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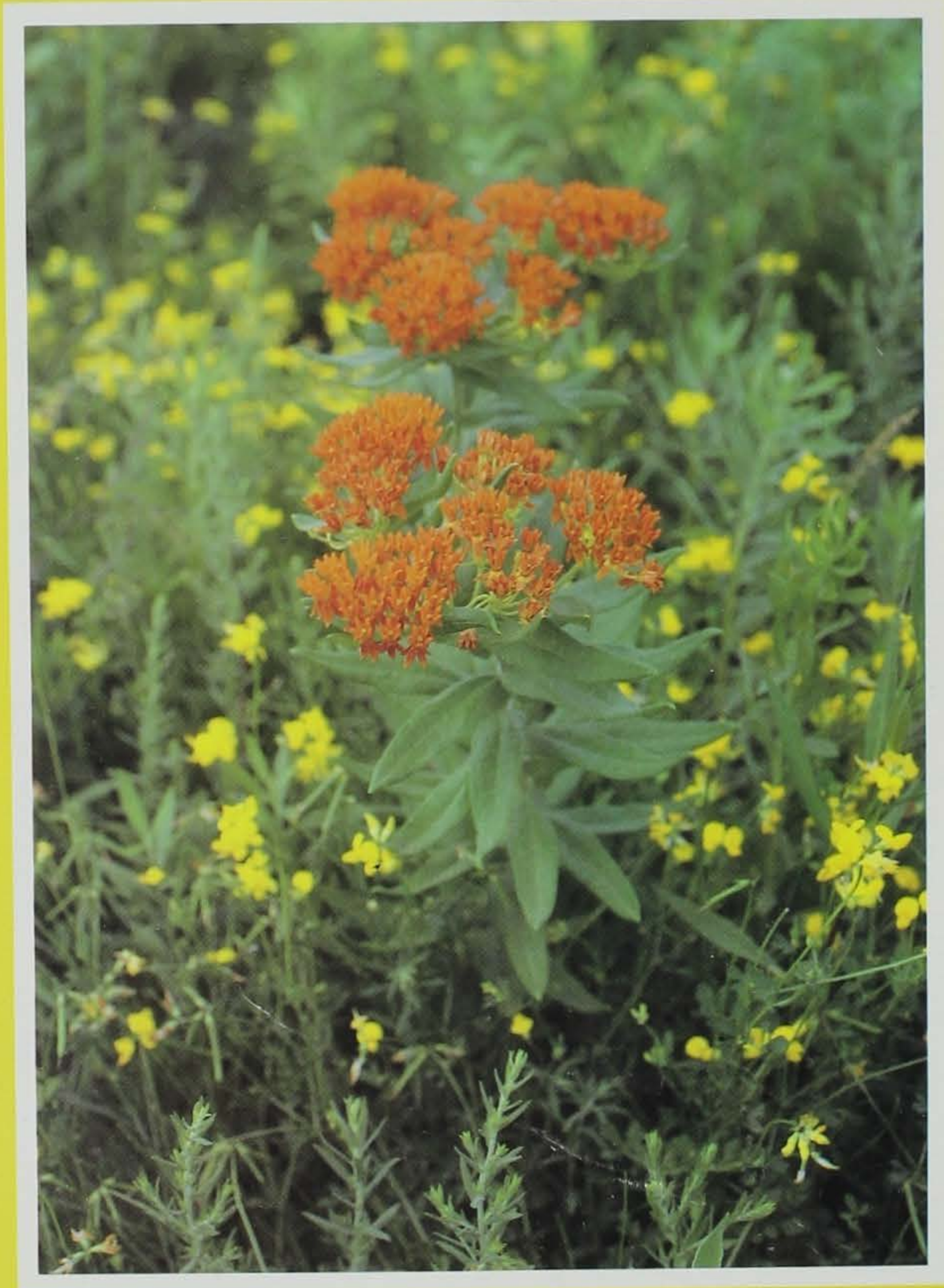
Iowa CONSERVATIONIST

July/August 1993

Department of Natural Resources



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by Shirley J. Schermer

Archaeology and Iowa's State Preserves

Today people are aware that our supplies of natural resources like oil and coal are diminishing. Many people know it is necessary to conserve the natural resources that are still left. Conservation of our cultural resources is also necessary if we want to increase our knowledge of the past. Many archaeological sites that might have been able to tell us about ancient mammoth hunters, mound builders or prehistoric villagers are being destroyed. Archaeological sites are non-renewable resources. When they are destroyed, they are gone forever.

Many things, even nature itself, can endanger sites. Much archaeological information is lost each year through erosion, plowing, industrial and residential development, and highway construction. Even if broken and scattered artifacts are found later, most of the information about the site and its occupants is lost. People digging up artifacts without regard to the site and the knowledge it contains pose dangers as well.

Archaeological preserves were established to encourage the study and appreciation of prehistoric and historic cultures in Iowa. The need to preserve important archaeological sites for future generations was recognized as early as 1920 by Charles R. Keyes, past

director of the Iowa Archaeological Survey. Keyes, considered by many to be the father of Iowa archaeology, recommended, in the 1930s and 40s, 18 sites for state purchase and preservation. Six of those sites have since been dedicated as state preserves. Three additional sites are now protected within Effigy Mounds National Monument.

There are currently 16 preserves dedicated for their archaeological significance. Several qualify for

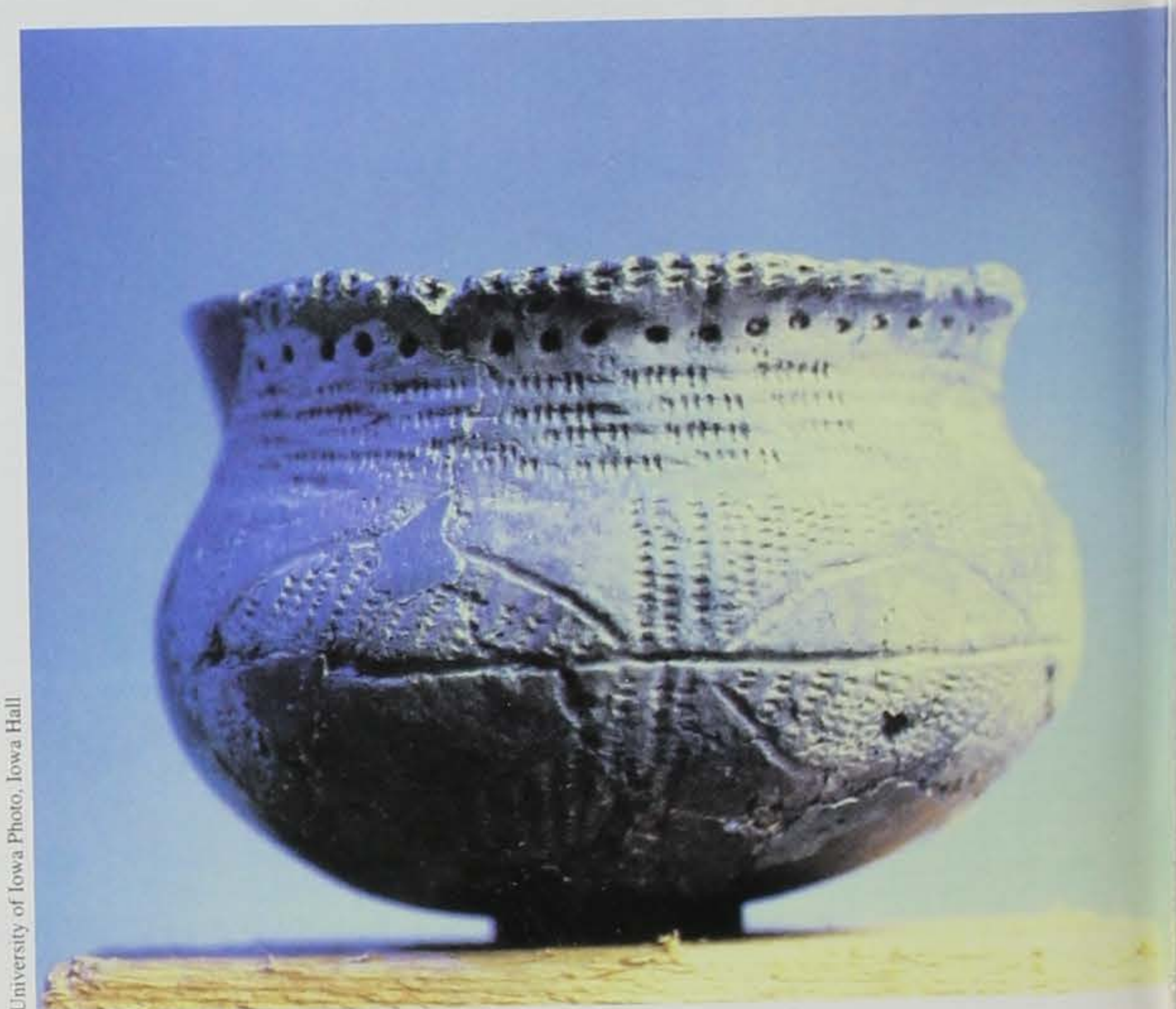
preserve status in one or more of the other category types -- geological, natural(biological), historical or scenic. Conversely, many preserves not designated specifically as archaeological preserves do contain archaeological sites.

