. Painting by Artist Robert Scott, Box 43, Hales Corners, WI 53130.

Each month of the year seems to bring another dispute, another decision point, another unresolved issue surrounding deer management in Wisconsin. Each year changing views and values result in new proposals, new laws, new controversy. People have their own perspective on these, their own biases. But DNR's job is to back off and try to determine what's in the best interest of the whole state, the entire resource. Doing this can make life complex and exciting for DNR and its deer managers and for public information personnel. But the people are always interested and the effort to balance all their different viewpoints into state policy is important. DNR gladly accepts the responsibility and realizes that the hectic part comes with the territory. But it would be nice if those #@%*%[expletives were deleted. They don't do a thing for our image!

A Milwaukee program to prevent ingestion of leaded paint is working.

Get the lead out

Lead in very small doses can cause brain damage in children. Because of this, DNR monitors lead in seven cities and EPA wants to cut back its use in gasoline.

CAROL GANNON, Medical Technologist, Department of Health and Social Services

Contributing authors: SHEENA CAREY, JEANNE SOLLEN, DNR Public Information

In the early 1970s, widespread reports of children being admitted to hospitals, comatose and dying due to exposure to lead, prompted an all-out attack on lead-based paint poisoning.

Screening and treatment programs were established. Buildings were refinished with no-lead paint. Lead in paint was drastically reduced.

Now, a decade later, lead poisoning causes few deaths. None has been reported in Wisconsin in 10 years. That's progress. But not victory. New evidence suggests an insidious lead contamination. Disguised and delayed, it can cause mental retardation or reduced mental capacity.

"Lead won't kill these kids," says one researcher. "It will make them a little dumber, make life a little harder."

It will also make society poorer — in terms of the lost human potential, lost productivity and costly special education programs. One estimate suggests lead poisoning costs the United States $1-billion annually.

Lead contamination of our natural environment — Wisconsin's included — is a problem that won't go away.

The major cause of childhood lead intoxication was — and still is — the ingestion of lead-based paint. However, over the past 15 years public health emphasis has shifted from paint only — to concern for a child's total environment, including the air he or she breathes.

Lead enters the air largely from motor vehicle emissions. Each tankful of leaded gasoline puts about two ounces into the air. And although the nation is converting from leaded to unleaded fuel, Wisconsin residents are still driving about 500,000 lead-gas vehicles. Based on national figures, estimates are that another 500,000 non-lead gas vehicles have been tampered with and are illegally using leaded fuel.

EPA studies suggest that about 26% of the cars they sampled in 1983 showed evidence of tampering with pollution control devices or fuel switching. That's up from 17% in 1982.

Recognizing both the significant health threat and the fact that fuel switching and tampering is so widespread, EPA has proposed a 91% reduction in the amount of lead in gasoline starting in 1986. It may ban all lead from gas by 1995. In a

A blood test screens youngsters for lead. Department of Health and Social Services photo.

move opposed by some refiners, the agency would limit the amount of lead to 0.1 gram per gallon, down from the current 1.1 grams.

Wisconsin DNR has also been concerned about airborne lead pollution and has been monitoring it since the early 1970s. Initially, seven sites around the state were chosen: Superior, Eau Claire, Door County, Madison, Milwaukee, Racine and Kenosha. Later, three additional monitoring sites were added in Milwaukee, two of which are located near downtown expressways.

Encouragingly, no monitor anyplace in Wisconsin now reports lead levels above national ambient air quality standards. (There were several violations in the 1970s.) In fact, the two expressway monitors show lead at only one-fifth to three-fifths of the standard.

Two potentially significant lead sources existed in Milwaukee industry in the 1970s. One of these was a secondary lead smelter, now closed. The other, Globe Battery Division of Johnson Controls, has reduced its lead-related processes and emissions. The first quarterly data from a sampler to check the plant's emissions show lead values well below the federal standard.

There are some who theorize, however, that on the basis of ambient data, it is impossible to accurately conclude there is little risk. There are two reasons: first, sources of lead in a child's environment are so numerous; and second, many of the most susceptible children live among heavily traveled city streets day-in and day-out and endure airborne lead contamination almost constantly. The urban environment presents a special risk to the child. Youngsters who live in it pick up more lead than rural children. Tests of youngsters in the more rural areas of Grant, Lafayette and Oconto counties showed an average blood lead level of 15 micrograms per deciliter (ug/dl). (The standard measure of lead exposure is concentration in the blood.) This compared to an average level of 26 ug/dl for children in urban Racine. Facts like these suggest strongly that lead in the air adds to a child's body burden of lead.

Recent studies, starting with one in Massachusetts in the late 1970s, found that lead at lower levels than previously considered hazardous may cause subtle brain impairment in children. These studies seem to indicate that blood lead levels in even the mildly elevated range (30-50 ug/dl) can cause learning and behavior impairment.

Because a number of health effects have been detected below the presently defined maximum safe blood lead level for children of 30 ug/dl, the National Center for Disease Control in Atlanta has proposed reducing the figure to 25. According to the Center, roughly 21% of children between six months and five years old have blood concentrations between 20 and 29 ug/dl, and about 4% have higher levels.

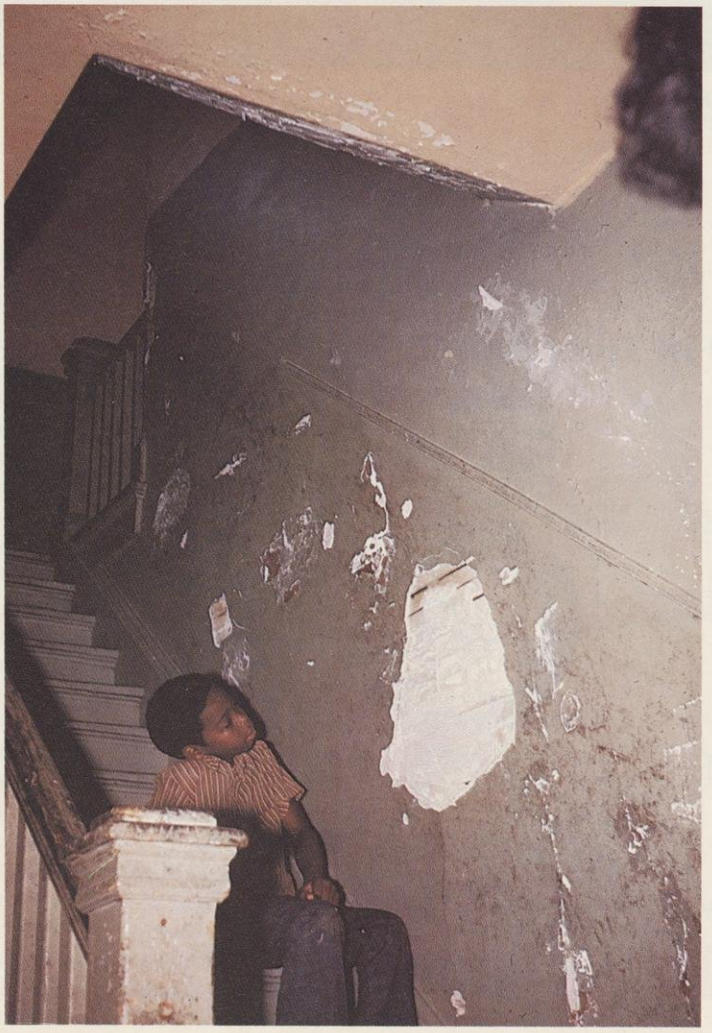
The health effects detected below 30 include interference with the blood production process. EPA reports this has been detected at readings even as low as 15 ug/dl and changes in brain waves have also been detected at this level.

Children, (especially those aged six or under), and pregnant women are the groups most at risk from lead. The six and under group have greater opportunities for exposure to certain lead sources like house dust and peeling lead paint. A child of this age is more apt to put foreign substances into his or her mouth as a means of discovery. The very young also have a higher incidence of nutritional problems such as iron or calcium deficiencies, which enhance lead absorption. Another factor is the increased susceptibility of the child's developing brain. Physical and behavorial effects like hyperactivity have been observed at lower blood levels in children than in adults.