CULTURAL HISTORY OF IOWA

For many people, Iowa's history extends back only to the first white European settlers. However, there were people inhabiting what is now Iowa for thousands of years before European settlement. Prehistoric archaeologists study the period of human history before it was written. With no written documents available, the material remains left by past cultures are the primary evidence archaeologists have to reconstruct the past. Prehistory is the majority of the total human story.

Paleo-Indian

The environment during the *Paleo-Indian* period was vastly different from that of today. The climate was cooler and wetter than



University of Iowa Photo, Iowa Hall

▶ Woodland pottery vessel

present averages. The recently deglaciated landscapes were covered by boreal and conifer-hardwood forests, shifting through time to elm- and oak-dominated woodlands. Prairie, if present, was very limited. The mobile Paleo-Indian peoples hunted now-extinct large mammals such as mammoth, mastodon and giant bison. Currently there are no known sites within the State Preserves System dating to this period.

Archaic

Following the end of the Ice Age, environments changed relatively quickly, as deciduous woodlands, mixed with prairies in western areas, became established over most of the state. The *Archaic* culture was an adaptation to forest and riverine conditions with intensive hunting and gathering. This economic adaptation and the seasonally mobile settlement patterns of Archaic peoples seem to have been a response to the seasonally

diverse environment. Toward the end of the Archaic period, population levels appear to have increased substantially. The construction of large communal burial grounds, or ossuaries, suggest that Archaic groups were becoming more sedentary.

Brushy Creek State Preserve in Webster County was dedicated for its archaeological, geological and natural features. The area was occupied by Middle Archaic people who camped in the Brushy Creek bottomlands and used the abundant plant and animal resources. One of the early Middle Archaic sites contains evidence of bison killing and butchering.

The next major period of human occupation in the Brushy Creek valley occurred approximately 1,000 to 1,200 years ago, when Late Woodland people used the uplands for seasonal hunting. A burial mound group located within the preserve boundaries was built by these Woodland people.

Woodland

The *Woodland* tradition was characterized by the construction of burial mounds and by improved technologies, such as ceramics and horticulture, which lead to increased efficiency. The basic hunting and gathering subsistence strategy, continued from the Archaic period, was pursued during all of the Woodland cultural phases. Native plants often thought of as weeds today were grown for their nutritious seeds. Woodland farmers developed domesticated varieties of some native grain crops long before corn or beans became important.

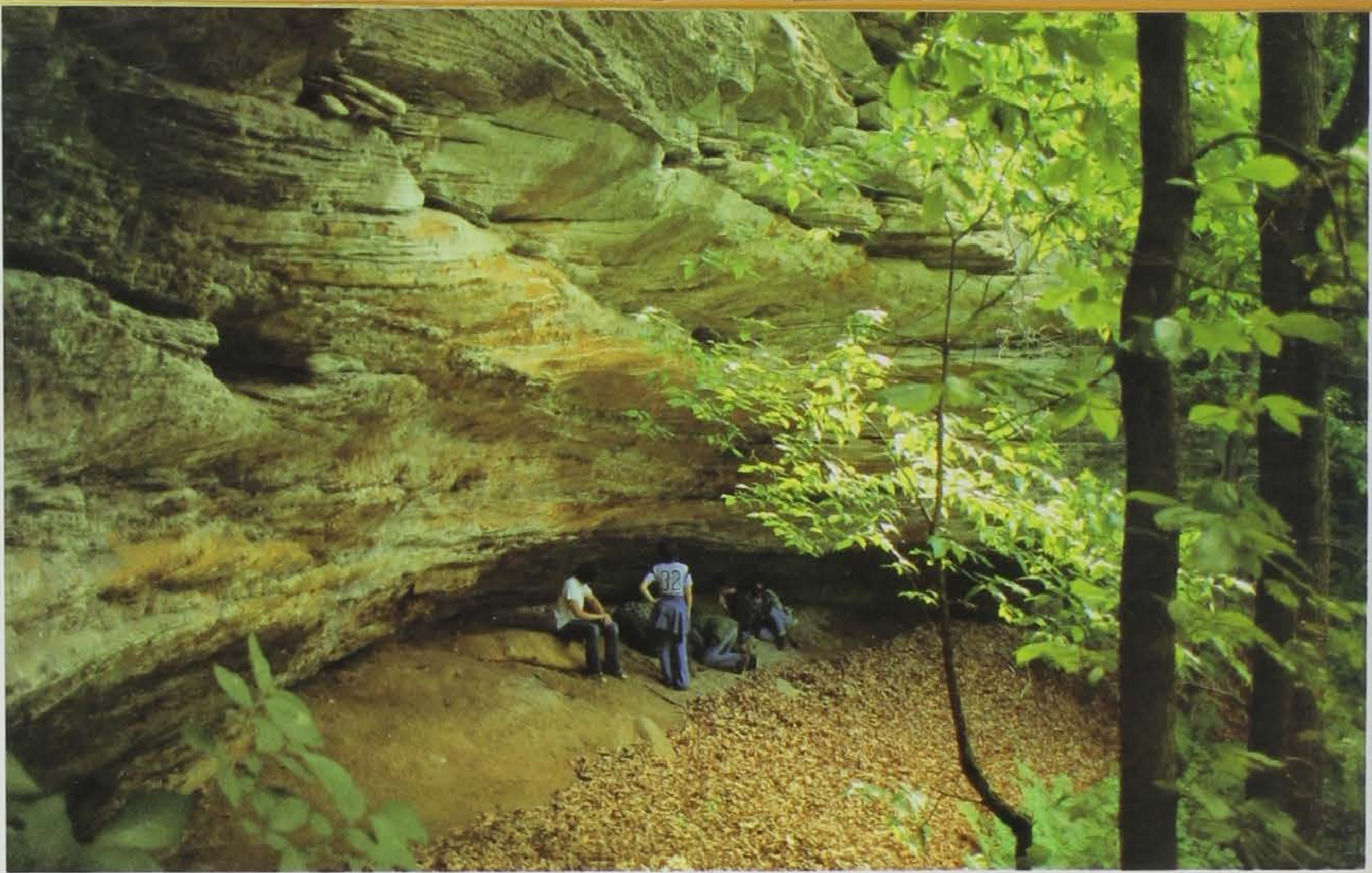
Ceramics are an example of one very important artifact for the archaeologist. They are breakable, yet the broken pieces, or sherds, occur in abundance after hundreds of years in the ground. Ceramics were also an avenue of artistic expression. The appearance of pottery during Woodland times is significant because it indicates that people may have become more sedentary. Earlier peoples used light-weight,

A Timeline of Iowa Prehistory

DATE	CULTURAL PERIOD
A.D. 2000	Historic <i>Dakota Mesquakie Winnebago Potawatomi Iowa Oto</i>
A.D. 1300	Oneota
A.D. 1000	Oneota Mill Creek Great Oasis Glenwood
A.D./B.C.	Late Woodland
	Middle Woodland
	Early Woodland
1000 B.C.	Late Archaic
2000 B.C.	Middle Archaic
3000 B.C.	
4000 B.C.	
5000 B.C.	Early Archaic
6000 B.C.	
7000 B.C.	Late Paleo-Indian
8000 B.C.	
9000 B.C.	Early Paleo-Indian
10,000 B.C.	

▼ Example of effigy mounds built by the Late Woodland culture. This aerial was taken at Effigy Mounds National Monument in Allamakee County.





Dean Thompson, Office of the State Archaeologist

▲
Rock shelter at Woodman Hollow State Preserve, Webster County

portable skin bags or carried woven containers made from the inner bark of trees or reeds. Nomadic hunters and gatherers would not have wanted to carry heavy breakable pots. When they began to settle in villages for parts of the year, however, they found many uses for pottery.