Pregnant women are high risk because the fetus receives the same amount of lead as the mother through the blood that crosses the placenta.

When blood lead levels exceed 70 micrograms per deciliter (ug/dl) the effects become apparent. Signs of encephalopathy, life-threatening brain damage, are seen in some children with levels between 80 and 100 ug/dl. Severe anemia, kidney disorders, anorexia, abdominal pain and vomiting are other health effects observed in children at the 70 ug/dl level.

EPA notes that significant nerve dysfunctions in the body, an impaired ability to formulate concepts, lower IQ, and altered behavior were found at lead levels of 40 to 60 ug/dl among 70 preschool children after controlling for age, race, sex



Peeling paint is one of the main sources of lead in youngsters' blood. Department of Health and Social Services photo.

and socio-economic status. Children with these levels were seven times more likely to repeat a grade in school or be referred to a school psychologist for behavior problems. Also of growing concern in recent years are lead effects on vitamin D metabolism in children. These have been demonstrated across a wide band of blood lead levels that range from 12 to 120 ug/dl or higher. According to EPA, the interference of lead with vitamin D metabolism is of concern because this vitamin is crucial for the metabolism of calcium and phosphorous and the normal growth and development of young children.

Not surprisingly, Milwaukee is the Wisconsin community that has been most concerned about lead poisoning. In the early 1970s, the city health department began the state's first lead screening for children. Since then, each year (until 1984) has seen a decline in the percentage of children with elevated lead levels in their blood.

In about 1972, roughly one child in five of those tested had high lead levels. Today the rate has dropped to 6% or 7%, according to Frederic Blodgett, a professor of pediatrics at the Medical College of Wisconsin in Milwaukee. But in the summer of 1984, the number of lead poisoning cases rose .3% from 1983. This is discouraging, especially given the fact that the city's elevated lead rate level of approximately 6% is 2% above the national average.

Blodgett says lead poisoning seems to increase in children in summer for two reasons: first, they have more access to exterior paint, which is more commonly lead-based; second, they are more exposed to motor vehicle fumes during outdoor play.

Where is the greatest risk?

"Initially we screened children city-wide," said Dr. Ralph Lundgren, associate director of Milwaukee's program, "but a pattern developed of almost all positive cases being found in the inner city and on the north side." Although the near south side had many homes that were potential lead risks because they were old and dilapidated, somehow they did not produce as many lead poisoning cases as comparable dwellings in the inner city or on the north side. No explanation is adequate to account for this anomaly, he said.

Initially, the city funded four nurses' aides who made door-to-door visits to detect poisoning cases. Aides took blood samples on the spot and submitted them to the city health department for analysis. If the lead level was high, a child would be referred to a lead clinic in the municipal building for a physical examination. At the same time, the city arranged for a sanitarian to inspect the child's home for potential poisoning sources; old peeling paint, decaying porches, chipping woodwork and falling plaster.

"The environmental phase of the program involved sanitarians going out to the home, inspecting it, testing paints and serving notice to certain landlords that repairs had to be made," Dr. Lundgren said. Woodwork paint might have to be stripped; roof leaks stopped to prevent crumbling plaster; water damage on window sills covered when that damage resulted in flaking paint.

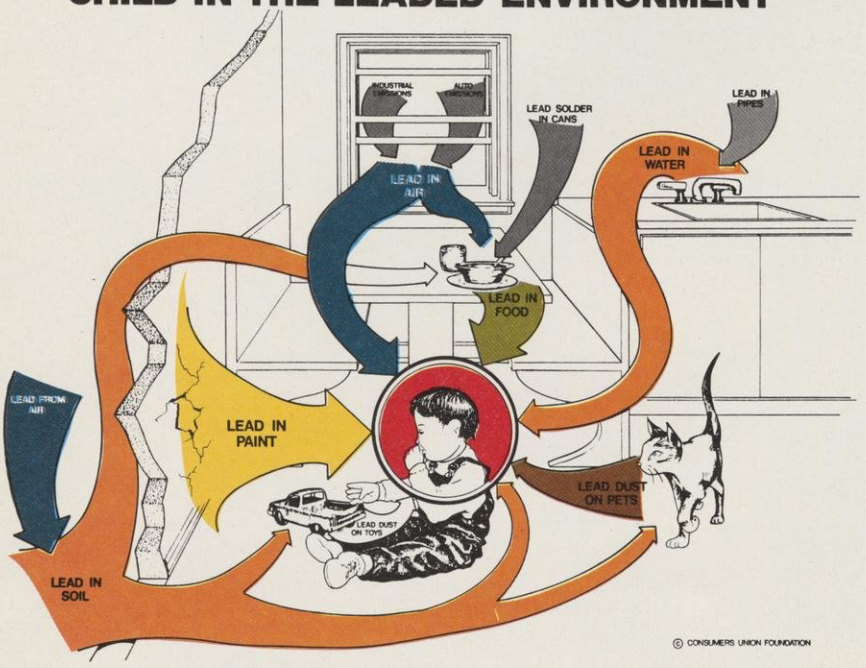
Some old paints contained 20% lead, the doctor noted. Since the federal government set a lead limit on paint in 1978, the lead component has been reduced to .06% of the paint by weight, a city health department spokesperson said.

Federal funding cuts have eliminated the nurses' aides which meant that screenings had to be moved to fixed sites, hospitals and clinics.

"Federal cutbacks came at a time when the Milwaukee statistics were looking pretty good," Dr. Lundgren commented. In 1978, when almost 1,800 children were screened, 22% were found positive, which meant they carried certain lead levels in their blood. In the 1980s the annual screenings were up to 4,000 to 6,000 children a year, but the positive percentages had fallen to between 5% and 8%.

All in all, government watchfulness over the health effect of lead in the environment is increasing and individual awareness has been aroused. Continued DNR monitoring coupled with EPA pressure to reduce emissions and get the lead out of gas will reduce the danger. Research will continue and finally, working together, government, science and individual action may at last eliminate the threat altogether.

CHILD IN THE LEADED ENVIRONMENT



Catch-all

Toxics, acid rain and hazardous dumps still major problems

Ruckelshaus praises Wisconsin

Cites progress

By Jeanne Sollen

Milwaukee — In a speech at the War Memorial Center here recently, EPA Administrator William Ruckelshaus commended Wisconsin for its new groundwater legislation. A problem with groundwater, he said, is that it is affected by local land use decisions. He also commended the state for its priority watershed program aimed at improving water quality and said EPA has pointed out Wisconsin's watershed program as a model nationwide. Commenting on other matters, Ruckelshaus urged the public, press and environmentalists not to discount the "remarkable" environmental progress that has been made in recent years. He summed up gains made by his agency since 1970 and the most insistent challenges facing it today.

With wry humor, the nation's chief environmental pilot defined the differences between his first term of service, running a popular new agency that opened in December 1970, and his second term, trying to restore public confidence to EPA while coping with a more elusive second generation of problems.

"The amount of progress we have made in cleaning up our air and water is remarkable," he asserted.

Rivers coast to coast, unable to spawn salmon for a century, now do so, he said. "The Potomac River is now fishable and, for the brave, swimmable."

Levels of sulfur oxides, a precursor of acid rain, are down by 25% since 1973 in the eastern states, he said.

"Had we not had the Clean Air Act, instead of 31-million tons of sulfur oxides, there would be 41-million tons, and then we really would have problems."

The early pollution problems were more visible, he commented, "those that we could touch, feel and smell."

Today's problems are different, and attitudes are also different, he said. **The general public is committed to a clean environment, and industry has come to accept that commitment. Expectations are greater, especially among environmentalists and the press. The tone toward government is more "accusatory," he said, and environmentalists have become politicized.**

The new generation of environmental problems, he said, includes toxic substances on which federal controls are just beginning, long-range transport of pollutants, hazardous waste sites, acid rain, and asbestos removal in the schools.

The administrator, who has been criticized for considering cost-efficiency in his solutions, suggested that cost will continue to be a factor in his thinking.

"We have to learn to manage risk better than we have in the past and what we normally do is reduce it, not eliminate it." The cost of reducing environmental risk must be taken into account, he claimed, along with pace and level of risk reduction.

The EPA budget is up 53% since he returned, Ruckelshaus said, adding: "I don't know what to do with the money Congress has been pushing on me."

In his news conference, Ruckelshaus said EPA would add 250 Superfund sites to the national priority list of 546. The number of hazardous waste sites nominated for consideration for federal cleanup assistance is expected to reach 1,600 to 2,200, he noted.

It is natural, he observed, that people living around the sites "don't want them cleaned up tomorrow; they want them cleaned up yesterday." But EPA is moving as fast as it can, he asserted. The agency has cleaned up 170 sites and taken emergency steps to alleviate health threats at several hundred more.

Queried on acid rain, Ruckelshaus dodged the question in the early part of his news conference. **When the issue returned later, he indicated that his agency might support a mandated reduction of sulfur dioxide if the reduction levels were less than the 10 to 12-million tons proposed in most of the acid rain control bills introduced in Congress.**

Cut ordered in sulfur dioxide emissions

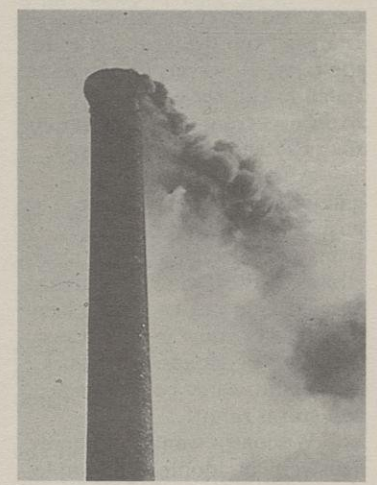
Sturgeon Bay — The Natural Resources Board has passed a rule requiring many Wisconsin fossil fuel users to reduce sulfur dioxide emissions by the year 1988. The rule affects 208 major industries and utilities that burn coal or heavy fuel oil. **It was passed after computer modeling and weather data showed that current emissions of sulfur dioxide sometimes had an adverse effect on the health of Wisconsin citizens.**

The new rule replaces a former board policy that had been found inadequate because it dealt with violations of air quality standards on a time-consuming, case-by-case basis. The old policy required enactment of a special rule every time a violation occurred, but while the rule was being prepared and verified, emissions might continue and could affect the public health.

The new rule also provides for variations in cases of economic hardship or technical difficulty. It will bring Wisconsin into compliance with the federal Clean Air Act.

Utility and industry representatives appeared at the board meeting to complain that the new rules are more stringent than necessary and will result in increased electric bills.

(For related stories see the acid rain supplement: **The acid test.**)



A new rule reduces sulfur dioxide emissions at 208 Wisconsin industrial and utility plants.

Mandatory hunter education

Madison — A new law that takes effect January 1, 1985, requiring universal hunter education in Wisconsin will increase participation in hunter safety courses by only 5 to 10%. The new law applies to persons born after January 1, 1973.

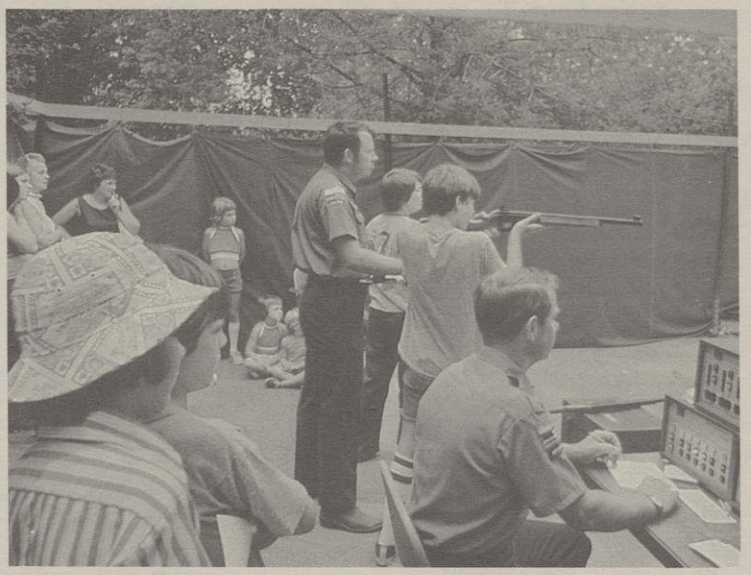
"We feel we have been reaching 90 to 95% of younger hunters for several years," said Homer Moe, DNR hunter safety coordinator.

In addition to making hunter safety courses mandatory the new law changes the name of the program to the Hunter Education and Firearm Safety Program. Those who complete the course will receive a certificate of accomplishment that may be used as a small game hunting license for one year. Cost of the course is $3.

Young hunters can take the course anytime during the year in which they turn 12.

The curriculum includes instruction in commonly accepted principles of safety in handling firearms and equipment, the responsibilities of hunters to the environment and to landowners, and other principles of wildlife management and conservation.

"The evolution of hunter 'safety' into hunter 'education' is now complete," Moe said.



DNR's hunter education and safety program already reaches most young hunters.

Minnesota sewage cutback not good enough

Madison — Wisconsin has found a Minnesota proposal for cutting back discharge of raw sewage into the Mississippi River inadequate and will continue its lawsuit calling for a comprehensive cleanup plan.

Minnesota had said it would set a timetable for abating combined sewer overflow discharges from the Twin Cities to the river. **However, its proposal failed to call for action on overflows from separated sewers that also enter the Mississippi.**

An estimated 4.6-billion gallons of untreated sewage gushes into the river annually from 85 outlets along a 28 mile stretch in the Twin Cities area. Discharges occur each time heavy rain falls or snow melts because the water overloads sewer lines designed to carry both sewage and storm runoff.

Wisconsin wants a comprehensive plan adopted and implemented that will clean up all discharges from both combined and separated sewers.

Scott PCB discharge banned

Madison — DNR will allow no detectable levels of polychlorinated biphenyls (PCBs) in discharge water from the Scott Paper Company mill in Oconto Falls beginning February 1, 1985. Modification of the firm's industrial wastewater permit allows Scott to produce 70 tons per day of recycled pulp, but limits PCB discharge to 0.5 parts per billion (ppb) in resulting wastewater. And if PCB detection levels drop in the future, the mill will automatically have to meet the new limit.

PCBs were used by industry until scientists linked the chemical to liver cancer and reproductive problems. Even very tiny amounts of PCBs, measured in parts per million or billion, can contaminate living things and potentially affect human health.

Currently the Oconto Falls mill discharges as much as four pounds of PCBs annually, according to DNR estimates. These PCBs come from waste paper Scott recycles in its manufacturing process. They go into the Oconto River which empties into Green Bay. Many fish in Green Bay contain PCB levels above federal Food and Drug Administration human consumption guidelines.

Until February, the mill is limited to a maximum daily discharge of 2.02 ppb and a four-month average of 0.96 ppb of PCBs.

Of 11 firms that recycle waste paper in Wisconsin only two discharge detectable levels of PCBs. They are Scott and the Fort Howard Paper Company at Green Bay which discharges more than 40 pounds each year into the Lower Fox River.

23 Superfund waste sites in Wisconsin

Madison — The Environmental Protection Agency has announced that three more Wisconsin sites will become eligible for federal hazardous waste cleanup assistance.

They are the Fridowske Drum and Disposal site, Franklin (Milwaukee County); the City of Stoughton Landfill (Dane County); and the Presto Industries site in Eau Claire. The three were added to the EPA national priority list of superfund sites and bring the total in Wisconsin to 23.

The EPA superfund is a federally managed program that investigates and cleans up hazardous waste sites that threaten human health or the environment. The priority list includes both dangerous and potentially dangerous sites.

In picking superfund sites, EPA considers the kinds and quantities of buried wastes, proximity to people and potential for groundwater pollution.

Robert Krill, director of DNR's water supply program, said DNR and local municipalities monitor public water supplies to ensure safe drinking water.

"We also monitor wells near landfills and other possible contamination sources to see if harmful contaminants are present," Krill said. "We know Wisconsin's highly permeable soils provide abundant supplies of water, but these same characteristics make our water susceptible to contamination from a variety of sources."

The Wisconsin site most in need of cleanup ranks 49th on the EPA national list of 538 superfund sites. It is the Omega Hills Landfill in Menomonee Falls.