Earthen mounds are believed to have been constructed primarily for religious, ceremonial and burial purposes. These symbolic features and the cooperative construction efforts needed were seemingly associated with birth, rebirth and death. The predominant type of archeological feature in the State Preserves System is that of the burial mound group. Although hundreds of mounds dotted hilltops and terraces along rivers and streams even a hundred years ago, many have been destroyed by cultivation, construction and vandalism.

Early Woodland settlements were small and seasonally occupied, similar to those of the Late Archaic period. The *Middle Woodland* period is

characterized by influences from what archaeologists call the Hopewell Interaction Sphere -- a burial cult or religion. This interaction sphere consisted of the exchange of ideas and raw materials among cultures over a wide area but with local variations and modifications. Trading involved raw materials such as Knife River flint from North Dakota, obsidian from the Yellowstone Park area, and shells from the Gulf Coast, as well as high quality stone and ceramic artifacts. Burial mounds of this period are more complex than earlier or later mounds. Most Middle Woodland peoples probably lived in small communities or farmsteads, focusing their subsistence economy on food resources in large river valleys and tending gardens of squash, tobacco and native grain crops such as marshelder and goosefoot.

By *Late Woodland* times population levels apparently increased rapidly. For the most part, settlements were small and dispersed across the landscape. Although the widespread exchange of exotic raw materials and artifacts declined, some trade and contact with other groups continued. A technological development appearing at this time and contributing to cultural

change was the bow and arrow. Corn was introduced to many groups after around A.D. 800 but did not form a staple crop until A.D. 1000. While mound building continued into the Late Woodland period, mound construction was generally simpler than in the preceding period. An interesting variation appeared in the Upper Mississippi River valley area -- the construction of effigy-shaped mounds.

In *Turkey River Mounds State Preserve*, on top of a scenic narrow ridge overlooking the Mississippi River and the mouth of the Turkey River, are 43 burial mounds and a semicircular ditch which encloses three of the mounds. Mound construction spanned the "transitional" Archaic-Woodland period through the Late Woodland Effigy Mound period. Most of the unexcavated mounds within the preserve -- an effigy mound, linear mounds, and conjoined conicals -- probably date to Late Woodland. The Turkey River State Preserve Archaeological District was listed on the National Register in 1989.

Fish Farm Mound Indian Mounds State Preserve contains at least 28 mounds on a high terrace

overlooking the Mississippi River in northeast Iowa. Two other mounds exist outside of the preserve boundaries but are considered to be part of the same site. Some of the mounds were built during the Middle Woodland period by people at least peripherally involved with the Hopewellian mortuary complex. Other mounds were built by early Late Woodland groups. There are several sites in the immediate vicinity of Fish Farm Mounds including a rock shelter, another mound group and two village sites, all of which may be culturally associated with this preserve. The Fish Farm Mounds were listed on the National Register of Historic Places in 1988.

Hartley Fort State Preserve is a small fortified Late Woodland village in Allamakee County in northeast Iowa. This is a private preserve and permission must be obtained to visit the site. Archaeological deposits at Hartley Fort include an earthen enclosure, a habitation area, nine conical mounds and a borrow pit. Storage pits, burials and palisade postholes were uncovered during excavations in the 1960s. Pottery indicates contact with the Mill Creek culture in northwest Iowa, Late Woodland cultures in southern Wisconsin and Mississippian sites in the American Bottom near East St. Louis, Illinois. Archaeological evidence suggests the site was later used by people of the Oneota culture. The site is significant in relation to understanding the interaction of late prehistoric groups in the Upper Mississippi Valley.

Late Prehistoric

By A.D. 1000, the earlier hunting and gathering groups had been replaced by cultures based primarily on horticulture -- in eastern Iowa, the Oneota; in western Iowa, Oneota, Great Oasis, Mill Creek, and Glenwood (Central Plains). Improved corn varieties, garden surpluses, new storage methods, earthlodge houses, and a complex social organization were common to these Late Prehistoric villagers. Bison meat was a common item in the diet, and hides were processed for clothing, robes, lodges and tepee coverings. Bison bones were modified into a

variety of tools such as scapula hoes, used in gardening and digging.

The *Great Oasis* culture developed from the local Late Woodland culture around A.D. 1000. Villages were situated on low terraces above the flood plains of rivers and streams, and on lake shores. Large, permanent villages may have been occupied by the entire population throughout the fall, winter and spring. Smaller, temporary campsites were used for seasonal gathering of resources. During the summer, a communal bison hunt or the establishment of small campsites for horticultural purposes may have led to temporary abandonment of the large settlements.

Although the main distinctive feature of *Gitche Manitou State Preserve* is geological, several archaeological sites are located within the preserve boundaries. Prehistoric sites include a possible mound group and three habitation sites. A recent archaeological survey of this preserve identified one and possibly two Great Oasis sites.

Mill Creek villages appear as deep accumulations of habitation refuse, or midden deposits, on terraces above the Big and Little Sioux rivers and their tributaries. Many of the compact villages were fortified with log palisades and encircling ditches. Within the villages were individual earthlodges with large internal storage pits containing the produce from their corn plots along with native crops. Communal bison hunts were probably conducted on one or more occasions during the year. Mill Creek people maintained connections, possibly through trade, with major prehistoric centers in the Mississippi

valley.

Wittrock Indian Village State Preserve is a Mill Creek village located in O'Brien County in northwest Iowa. It was the first archaeological site dedicated in the Preserves System. Thanks to the Wittrock family, who plowed around the site until it was acquired by the DNR in 1937, much of the site remains intact.

The site is situated on a low terrace on the eastern bank of Waterman Creek, a tributary of the Little Sioux River. Occupied between A.D. 1100 and 1300, the village was surrounded by a rectangular ditch -- still visible today -- and a palisade used for fortification. Depressions in the land surface reflect the locations of 20 semisubterranean houses built by the village occupants.

The site was dedicated as a National Historic Landmark in 1965. Although the preserve is state-owned,



P.A.S.T. Photo, Office of the State Archaeologist

▲ Wood duck effigy pipe found at Toolesboro Mounds, Louisa County

access is across private property. Permission from the adjacent landowner is necessary to visit the site.

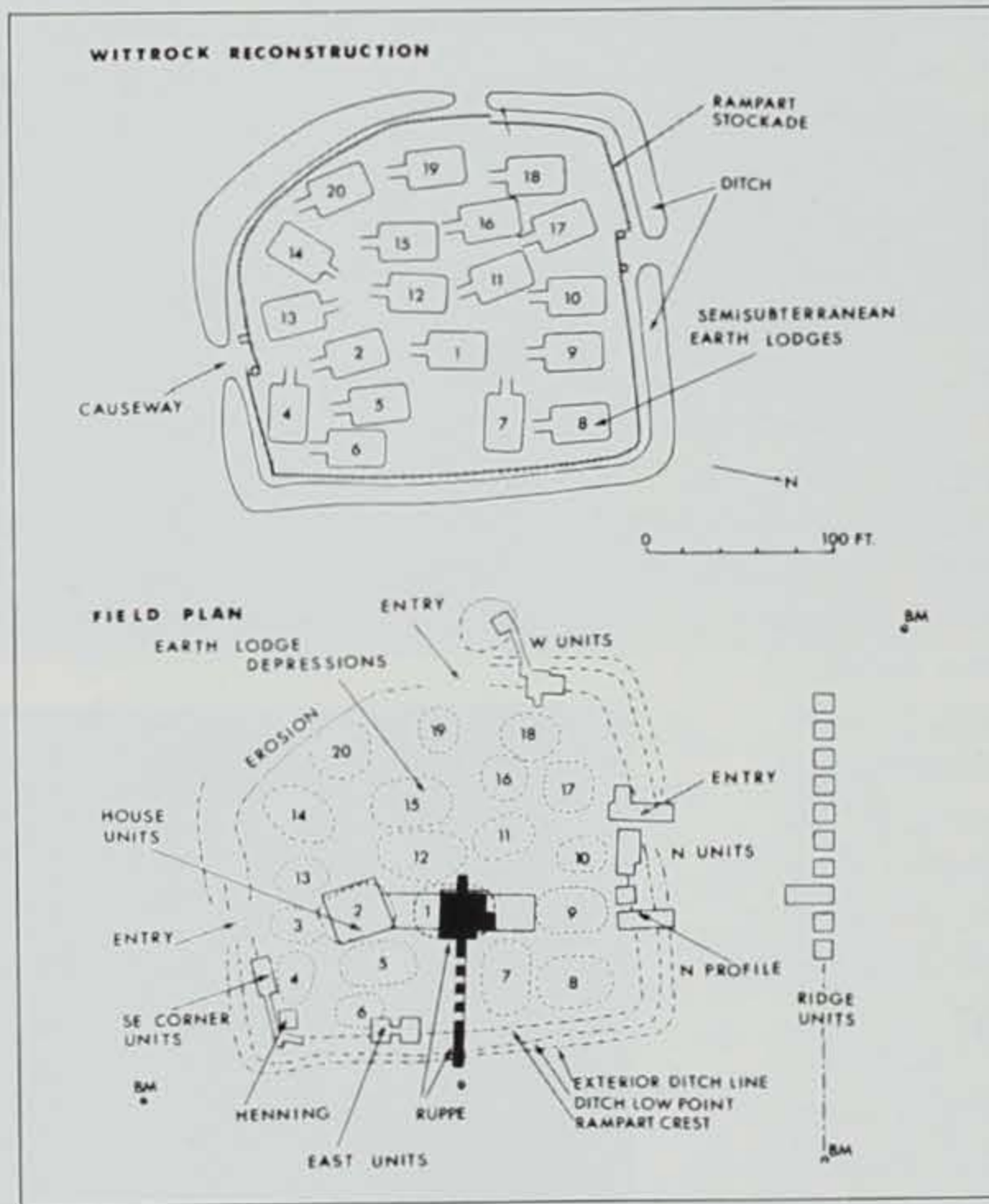
The archaeological remains of communities along the Missouri River in eastern Nebraska, southwestern Iowa, northwestern Missouri, and northeastern Kansas are grouped into what is called the Nebraska phase of the *Central Plains* tradition. In south-