Others range from 56th to 529th.

Catch-all

$1 hunting license surcharge for wildlife damage

Madison — A $1 surcharge on all hunting licenses except small game to pay wildlife damage claims is proposed in the next DNR budget. The surcharge would bring in $1.6-million during the 1985-87 biennium to defray deer, bear and goose damage claims.

The current allocation of $486,500 is far short of requirements. Marquette County alone could have used two-thirds of it to pay one year's damage claims; instead farmers there were compensated at only 13% of loss. A UW study says the cost of wildlife damage to agriculture ranges up to $15-million per year, and some farmers say it's twice that amount.

The $1 surcharge would be added to the sports license and to resident and nonresident deer, bear and archery licenses.

Altogether, hunters in Wisconsin now spend more than $10-million per year on license fees, and their minimum estimated impact on the state's economy is $759-million per year.

Deer damage to corn.

$500,000 for wildlife management on private lands

Madison — A program to encourage private landowners to implement practices that enhance wildlife habitat, has been proposed by DNR for 1985. Recommended by the Natural Resources Board's hunter-landowner council, the program would cost about $500,000 during the next biennium. Sharp-tailed grouse, ruffed grouse, woodcock, quail, rabbits, ducks, geese and pheasants are among species expected to benefit.

Demonstration plots and development of new techniques for restoring and preserving farm wildlife habitat are planned. Wildlife managers would work with farmers to get practices going and cooperate with local officials to abate damage done by wildlife.

About 85% of Wisconsin land is privately owned and 80% of Wisconsin's wildlife inhabits that land. Over the last 20 years, however, some farmland has been converted to other uses and even more has been subjected to intensified agricultural practices that make land inhospitable to wildlife. The program is designed to counteract this trend. It will be included in the next DNR budget which will be submitted to the Legislature for action.

Poacher hotline

Turn in poachers. Dial 1-800-TIP-WDNR (847-9367). Call toll free from anywhere in the state. Information provided is confidential.

This new poacher hotline number became active on September seventh. Since then, 191 calls have been received. Sixty-one were actual violation reports. The State Patrol answers the number when DNR offices are closed.

Heart attack

Milwaukee — During this deer-hunting season up to 600,000 hunters will be taking to the Wisconsin fields and woods. For many, miles of walking with an eight-pound rifle in cold November air is the heaviest physical exertion they'll do all year. Compound the situation with "buck fever" and these hunters may be at serious risk of a heart attack. Many can be prevented.

The American Heart Association of Wisconsin says hunters over 40 years old should consult their physicians before beginning the season. A doctor will have many good suggestions to help reduce the risk of heart attack; for example, beginning an exercise program before the season so the exertion of hunting won't be such a strain. Hunters should also take time to learn the warning signals of heart attack and be prepared to act should symptoms show.

These are the warning signals:

1. An uncomfortable pressure, fullness, squeezing or pain in the center of your chest behind the breastbone.

2. The sensation may spread to your shoulders, neck or arms. If it lasts for two minutes or more, you could be having a heart attack.

3. Severe pain, dizziness, fainting, sweating, nausea or shortness of breath may also occur, but are not always present.

Share your concerns with another member of your party — seek immediate medical attention.

For more information, contact the American Heart Association of Wisconsin (toll-free) 800-242-9236, or in Milwaukee 271-9999.

Search for lead in drinking water

Madison — Recent investigations detecting lead in drinking water at an Eau Claire school have prompted a statewide look for lead in public water supplies.

State health, plumbing and water supply officials have developed a cooperative plan for locating suspect water supplies and minimizing human exposure to lead in drinking water. The cooperative plan includes:

- An immediate ban on lead solders and fluxes commonly used to join water pipes in buildings.
- Testing in susceptible communities to accurately assess the levels of lead exposure.
- Easy-to-follow instructions for inexpensive methods to reduce lead levels in water.

"I want to emphasize that this is a preventative program" stated Dr. Henry Anderson, chief of the State Division of Health's Environmental and Chronic Disease Epidemiology Section. "We haven't found cases of lead poisoning that we can attribute to drinking water. We want to get ahead of a potential health concern."

Lead concentrations averaging 250 parts per billion (ppb) were detected at an Eau Claire junior high school. Previously, the US Environmental Protection Agency and the State of Wisconsin set a safety standard of 50 ppb lead in drinking water. Blood tests from the first group of Eau Claire residents who were tested at the request of their physicians show normal lead levels, Anderson said.

State investigators concluded that the lead was coming from water pipes rather than an outside source of contamination.

Water pipes in buildings are made of copper, but pipes are joined with solder which commonly contains 50 percent lead — 50 percent tin, explained Jim Sargent, director of the State Bureau of Plumbing. Soldering fluexes may also contain lead.

Effective immediately the plumbing bureau has banned the use of lead-containing solders and fluxes for new construction. Solders containing 95 percent tin — 5 percent antimony are available.

Higher lead concentrations are primarily a concern in newer buildings.

"Within a few months to a year or so, the inside of water pipes become coated, effectively sealing the system," said Robert Krill, director of DNR's Bureau of Water Supply. "But in newer buildings the coating has not formed and water standing in the pipes overnight may slowly dissolve small amounts of lead from soldered joints," he said.

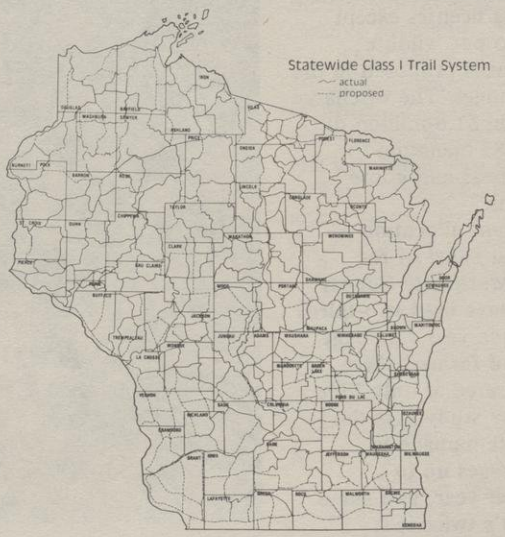
"People who habitually fill up a glass of water first thing in the morning may be drinking some lead with their water," said Dr. Anderson, "but I don't want to scare anyone."

"In most cases," he said, "the short-term solution is easy. Simply let the water run a few minutes before drinking it, use water for washing or bathing before drawing drinking water, or draw a container of drinking water after the tap water runs a few minutes and store it in the refrigerator for later use."

The national lead drinking water standard was set to protect people who could be drinking lead-contaminated water for a lifetime, Anderson said.

Last year, DNR staff evaluated all public water supplies to check for soft water with low calcium carbonate levels which can corrode pipes.

Based on this study, DNR identified 57 municipal water supplies with low calcium carbonate. These systems were then analyzed for lead, copper, cadmium, zinc and iron. Only five exceeded normal water standards. However, DNR's search for lead in tap water from new plumbing will continue. Communities with suspect conditions will be sampled — measuring water which sits over night in interior pipes, water from the service line, and water from the main line.



Wisconsin's network of snowmobile trails.

10,000 miles of snowmobile trails

Madison — Wisconsin's extensive snowmobile trail system will pass the 10,000 mile mark this season with 300 miles of new trails soon to be opened.

According to Larry Freidig, recreation specialist in DNR's bureau of aid programs, the state's 162,000 registered snowmobilers now enjoy well-marked, well-groomed, safely maintained trails that take them just about anywhere they want to go.

"It's an impressive system," he says.

Freidig attributes much of the system's success to Wisconsin snowmobile clubs, that do much of the signing, maintenance and grooming of trails. They also build their own trails, which are often open to the public.

Freidig says snowmobiling has turned into an exciting and enjoyable "destination" sport.

"People think they drive these things around in circles," Freidig said. "With good trails and properly maintained machines, 100 mile trips are common."

Most Wisconsin's snowmobile trails are county-run but paid for out of snowmobile license fees and the gasoline tax.

Only 530 of the 10,000 miles are located on state property and operated by DNR.