western Iowa near Glenwood, these sites occur as scattered homesteads and small clusters of houses along ridges and bluffs, and in the valleys of the Missouri River and its tributaries. Currently there are no known Central Plains sites within the State Preserves System

During the Late Prehistoric period the *Oneota* culture dominated much of

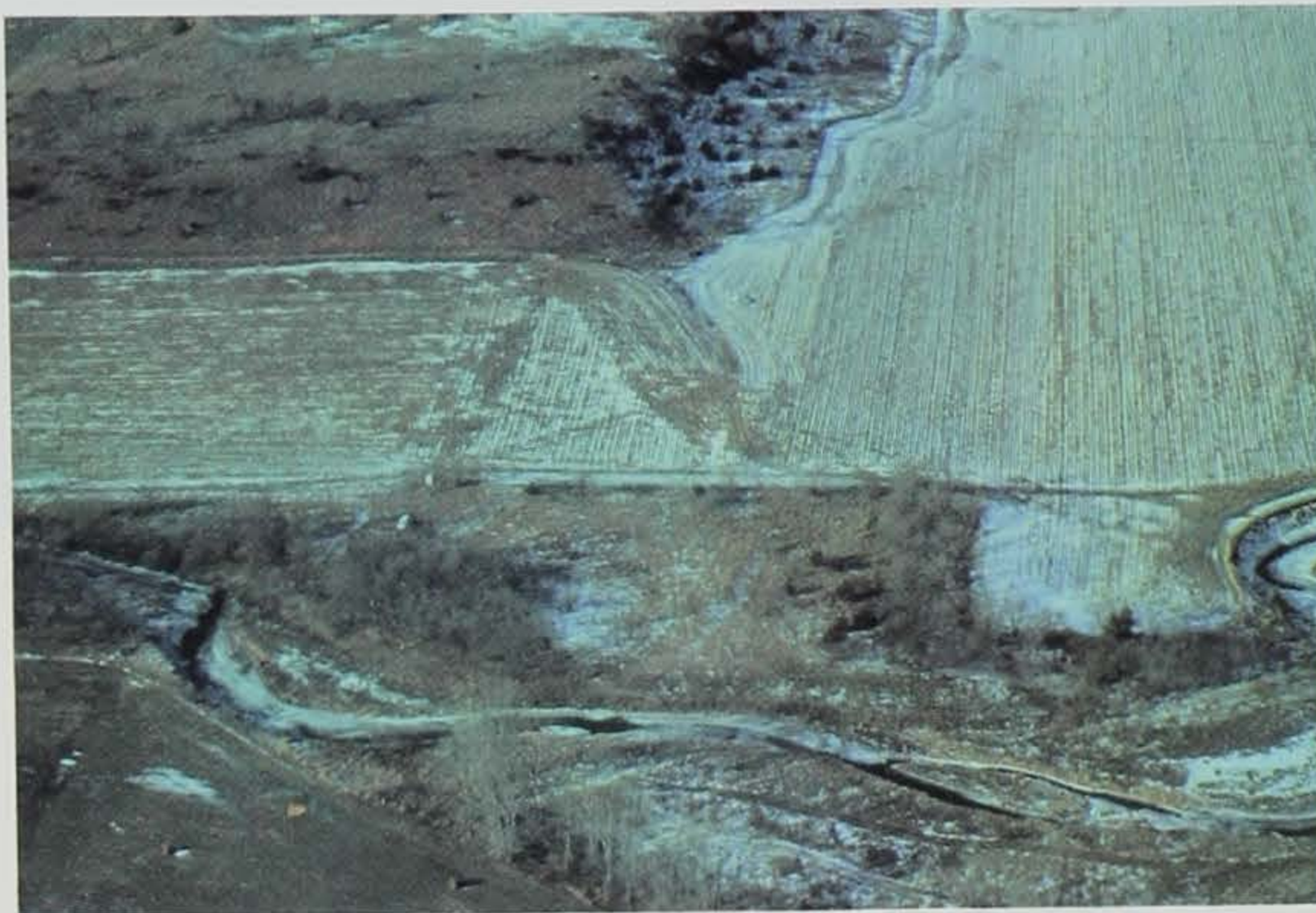
eastern Iowa as well as extensive parts of central and northwestern Iowa. Oneota peoples lived throughout the Midwest between around A.D. 1000 and 1700. Oneota villages were large and sprawling with numerous storage pits scattered throughout. Shell-tempered, globular-shaped pots decorated with geometric designs are distinctive and found in abundance on Oneota sites. The subsistence economy was based on fishing, hunting, plant collecting and agriculture. Oneota complexes are ancestral to several midwestern tribes such as the Iowa, Oto, Missouri and Winnebago.

►
Reconstruction diagram of the Wittrock Indian Village, O'Brien County



Marshall McKusick Reconstruction

▼
Aerial photo of Wittrock Indian Village State Preserve, looking north at the site