This year $1,753,000 will be spent on the snowmobile trail network including:

- $87,000 for state trail maintenance.
- $68,000 for new trails.
- $59,000 to private landowners who allow public trails on their land.
- $30,000 for signing of privately owned trails that are open to the public.

Only 23% of the funding comes from the $12 biennial snowmobile registration fee. The remainder comes from the motor fuel tax. The trail program receives revenue from the state fuel tax in proportion to the number of registered snowmobiles.

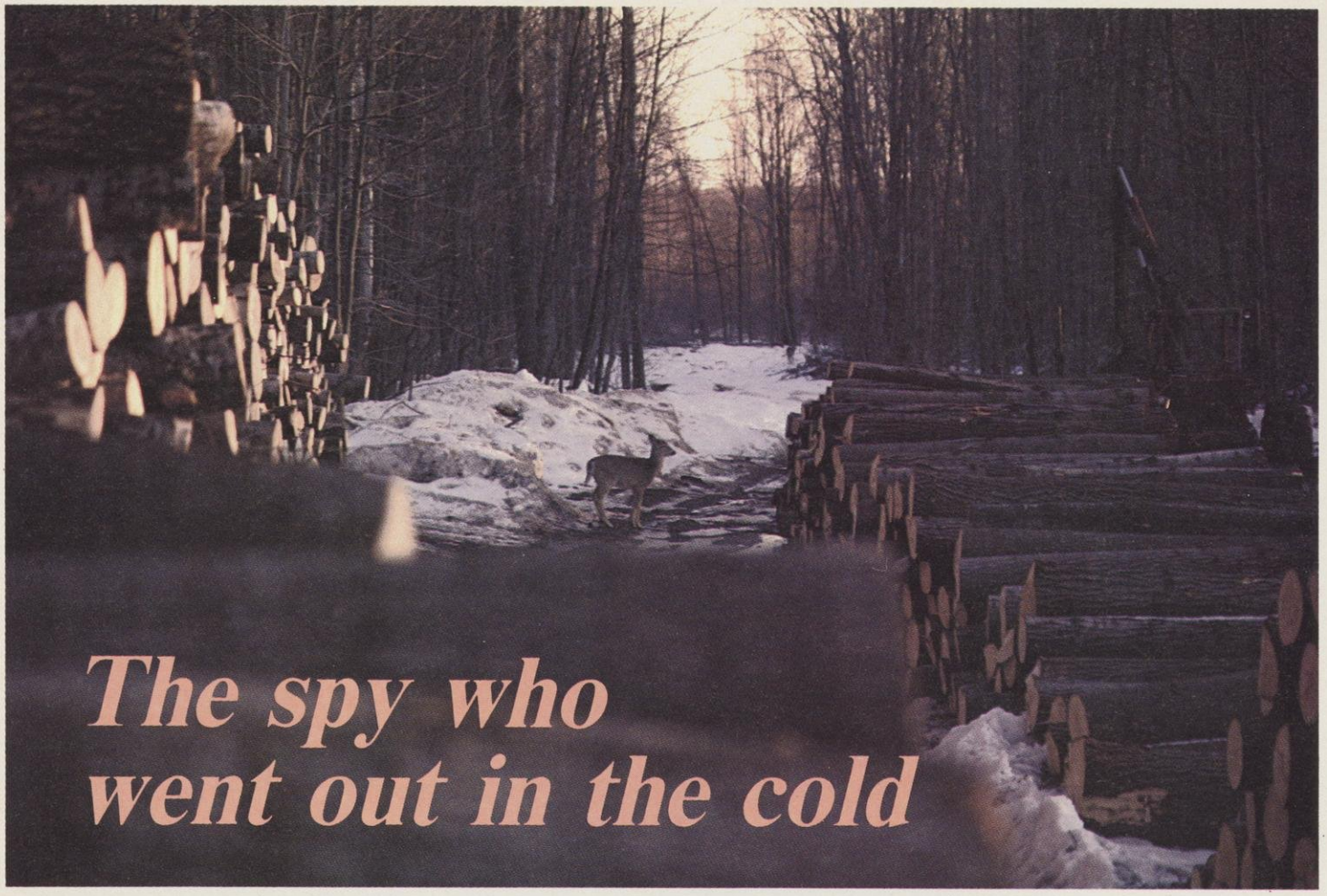
Wood duck houses

Baldwin — DNR has erected and maintains about 2,600 wood duck houses in traditional nesting areas around the state and about a quarter of them have been used.

According to Wetlands Wildlife Researcher Bruce Bacon, wooden houses seem to be preferred by wood ducks — but there are also plastic, metal and other types in use. And, Bacon says, wood ducks aren't the only waterfowl to benefit from these houses — hooded mergansers have moved in too.

The US Forest Service places wood duck houses in the Nicolet and Chequamegon National Forests and many others are erected around the state by conservation clubs and individuals.

About 25% of the wood duck houses erected around the state have had tenants.



The spy who went out in the cold

DAN LICHT, Stevens Point student

A winter logging job can provide browse. Photo by author.

A deer yard has lots of surprises and lessons about life, death and survival.

I was disappointed. The six deer below my tree stand were feeding peacefully, unaware of my presence 20 feet above in the concealment of the black spruce. They were unalarmed and content. Why was I disappointed? Because there should have been more deer. At least another 30. The northern winter was becoming long and hard, so the deer were taking advantage of the smorgasbord of fallen trees below me. In days previous, deer had been here by the dozens. But now the sun was sinking rapidly and light was leaving this little browse cut here in the forest. About five minutes earlier I had reluctantly admitted defeat and put the camera back in my pack. I was preparing to climb down when I caught some movement back in the shadows of the woods. Ah! Finally.

A deer silhouette was slowly meandering toward me in that time-consuming pace, typical of a browsing whitetail. Another glimpse of movement, then another deer. Well, it's about time I thought. At least a few are coming back. When I turned to catch the last view of the sun as it dipped below the treeline, I was caught completely off guard by several more deer that had simply appeared. I can't describe it any better than that. I turned to look back at the original two returnees and now there were a half a dozen. Then, in another direction, more movement and more forms gliding through the trees. A deceptive glide that is almost impossible to follow. If you blink, the deer vanishes. Turn away and then look back and it's there again. From all four points of the compass they had appeared. Some walked hurriedly, some meandered slowly, but most just appeared. In about 20 minutes my six deer had swelled to 30 to 50 animals. The deer silhouettes were in sharp contrast to the bright bluish-tinged snow reflecting light from the rising February moon. It's hard to believe the noise several dozen unalarmed feeding deer can make. I sat in the moonlight and watched and listened with total fascination and awe. At a moment like this, one loses all track of time. To me, it seemed I had been up there a couple of minutes when in reality it had been a couple hours. But finally, the sharp winter penetrated. I could take the cold no longer and had no choice but to spook the deer on my way down. With a thunderous crashing of branches and snorting in all directions, they took off. What had been an oasis of activity in the cold night suddenly became empty, leaving me alone in the moonlight to walk back to the car.

It's always regretful to spook the deer. Fortunately they'll come back soon. Few of them run more than a couple of hundred yards. Within a half an hour the clearcut will again be a beehive of activity.

Anyone who likes to watch deer should get out for a look during the deep snows of winter. The deer of the north are easy to find and they will do things that may surprise, fascinate, sadden and amuse you.

When the snows come, an ancient struggle begins — the deer against Old Man Winter. Animals that tough it out may win this year, or the next, or even the next. But sooner or later the guy from the north will have his day. The snows will be deep and the days and nights bone chilling cold for weeks at a time. The whitetailed deer, *Odocoileus virginianus,* is the David taking on Goliath. As the first snows fall, deer group together, many coming from miles away. Does, fawns, bucks all driven by an instinct as old as the species itself. They come together at a deer yard, a somewhat mysterious place where they spend the next three or possibly four months. Why they choose the area they do is a much debated question. Some have theorized that it's for food; others say it's for shelter from weather; still others a sanctuary from predators. It's very possible a combination of all these is the reason. Whatever it is, it is a very strong instinct. The first couple months of winter are only a warning. They're not the real test. But they set the stage. If snows pile deep quickly, it could be trouble. The deer make a network of trails to help them get through the belly-deep snow. As food becomes scarce they utilize their supply of body fat acquired during fall. This could be the key. In the end it boils down to a test of endurance. Which will come first? The regrowth and warmth of spring or the exhaustion of the deer's energy supply. Deer need browse in the form of buds and twigs. Maple and red-osier dogwood are two favorites but many other trees and shrubs will do. Soon deer exhaust the limited supply of browse within reach, especially if the herd is exceeding the carrying capacity of the deer yard. If a tree falls to the ground it will attract deer quickly. If a lot of trees are knocked down the area becomes a deer magnet.