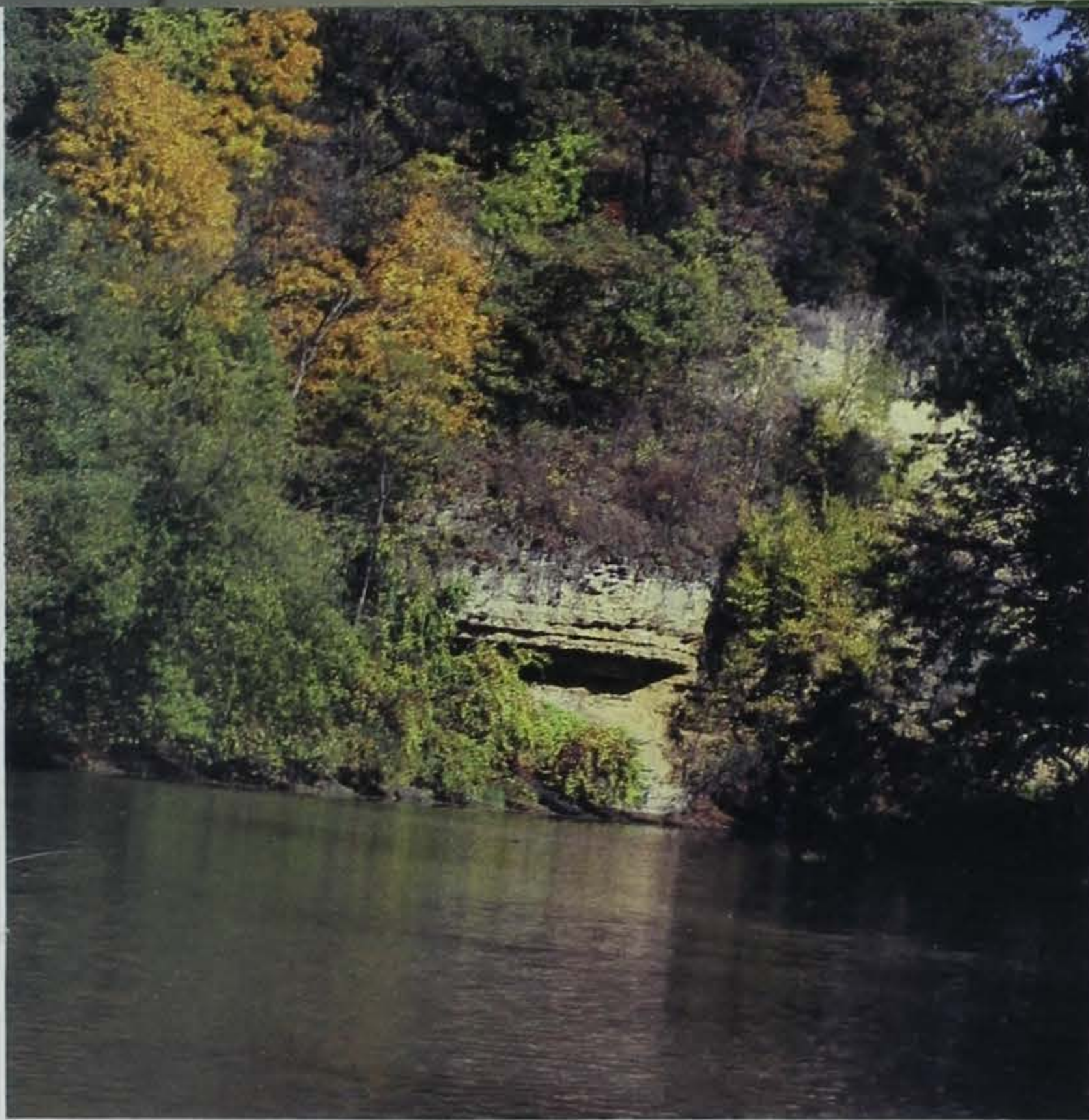


Mary Helgevold

Historic Indians and Euro-Americans

Early Euro-American trappers and traders in the eastern part of the state would have likely encountered the Iowa, Dakota, Sauk and Mesquakie tribes. By the early to mid-1700s, the Iowa were moving west due to increasing pressures from groups to the east -- Great Lakes groups including the Sauk, Mesquakie (Fox), Winnebago and Potawatomi. By the early to mid-1700s the Mesquakie were settling into eastern Iowa, remaining until the Black Hawk War treaty in 1832. The Indian-French trading culture flourished for nearly 150 years, between the 17th and the early 19th centuries, starting with the Marquette and Joliet exploration of the Upper Mississippi in 1673. The fur trade and, in northeastern Iowa, lead mining maintained European interest in the region.

In 1762, the area that is now Iowa came under Spanish rule. The Mines of Spain State Recreation Area, Dubuque County, is a portion of Julien Dubuque's original land grant which he received from the Spanish government in 1796. The Mesquakie Indians allowed Dubuque to mine for lead in what they considered their territory from 1788 to Dubuque's death in 1810. The United States obtained Iowa as part of the Louisiana Purchase in 1803 after the area had been returned to the French, and soon thereafter President Jefferson sent Lewis and Clark to explore the Louisiana Purchase. In 1809, Fort Madison was built, followed



DNR Photo

◀
**Catfish Creek at Mines of Spain,
 Dubuque County**

The sites at the mouth of Catfish Creek comprise the area that has been an intricate part of the prehistoric occupation of the region, the focus of early historic American Indian and Euro-American interaction, as well as the site of an early American mining settlement. Historical documentation is imprecise enough to raise uncertainty as to the exact locations of the various structures associated with Julien Dubuque's establishment. While archaeologists do not have enough evidence at this point to conclusively pinpoint the locations of these structures, it does appear at least some of Dubuque's settlement occurred in this site complex near the mouth of Catfish Creek.

The most readily observed features of the lead mining in the Mines of Spain are the mine pits, adits and shafts. Archaeological evidence for the lumbering and farming activities that replaced lead mining as economic pursuits include stone fences, a series of old roads, several historic foundations and a small historic family cemetery. Historical and archaeological evidence indicate the area was also used for weekend or summer retreats by at least two Dubuque families in the latter part of the 1800s.

Fort Atkinson State Preserve is located along the Turkey River in Winneshiek County in northeast Iowa. The Neutral Ground, a 40-mile wide strip from the Mississippi River to Des Moines, was established in 1830 by the U.S. government in a peace effort to separate the Sioux (to the north) and the Sauk, Mesquakie and Iowa. In 1840, the army tried to move the Winnebago from Wisconsin to the eastern half of the Neutral Ground, where they were provided with an Indian agency and school. The Winnebagos, however, were reluctant

by Fort Armstrong at Rock Island, Fort Crawford at Prairie du Chien and Fort Atkinson in Winneshiek County. In 1833, much of eastern Iowa was opened for non-Indian settlement, in 1846 Iowa was granted statehood, and by 1850 small towns were scattered across the state.

Catfish Creek State Preserve is located in the northern portion of the Mines of Spain State Recreation Area, south of the city of Dubuque. The Mines of Spain has been listed as a historic district on the National Register of Historic Places and has been nominated as a National Historic Landmark. The natural resources of the Mines of Spain attracted both prehistoric and historic inhabitants to the area.

For the prehistoric people, the Mississippi River was a source of food, water and a transportation route. The rock formations provided surveillance points, landmarks, shelter and possibly ceremonial sites. Abundant plant resources and wildlife provided food and clothing for the prehistoric people and later attracted Euro-American interest in hides and furs and the

subsequent influx of trappers and traders. The lead deposits in the area drew international attention to the region as early as 1682.

The prehistoric cultural sequence of the Mines of Spain follows the general pattern for the rest of Iowa and the midwestern United States. Prehistoric evidence such as burial mounds, rock shelters, village and camp sites, and numerous artifacts indicate previous occupation in the area dating as far back as approximately 8,000 years. Although the lead ore in this area had been known to Europeans since the 1600s, the lead region of the Upper Mississippi Valley was controlled by American Indians until the 1820s and 30s.

Julien Dubuque spent 22 years living and working with the Mesquakie Indians at the Mines of Spain. His lead-mining establishment included a wharf, a blacksmith shop and forge, a mill, a smelting furnace, boats, mining equipment, livestock, fur trade paraphernalia, and housing for him, his French associates and several hundred Indians, as well as the lead mines themselves.

Fish Spawning

Species	Time	Temperature
Northern Pike	March-April	35 degrees
Walleye	April	45-50 degrees
White Crappie	April-May	56 degrees
Black Crappie	April-May	58 degrees
Carp	April-June	58-68 degrees
White Bass	April-June	58-70 degrees
Largemouth Bass	May-June	63-68 degrees
Bluegill	May-August	70-80 degrees
Channel Catfish	May-July	75 degrees
Brook Trout	October-November	50 degrees

Do all fish spawn at the same time of year?

No. There is quite a difference in the spawning time of many fish species. One of the earliest species is the northern pike, which usually spawns in March or April when the water temperature is only about 35 degrees -- just three degrees above freezing. Northerns have been known to spawn under the ice. Largemouth bass don't begin spawning until water temperatures are 63-68 degrees which, in Iowa, usually occurs in May or June. Channel catfish really like it hot before they become amorous. They don't start spawning until water temperatures reach the mid-70s which can occur in Iowa anywhere from late May to July. Brook trout are at the other extreme. They don't spawn until October or November when the water temperature has dropped back down to around 50 degrees.

See table above for a list of the fish mentioned plus some other popular species and their spawning times and temperatures.

I like to go crappie fishing using jigs tipped with minnows, but I usually have some minnows left over from each trip. How can I keep them alive until the next trip?

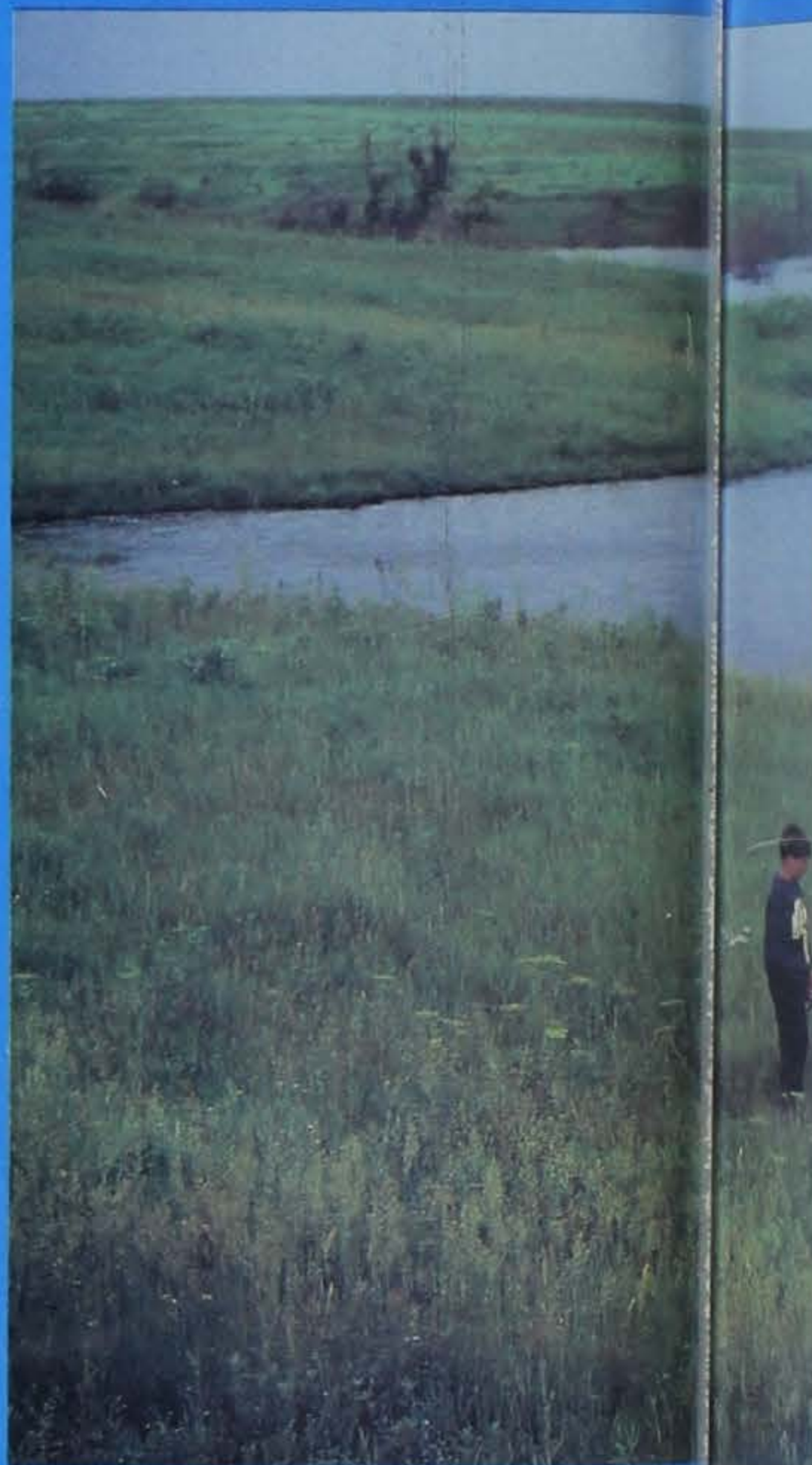
A jig and minnow combination is a great way to really tie into good numbers of crappie, but as you've noted, keeping the minnows alive

can be a bit of a problem. Temperature and lack of oxygen are your greatest enemies in this battle, so here are my recommendations starting from the time you head home until you head out to the lake again.

First of all, look in your minnow bucket and get rid of any minnows that are injured or look stressed. Fill your bucket with some cool water from the lake -- not the water in the shallows by the boat ramp where the sun has been shining all day, but in some deeper water that has been shaded. If your trip home takes more than an hour, try putting the minnow bucket in your cooler to keep the temperature from climbing too high. Don't let the bucket sit in the sun in a closed vehicle for too long.

Once you're home the minnows will still need a cool place to live with plenty of fresh water. I suggest using a cooler or half of a clean plastic drum to keep your minnows. Place the cooler in your basement or in an old refrigerator. Keeping the temperature down does several things -- it reduces the stress on the minnows, allows the water to hold more oxygen, and it slows the spread of most diseases.

Your minnows will need fresh water every few days. If you live where the water is chlorinated, you will need to let the water set for several days so most of the chlorine



Lowell Washburn



Ron Johnson

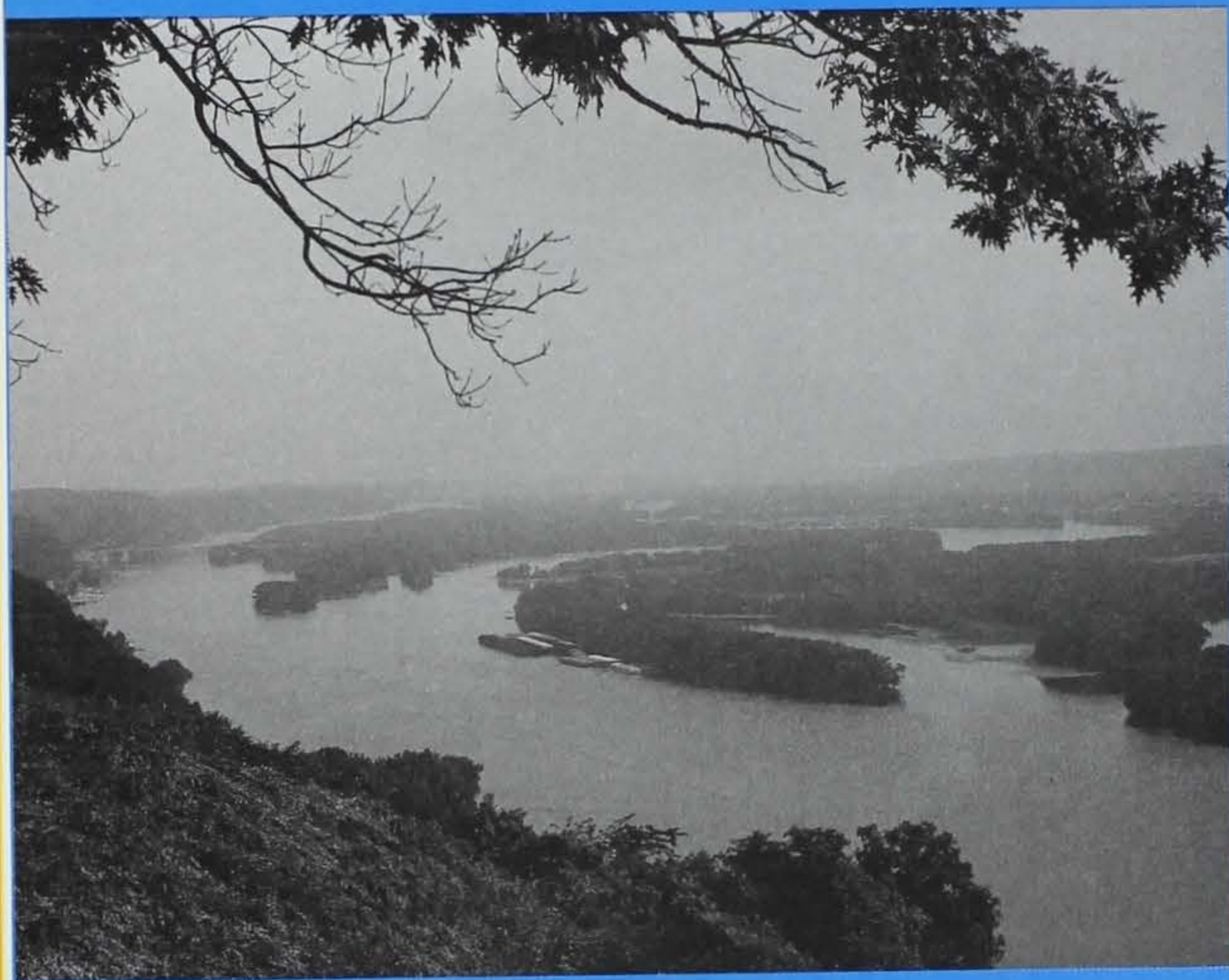


Water is the most dense, or heaviest, at 39 degrees. Both warmer and colder water are lighter. Once the water reaches 39 degrees, it displaces the warmer, lighter water at the bottom of the lake. This lighter water then rises. This is known as "lake turnover." (Top photo)

One of the earliest species to spawn is the northern pike, which usually spawns in March or April. (Far left photo)

Storing minnows in a cool place and changing the water frequently will help keep minnows alive between fishing trips. (Left photo)

DNR photo



Paul Kirpes

Effect of Temperature Upon the Density of Water

Temperature	Density
32 degrees	0.99987 -- water 0.9168 -- ice
34 degrees	0.99903
38 degrees	0.99999
39 degrees	1.0000
42 degrees	0.99997

will gas off. Chlorine is very hard on fish, but *why* is another question. If your water is heavily chlorinated or you want to be extra cautious, most pet stores sell de-chlorinating tablets for aquariums.