Wildlife managers and biologists realize this. Just a small cutting in the woods makes a difference for a deer herd. Pulpwood cuttings and other forestry practices provide browse. Landowners cutting firewood do too.

A cutting provides a great opportunity to watch, photograph and study deer, especially their social behavior. You'd be amazed at how unwary deer can become in a group situation. You'll smile as they strain and reach for a particularly tempting twig. You may be caught off guard when you see a deer reach out and kick another, especially when you realize it's a doe kicking her own fawn away from some food. You'll hear fawns bleating like sheep. Are they calling for their mothers? It's hard to say. You'll laugh when one deer scares itself by knocking over some branches and then pushes the panic bottom making the whole herd nervous. They'll all stare at each other for awhile and finally a few will start feeding. Some will remain nervous, looking for that mysterious predator. The guilty deer will give an academy award performance trying to look innocent. If you are in a hemlock tree, throw a few branches down. The deer may eat them as fast as they hit the ground. you'll come to recognize different deer. Some have a certain color, feature, bone structure or other distinguishing character-

Birch makes good winter browse. Photo by author.

istics. You'll also see different personalities. Some are warier than others. You'll learn how a deer spends its day.

One bit of caution on being around deer in winter. Don't make them spend any more energy than necessary. Best to go out in a few long sessions than a lot of short ones. If deer are in very serious condition it's best to quit going altogether. You can always go next year. The deer may not have that chance. Being able to watch deer is a great privilege. Don't abuse it.

The browse cutting I used was a small one, about a quarter acre in size, specifically to feed deer. All the trees were down except a couple of spruce which have little food value for deer. Spruce is more valuable as a standing windbreak. The cut trees were maples, birch and aspen, all good winter browse. Deer use of cuttings depends on proximity to deer yards or wintering areas. In this case, the cutting was in the center of a perennial yard and the fallen trees seemed to attract every deer.

During the coldest winter days, deer may stay bedded down under the yard's abundant conifers. Thick growths of spruce, balsam fir, hemlock and white cedar provide a microclimate where the temperature and windchill may be several degrees warmer than the surrounding area. The deer bed down, their metabolism slows and they wait out the bitter cold. But the first warm spell has them up and moving. Deer tend to be more active dur-

Bucks are involved in most of the conflicts.
Photo by Herb Lange.

Sooner or later the guy from the north will have his day.

ing daylight hours at this time of year. That's due in part to very little human disturbance and also because of the warmth of the afternoon sun. I often found most deer coming in to the browse cutting around 10 o'clock in the morning. Although it varied greatly, the time of arrival seemed related to the weather. On warm days with little wind they showed up early and in large numbers. Cold, windy days meant only a few deer showing up late in the afternoon. But as always there are exceptions. There always seemed to be a few deer at the cutting no matter what the weather or time of day.

When I showed up at the cutting I was often greeted by a few loud snorts and white tails bounding off through the brush. But rarely did they go far. Often I could see their forms back in the shadows of the conifers as I climbed to my tree stand. After quietly waiting for half hour or so they would start returning. Cautiously they would browse while making their way back to the fallen trees. But once they got there and felt safe, caution gave way to a hungry stomach. As they tried to tear off a twig they twisted and turned their heads every which way. "Torn off" is exactly what a deer-browsed twig looks like. Unlike rabbits and hares, deer have no upper incisors so they must crush and pull the branches and shoots they eat, giving the browsed tip a ragged appearance. A twig nipped by a rabbit or hare has a neat, diagonal cut as if sliced by a knife. Deer need about five pounds of buds or twigs per day so browsing can keep heads twisting, turning and pulling for a long time. It's also interesting how nomadic feeding patterns and behavior are. Rarely will deer stay in one spot for a long time. They may spend about five minutes browsing the tops of one fallen tree and then five minutes at another, no matter how abundant the twigs and buds are at the first tree. And even in the midst of plenty, as was the case at this particular cutting, you will still find deer occasionally nibbling at a spruce, tree fungus or other less nutritious food.

To most of us, deer seem peaceful and docile, so it's quite a shock when you see one aggressively kick another, especially when fawns are involved. What seems like an act of cruelty is in reality mother nature's way of assuring that the strongest will survive and propagate.

More often than not a threatening gesture is all that is needed for the inferior animal to back off. Deer biologists and researchers have placed aggressive behavior of deer in seven categories with only two involving physical contact. These are known as the strike and the flail. The nonviolent categories are the ear drop; hard look; sidle; rush and snort. Usually one of the above or a combination will settle any dispute, especially in late winter when the herd hierarchy is well established. On other occasions, a quick stiff-legged kick, known as the strike, will settle a conflict. Once I saw a large deer rear up on its hind legs and drop its front legs solidly against the back of another deer which seemed to be as surprised as I was. The whole confrontation lasted no more than a couple of seconds. Had I blinked I might have missed it. Occasionally two deer will rear up on their hind legs and flail at each other with their front feet. This is the most violent interaction among deer at winter yards. Never have I seen any aggressive behavior that lasted more than a few seconds. The inferior animal seems to realize its status quickly and gives way. Older bucks are usually the most dominant individuals and also seem to be involved in the most conflicts. Yearling bucks are usually subordinate to adult males. Adult females seem to be spread throughout the social hierarchy with some of the more aggressive does ranking near the top. Yearling females rarely exhibit aggressive behavior and are subordinate to all other adult deer with few exceptions. Fawns are at the bottom of the totem pole. Even then, there seems to be some hierarchy with male fawns dominant over female fawns. In a situation such as a deer yard it's easy to imagine the deer as all knowing each other and knowing their place in the herd hierarchy.

By midafternoon a large percentage of my deer would be bedded down throughout the browse cutting. Some would be chewing their cud, some sleeping and some just staring off into the distance. At this time, I often found myself starting to nod off. But just as my eyelids started to get heavy the deer would do something else to entertain me. More than once I have seen a deer's head suddenly shoot up and look long and hard in a certain direction. This naturally aroused the curiosity of other deer and one by one they would all start looking in that direction. I could never find the source of their interest but something definitely had their attention. After a couple of minutes one would go back to feeding. Then another would be down and resume chewing its cud. Then another, and another, until they had all resumed their activities, except for the original deer who would stubbornly keep staring off into the woods. Finally, it would call it quits too, often with one last long, hard look.

Shortly before dusk there is another surge of feeding activity with all trying to fill their stomachs before bedding down. Once again it seems to depend on the weather. Some nights, deer would leave for the warmth of the conifers just as the sun was setting. Other nights they would stay at the browse cut, feeding well into the night. I think sometimes many spend the entire night at the browse cutting. Those that go back to the yard usually travel in groups of one to six animals. This was also true when they entered the cutting. A few well-traveled trails connected the thick stands of conifers, where the deer bedded down, with the browse site.

It's a special feeling to be among a couple of dozen bedded and feeding deer on a sunny, peaceful winter day. In a way you enter a world that goes back millions of years. You see more than a fleeting tail or a large set of antlers. You see a life you can only imagine — a life of hard times, of animals barely surviving, but also a life of peace and simplicity. It is a peace and simplicity that we can only admire and envy.

Fat deer laugh at winter

KEITH MCCAFFERY, DNR Wildlife Research Project Leader, Rhinelander

Contrary to long-held notions, winter does not make all the difference when it comes to deer up north. Carrying capacity, population goals and winter losses are becoming better understood.

Ideas about deer management in northern Wisconsin are changing. Biologists were once convinced that quality of the winter range and losses that occurred in years with heavy snow and severe temperatures were decisive. Those factors, they believed, determined carrying capacity and deer abundance. Significant winter losses only happened when there were a lot of deer. They were density dependent.