Even if you have well water it might be advisable to allow the water to set for a few days. Some well water has very low concentrations of dissolved oxygen. Almost directly opposite from this is the fact that well water can be super saturated with some gases such as nitrogen. Allowing the water to set for a few days alleviates both these problems.

Another reason for letting the water set is so the temperature will adjust to the same temperature as the water the minnows are in now. Fish can go into thermal shock if they are quickly moved to water that is more than five degrees different from the water they are in.

In order to maintain adequate dissolved oxygen levels you should not try to keep more than one or two minnows per gallon of water. If you want to keep higher concentrations

of fish, buy an inexpensive aquarium pump and air stone and keep a steady stream of bubbles rising to the surface of the water at all times.

A quick recap --

- Keep fish cool and in good shape until you get home.
- Replace the water with fresh, cool, well-oxygenated water at least once a week.
- Avoid chlorinated water.
- Continue to sort out any injured or stressed fish or any that show signs of fungus.

You should be able to keep your minnows for a couple of months without worrying about feeding them.

What does it mean when people talk about a lake turning over?

A fairly simple question with a rather complex answer. Let's start with a short lesson in limnology (the science of processes in which matter and energy are transformed within a lake). The lesson starts with the fact that water is the most dense, or heaviest, at 39 degrees Fahrenheit. Water both warmer and colder than this is lighter. The fact that everyone has observed but may not have thought much about is that ice at 32 degrees is 8.5 percent lighter than water at 32 degrees. That is why ice floats. Water is one of the few substances that is less dense in its solid form than in its liquid form. The table above may help explain this unique characteristic.

In the fall as the surface water cools and gets closer and closer to that 39-degree point, it becomes more and more dense or heavy. This heavier water then displaces the warmer, lighter water at the bottom of the lake. This lighter water then rises. This is known as lake turnover. In the winter where would the lightest water be and where would the heaviest water be? The heaviest water would be at the very bottom of the lake and the temperature of that water would be that magic 39 degrees. The lighter

and cooler water would be above and would be progressively colder toward the surface with the coldest water at 32 degrees just under the ice. Remember the ice itself is 8.5 percent lighter than the water and therefore floats. If water did not possess this unique characteristic, it certainly would ruin ice fishing.

How many different kinds of fish are found in the Mississippi River?

Well, if you mention the Mississippi River most people think of catfish, -- maybe channel catfish, maybe flathead catfish, but definitely catfish. Many people are surprised to find that the Mississippi also has viable populations of walleye, sauger, largemouth bass and even smallmouth bass. Yes, that resident of clear northern lakes and freestone streams also graces the mighty Mississippi. In fact, 147 species of fish representing 28 families are known to occur in the Upper Mississippi River (UMR) -- that portion of the river north of the confluence with the Ohio River at Cairo, Illinois.

Believe it or not trout have even been taken in the UMR as far south as Pool 14 near Davenport, Iowa. Of course, not all of the 147 species occur throughout the entire UMR. Those species of interest to anglers, such as walleye, sauger, largemouth bass, channel catfish, bluegill and crappie are abundant in the pooled portion from Alton, Illinois north, but most become uncommon in the open river below Alton.

Which single species would you guess has the greatest number of individuals in the UMR?

Need a hint? Some ocean-going species of this family taste really good on crackers after they've been pickled. The family is the herring family, and the most abundant single species in the UMR is the gizzard shad -- a prey species and well-known bait fish of catfish anglers. The gizzard shad is classed as abundant from Cairo, Illinois all the way to the Twin Cities, often reaching hundreds of pounds per acre in some areas.

What family of fishes has the greatest number of species in the Mississippi?

You might be able to guess when I tell you most of its members never get more than a few inches long. The minnow family has 48 species found in the Mississippi which is just about one third of the total number of species. The most famous member of this family has to be the carp -- that Asian transplant that occurs everywhere.

... 147 species of fish representing 28 families are known to occur in the Upper Mississippi River.

What family has the second most number of species in the UMR?

The same hint for this group as for the minnow group would apply -- most members never get much larger than minnows. Although this is true, the lesser-known members of this family are even more obscure to most anglers than the minnows. However, the more famous members of this family are sought after by many more anglers. Have you figured it out yet? The second largest family of fishes found in the UMR is the perch family which includes those highly prized species -- the walleye and sauger. This family has 18 species found in the UMR, the majority of which, called darters, never get more than a few inches long.

Two families that come in a close third and fourth with 15 and 14 species, respectively, are the sucker family and sunfish family. The sunfish family contains the much-sought-after largemouth bass and its equally popular cousin the smallmouth, as well as bluegill and crappie.

In fifth place, we find the catfish family with the ever-popular

channel catfish and bullhead, and the ever-ugly flathead catfish.

Well, that gets us to sixth place, and like I said in the beginning, there are 28 families, some of which only have one species in the Mississippi. The bowfin is one such example -- that strange prehistoric-looking fish with the long dorsal fin that inhabits backwaters of the Mississippi. The even stranger looking paddlefish is another example. Its closest living relative

is found in China. In the lower pools and the open river there is even an obscure species named the mosquito fish that gives birth to live young.

So, as you can see, the Old Miss is a lot more than just a catfish creek. It contains a full range of fish species -- something you might keep in mind the next time you're trying to decide where to go fishing.

And, by the way, that rumor you heard is true. There is -- or at least was -- a shark in the Mississippi . . . a bull shark found in Pool 26 near Alton. The bull shark is an innocent species that often wanders into streams and estuaries. That other rumor you heard is also true -- "Fishing is great in the Hawkeye State."

Have a question you'd like to see considered for my next article? Send it to me at the Fairport Fish Hatchery, Rte. 3, Muscatine, Iowa 52761.

Bernie Schonhoff is a fisheries biologist for the department at the Fairport Fish Hatchery.

by Lowell Washburn

ALL IN A DAY'S WORK



DNR photo

▲ Hazardous spill specialists work to contain an anhydrous ammonia leak from this railway tank in Aplington in 1991.

Have you ever wondered what to do with a pile containing more than 14,000 dead and rapidly decaying laying hens? No? Well, then how about this one. Have you ever wondered what to do with that little puddle of fluorescent ooze that leaked from a barrel on a truck that just pulled off the interstate? You know, the puddle that just caused the county sheriff to suddenly become unconscious and fall face first into the parking lot of a busy fast-food restaurant. No, I haven't had to deal with that one either, and I don't think I want to.

I've also never had to try and figure out which way a deadly cloud of escaped anhydrous ammonia is going to head next, or how to safely remove 7,000 gallons of gasoline from the lift station of a public water treatment plant, or who or what just killed all the fish in a favorite fishing hole.

For a select handful of Iowans, situations like these are an all-too-common occurrence and may, in fact, be all in a day's work at an Iowa DNR's Environmental Protection Division field office.

In Iowa, the DNR's environmental protection activities are divided among six districts, each served by an EPD field office. A typical office is staffed by one field office supervisor, a half-dozen environmental specialists and one secretary. Field offices are located at Mason City, Manchester, Spencer, Atlantic, Des Moines and Washington, Iowa.

According to Bill Jinkinson, field office supervisor for the department's Mason City office, the field work in each district falls into two main categories -- routine and nonroutine.

One of the main purposes of each field office is to conduct inspections of various facilities to evaluate compliance with environmental regulations. "Typically, these include the periodic inspections of landfills, municipal wastewater treatment plants, industrial wastewater treatment sites, public water supplies, underground storage tank sites, and industrial air pollution sites," says Jinkinson.

"Of course it is the nonroutine aspect of our work that generates the most public interest. But it is also the part of the job that can instantly throw all of your plans out the window and make life extremely interesting," he chuckles.

Most of the nonroutine workload comes largely as the result of public complaints. "People come to us with a wide variety of concerns such as illegal open dumping, stream pollution, open burning, or maybe a runoff problem with a neighbor's feedlot," says Jinkinson. "We also respond to a number of emergency situations that we refer to as 'hazardous conditions'." The most common are spills involving agricultural chemicals or petroleum products. Although spills involving large quantities of toxic industrial wastes are the rarest type of 'hazardous condition' to occur in Iowa, they draw

widespread media attention and are perhaps the best known to the public.

Environmental specialist, Ron Stellick, agrees. Stellick works out of the department's Manchester field office and has been involved in environmental protection for 29 years.

"In [the northeastern] part of the state we seem to suffer frequent fish kills," says Stellick. Many occur during the summer when fish populations may already be stressed by heat. If a sudden occurrence flushes some waste into an already-stressed environment, the odds are high that a significant kill will occur.

When a fish kill does strike, environmental protection personnel often work hand in hand with fisheries biologists and conservation officers to discover the cause of the incident.