Today, deer biologists have revised these ideas. They now think that the number of deer an area can support (carrying capacity) is determined not by winter phenomena but by forest composition and the amount of sunlight that reaches the forest floor. And they no longer believe winter losses are density dependent, given the range of deer densities maintained in the last 20 years.

How did these new ideas arise and what are the implications for deer management?

Let's look at the definitions used for carrying capacity through the years. Carrying capacity has been thought of as:

1. **The number of deer that will survive severe winters.**
2. **The population level reached when deer begin to damage their food supply or habitat.**
3. **The population level reached when recruitment (births) is matched by natural mortality (deaths).**

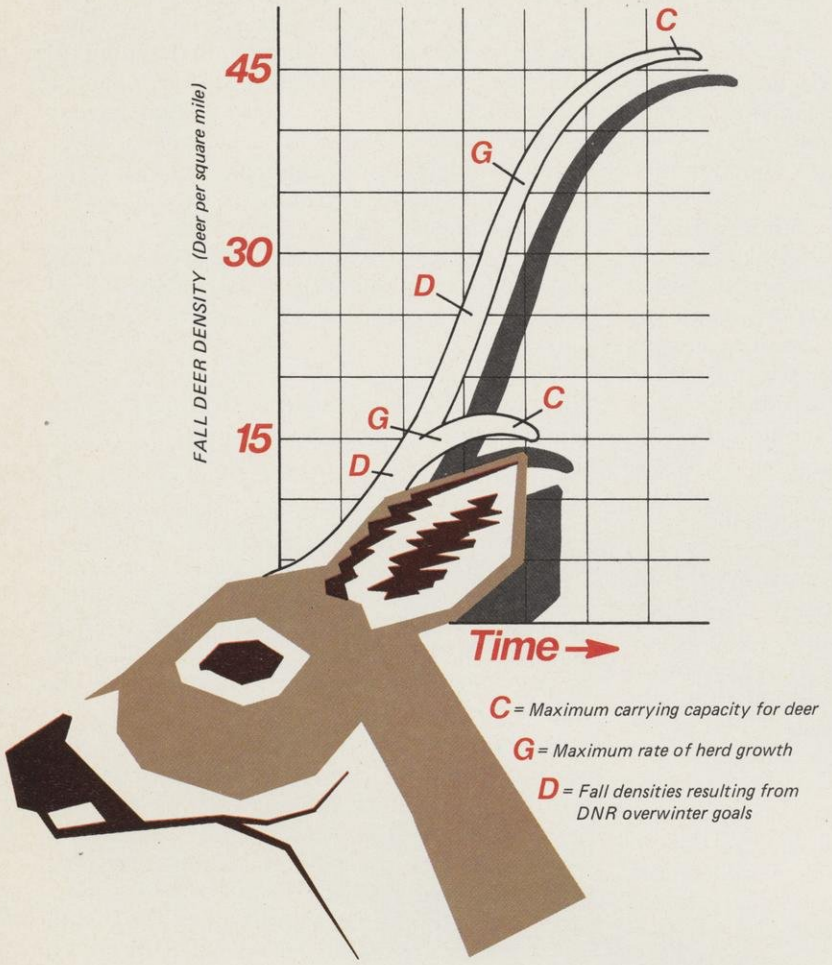


Illustration by Artist Eric Weaver

Carrying Capacity

This S-shaped curve shows that population growth spurts up steeply until it slows and stabilizes. Leveling off occurs as competition and nutritional stress increase death rates and decrease birth rates.

The numbers on the vertical axis typify deer densities in northern Wisconsin. The tall curve represents the very best habitats where maximum deer numbers could approach 45 per square mile in fall. This density was probably reached over relatively broad areas of the north following the slashings and fires of the 1930s. Only a few northern units have forest habitat capable of this high density today.

The top of the curve, where increase stops, is the point of maximum carrying capacity. Midway up the curve is a point of maximum herd growth, a point of top biological potential where environmental conditions aren't yet limiting. The range of values between the maximum rate of growth and maximum carrying capacity depict a practical management definition of carrying capacity in Wisconsin.

The smaller curve represents population growth and carrying capacity on some of the state's poorest northern units. Habitat in these units is mostly pole-sized and larger maples, dense conifers and swamps. Though undergoing the same winter severity as adjacent "good" units, fall deer populations in the "poorer" units seldom reach or exceed 15 deer per square mile. Severe winters will temporarily set back deer numbers in both good and bad habitat units, but it's the habitat composition that determines long-term population levels, or carrying capacity. Each unit will have a population growth curve of a different height, depending on the habitat mix in the unit.

4. The range of population densities between definitions two and three.

The first definition is not very applicable to most of northern Wisconsin. For example, it doesn't explain three-fold differences in deer populations in adjacent units. It might better describe carrying capacity if severe winters came predictably every year. Winter severity (climate) does, in fact, determine the whitetail's northern limit in southern Canada, but, in Wisconsin, severe winters are not predictable and cause only temporary setbacks in population levels.

The second is perhaps the most common textbook definition of carrying capacity. However, it implies a specific deer density without defining what constitutes damage. For example, does the beginning of a browse line on cedar indicate that carrying capacity has been reached? Probably not.

The third definition describes maximum carrying capacity, certainly not a level we would seek to maintain through management (or lack of management). This would leave no room for harvest, and environmental damage would be clearly evident and severe.

The fourth definition describes carrying capacity as a range of deer densities and perhaps is most applicable to deer management in Wisconsin. This definition can be most easily understood when plotted on a graph. The graph would show a population growth curve that spurts up steeply at first when there's plenty of food and room for more deer. Then it would slow and level off as competition and nutritional stress increased death rates and decreased birth rates. Although in the real world, populations on previously understocked ranges tend to overshoot this level temporarily, the leveling off point is the maximum carrying capacity (definition #3 where births equal deaths). Midway up the curve, would be a point of top biological potential where environmental conditions aren't yet limiting — where the greatest annual increase in numbers occurs. Beyond this point of expansion, the population begins to damage its food supply and this corresponds best to definition #2. These dynamics occur in all the different management units across the north, but the actual population levels depend on local habitat. The best management definition of carrying capacity is somewhere between #2 and #3, between maximum expansion potential and where births equal deaths, or definition #4.

Good habitat units in the north contain an abundance of aspen, oak, upland brush, grass and sometimes farm fields. Deer densities often exceed 30 per square mile. Poor habitat units are made up mostly of pole-sized and larger maples, dense conifers and swamps. Though undergoing the same winter severity as adjacent "good" units, fall deer populations in the "poorer" units seldom reach or exceed 15 deer per square mile. Severe winters will temporarily set back deer numbers in both good and bad habitat units, but it's the habitat composition that determines long-term population levels, or the carrying capacity. Each unit will have a population growth curve of a different height, depending on the habitat mix in the unit.

These new ideas on carrying capacity also affect two other deer management concepts: overwinter goals and winter losses.

Overwinter Goals

Since 1961, Wisconsin has used overwinter goals to help manage the deer herd. These goals were originally determined by examining results of deer pellet surveys. Looking at several years of data for a given unit, the goal was set near the middle of the range of densities seen for that unit. By this method, the deer herd itself was telling us about unit carrying capacity.

Overwinter goals in the northern forest vary from 10 deer per square mile in the poorest units to 25 in the best units. These levels typically result in fall densities of about 12 and 36 respectively. Goals set by this practical procedure correspond well with current research on habitat and carrying capacity. Resulting fall densities are about midway between the maximum rate of herd growth and DNR's winter goals. A portion of the difference between the overwinter goal and fall density is available for hunter harvest.

Overwinter goals have been reviewed and revised through the years. Most changes have been minor (fewer than five deer per square mile). Usually, changes were downward, reflecting the loss of forest openings and the increasing amount of shade within the forest. Future goal reviews may result in further reductions. It's important to remember that these reductions will not be the result of severe winters, but will reflect loss of habitat quality (carrying capacity).

Winter Losses

Winter losses occur when deep snow outlasts the fat reserves and endurance of deer. As Pat Karns (Minnesota DNR, Grand Rapids) describes the situation, deer enter a "walking hibernation" during winter. Their metabolic rate decreases and their food intake declines. They often "yard" to conserve energy. The typical deer yard has dense overhead cover and very little understory food. When yarded, deer are especially dependent on their stored fat reserves. If winter breaks up early, most deer survive. If not, many deer die.

Good habitat with aspen, openings and oak can keep deer populations high and get them through the winter. Painting by Artist Virgil Beck, Box 66, Stevens Point, WI 54481.

Severe winters seem to kill a fixed proportion of the herd regardless of deer density, unless the density is at or approaching the maximum carrying capacity. Winter severity is quite easily documented using the Kohn Severity Index (Bruce Kohn, DNR, Rhinelander). This index cumulates the number of days with 18 or more inches of snow on the ground and the number of days with a minimum temperature of zero degrees fahrenheit or below. An index of less than 60 is considered mild, over 100 is severe.

A severe winter usually results in a 20 to 25% deer loss. If the population is at or near the maximum carrying capacity, a higher proportion may die because the deer are already physically stressed before the winter begins. Apparently, this condition existed in some units as recently as the 1964-1965 severe winter. At or below goals, winter losses appear to be proportional to the severity of the winter.

A winter loss, even a severe loss, does not indicate a need to reduce overwinter goals. These losses cause short-term depressions in deer population levels. The long-term capability of the land to produce deer is determined by the forest types present.

Management Implications

The long-term trend in carrying capacity in northern Wisconsin is downward. Increased timber cutting and efforts to maintain critical habitats on publicly-owned land have helped, but they aren't enough. Denser stocking of trees through improved silviculture, the continuing loss of forest openings, gradual increases in the amount of northern hardwoods and balsam fir, and the loss of habitat to human developments inexorably will reduce deer numbers in the northern forest.

Winter range management, per se, has lost emphasis in recent years. Conifer acreage (potential yarding cover) is increasing through natural succession and through planting of pines, yet carrying capacity is declining. Thus, even though more winter cover will be available, fewer deer will be produced to seek cover in the future. Something more than winter range management is needed.

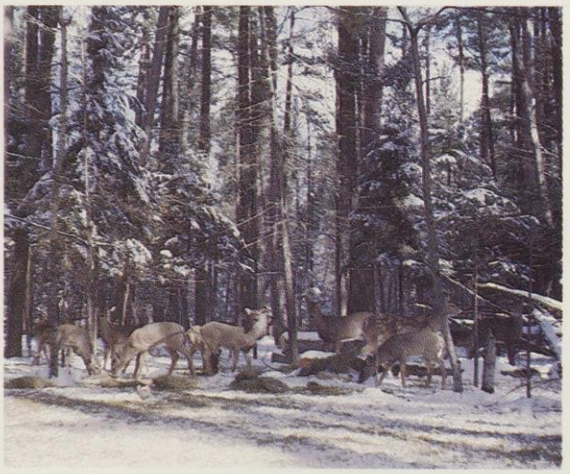
Yard management plans are used to combat winter losses. Though important, these plans are no panacea. They attempt to maximize benefits for deer through coordinating timber harvest schedules. They also provide for the maintenance and enhancement of preferred winter cover. However, they aren't very effective for feeding deer once deep snow conditions exist. It's extremely difficult to initiate and maintain timber sale operations under these conditions.

Other techniques for feeding deer aren't much better. Hay feeding is out, and emergency browse cutting is rarely effective even on a local basis. By the time emergency conditions exist, woody browse is "too little and too late. Woody twig ends are not preferred food by deer and don't contain sufficient nutrients to maintain a deer's body weight. They are eaten only in winter or when more nutritious foods (green leaves, weeds, grasses, etc.) are not available. At best, woody browse will only slow the rate of fat depletion, but won't reverse the decline in deer vigor.

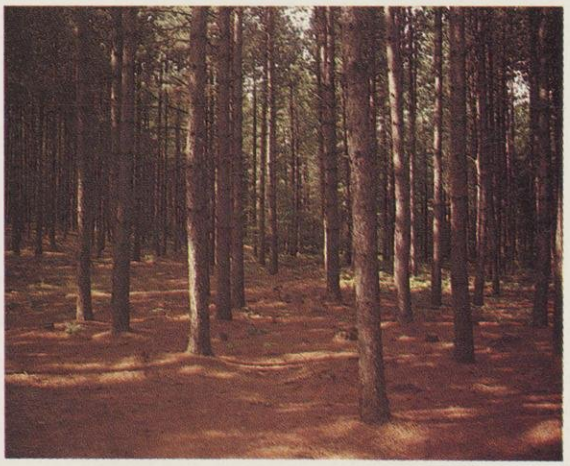
Commercial pelleted rations are now available that will save starving deer. They have been used successfully on a local basis. However, whether it's advisable to use these pellets extensively is presently under review. Questions about timing, cost effectiveness, administration and logistics have to be answered first. It's doubtful that enough starving deer can be reached to justify the costs.

Most deer managers agree that the best way to produce deer and minimize winter loss is to insure that deer are well fed before winter sets in. Habitat management programs in the Lake States have been tailored to maintain aspen, openings and oaks. Leaves of aspen and associated ground layer plants are the principal sources of nutrition in summer. Grasses and forbs in forest openings provide critical energy immediately before and after winters. And acorns can significantly add to the fat reserves of deer before winter.

These habitat management measures are aimed squarely at the determinants of carrying capacity. They attempt to maintain as tall a population curve as possible, given the existing habitat and forest management objectives in each unit. Loading fat onto deer in summer, and keeping populations near goals through proper antlerless harvests will result in the healthiest deer herd and will also lessen the impacts of the occasional severe winter.



Feeding hay to deer in Wisconsin during the 1940's was an economic disaster and failed to save many animals.
Photo by Staber Reese.



Pole size stands of conifers produce little food for deer.

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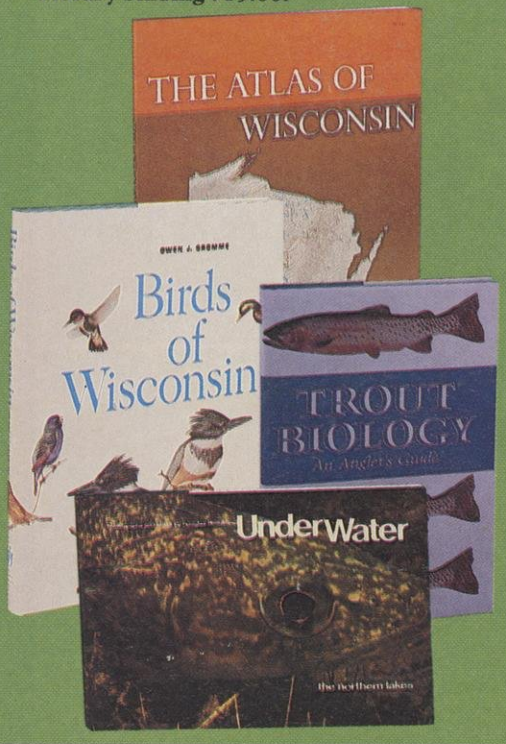

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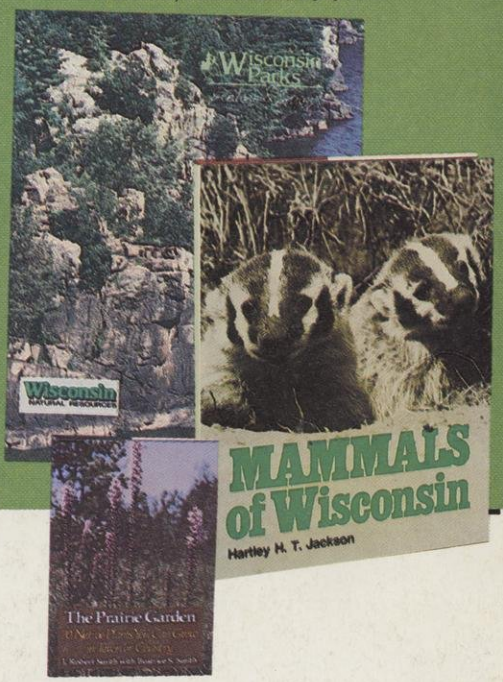

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