"The biologists are very efficient at determining the cause of death and the officers have a tremendous number of contacts out there," says Stellick.

"Once we arrive at a site, the first thing we try to do is sample the pollution. We grab samples upstream, downstream and from any known outlet," says Stellick. "Sometimes we get lucky."

At a recent kill, the scenario followed the cookbook formula. A pipe containing water contaminated by a feedlot operation was discharging directly into the creek. "Essentially there was no oxygen and no live fish on the downstream side of the discharge," says Stellick, "but things were normal from there upstream. A case like that is pretty cut and dried."

"Another time we got a call that a stream had literally turned white," recalls Stellick. "It turned out to be someone dumping milk from a dairy operation. A case like that is also pretty simple. You just pull on your boots, walk upstream and find the source." But these are textbook cases, and the task at hand is usually not so easy. Unfortunately, some of the calls come too late, and whatever toxin may have caused a kill is no

longer present at the scene. "At that point we can often speculate, but offer no real proof," Stellick notes.

"Some of our largest fish kills remain unsolved," says Stellick. A classic example occurred a few years ago on the Wapsipinicon River near Anamosa. "It was really quite incredible," says Stellick. "Dead fish everywhere -- lots of pike, lots of catfish over 10 pounds." No one could figure out what killed those fish, and the incident was eventually filed away. Then, out of the blue, the mystery killer struck five years later in the same

leaking underground storage tanks is currently being monitored.

"Considering that we are staffed by a total of only seven technical personnel and just one secretary, it's pretty easy to see how we can fall behind," says Stellick. "Recently, in a three-week period, we received more than 40 complaints at this office." Sifting through a mound of paperwork, Stellick listed some examples.

- an illegal sewer system discharging into the Maquoketa River;
- dumping of construction material into the Wapsipinicon River;

"... for me the things that stick out the most in my mind are not necessarily the big kills or the big spills. Instead, it is the unsolved mysteries like the reoccurring kills on the Wapsipinicon River."

place and with the same vengeance.

"That's really frustrating," says Stellick, "and you can lose sleep trying to figure out what's going on."

The field offices make recommendations on what actions should be taken to fix the problem, and may recommend enforcement action.

Each case is weighed on its own merit. Some are accidents, and unfortunately others are deliberate violations

"Basically, dealing with the complaint load comes as an 'add on' to our routine duties," says Stellick. At the Manchester office routine duties include the scheduled inspections of 518 active public water supplies, 25 sanitary landfills and transfer stations, 352 sites in 15 counties that hold permits to discharge treated wastewater, 36 major industrial air sources (each capable of annually emitting in excess of 100 tons of pollutants), 2,772 registered underground storage tanks, and 719 sites where the cleanup of

■ improper disposal of industrial waste at a fiber plant;

■ improper disposal of waste oil down a shop drain;

■ manure being dumped into a marsh adjacent to the Maquoketa River;

■ strong industrial paint fumes and overspray on cars;

■ a business dumping oil on a driveway and covering it with sand;

■ a dairy operation dumping wastes into a creek;

■ someone reporting an oil smell in their drinking water; and

■ one neighbor backing water onto another's land. (Even though EPD offices are not officially responsible for managing floodplains, they often serve as investigators for the department.)

"The list goes on and on," says Stellick.

"This morning while responding to one of these, I saw a black plume of smoke go up and knew it must be



DNR Photo



DNR Photo

▲ **A fire at a storage facility in Burt, Iowa, in 1991 involved many types of pesticides. The toxic smoke plume made it necessary to evacuate nearby farms. (Top photo)**

A typical complaint call may involve open burning of tires. (Bottom photo)

tires," he says. "We have enough to do already, and in spite of what some people think, we're not out there looking for more. But on the other hand, we're not turning our heads either." The incident turned out to be a landowner illegally disposing of old tires.

"Like everyone else, we have to set priorities," says Stellick. Some major sites have to be done on time, every time. "Our greatest priority is given to the inspections of water supply and waste treatment facilities in larger communities, heavy

industry and large power stations," says Stellick. There are also a number of sites where the federal Environmental Protection Agency is also involved, and those must be on time.

"At all of our field offices we try to do the best we can to meet everyone's needs," says Jinkinson. "Unfortunately, people who enforce Iowa's environmental regulations do not always have a particularly good image.

"In order to maintain credibility, we need to treat all Iowans in a fair, consistent and professional manner," says Jinkinson. "For example, we need to treat a small gas station operator the same way we treat someone at the Casey's chain. We also need to be consistent in the way we deal with a large municipal landfill versus a single landowner with an open dump.

"These situations can be extremely difficult, but are also very necessary in order to maintain integrity," says Jinkinson. However, Jinkinson also notes that field personnel are willing to "bend over backwards" when working with small businesses or individual landowners.

"We are very sensitive to a person's financial situation," says Jinkinson. "They must comply with the law, but we deal on a compassionate basis. What we are doing is for the citizens of Iowa and for the long-term health of the environment. In general, I think most people realize this, but it may not be realized by those we're dealing with at the time."

Although conflict resolution can certainly make for a long day in anybody's book, environmental protection work can certainly have its lighter, more interesting side as well.

"Just about the time you think you've seen it all, something new pops up," says Stellick. "We had one dairy operation, that ran its cooling water over the surfaces of a field and down into a sinkhole," he recalls. "The dairy had made some changes in its operation and asked us if they



DNR Photo

could still use the sinkhole. We put dyes in the cooling water and checked all the local farm wells in the area for one week. Everything was okay -- no colored water," he says.

Then one Saturday night a conservation officer called Stellick with an unusual story. It seems that while swimming in a spring a farmer's white ducks had suddenly become colored like a "bunch of Easter eggs." You guessed it, it was the dye from the dairy -- one month later and eight miles away.

"Another time we received a call from a citizen who complained of foamy, discolored and foul-smelling drinking water," Stellick recalls. "This individual lived near a large wastewater treatment plant and was convinced that the facility was leaking. Try as we might, we couldn't find a leak," he says. "Eventually, we even put dye into the toilet of the person who filed the complaint. It turned out that the water went from the toilet, into a road ditch, and disappeared into a hole. Pretty soon the dye showed up in the drinking water of that same person -- the one who had made the complaint. The foamy, smelly, discolored water was coming from his own sewage system



DNR Photo

and not the municipal treatment facility.

"Those kinds of incidents certainly keep the job interesting," says Stellick. "But for me the things that stick out the most in my mind are not necessarily the big kills or the big spills. Instead, it is the unsolved mysteries like the reoccurring kills on the Wapsipinicon River.

"If we could figure out what's happening in those kind of cases, we could do something about it," he says. "Those are the ones that disturb me the most. Maybe someday we'll find the answer."

▲ A train derailment near Mason City in 1989 caused 2,000 gallons of diesel fuel to spill into a drainage ditch. (Top photo)

▲ Diesel fuel from this semi-trailer truck spilled into the Cedar River near Charles City in 1990. (Bottom photo)



by Dennis Michel

HISTORY OF IOWA'S FOREST RESOURCES

Iowa is essentially a prairie state, with forestlands located either in the eastern part of the state, where there is increased moisture, or along the bottomlands and on the slopes adjacent to streams. The unglaciated region of northeastern Iowa, and the Skunk and Des Moines rivers were, and still are, the areas with the most significant forested acres.

In 1896, Dr. L.H. Pammel, of Iowa State University, analyzed the survey notes of the general land office for the 1832-1859 pre-settlement era of Iowa. Through his analysis, Iowa was estimated to have originally had about 19 percent forest with approximately 6.7 million acres. The settlement of Iowa during 1850-1875 had little effect on the original forested acreage. Because of the abundance of fertile prairie lands, most farms could be established without clearing the forest. Land ownership, adjacent to forested areas, was desirable for the potential lumber, fuel and fencing. Sawmills were widely scattered and did not have a negative impact on the forest resource.

For many years, pine logs from the Lake States were rafted down the Mississippi River to several sawmills in Iowa. By 1875, the cost of pine lumber from the great

sawmills along the Mississippi had increased, and the milling of Iowa lumber became more profitable. Barbed wire was invented and it was common practice to use forested areas as a cheap pasture, which had a significant effect on the quality of many tree species. The western extension of the railroads had a major impact on Iowa's forested acreage. It was estimated that one mile of railroad track required approximately 800 average-sized oak trees, just for ties. The combination of these factors increased the decline of Iowa's forested acreage.

The 1990 forest resource survey, completed by the U.S. Forest Service, estimates Iowa's forestland to be about 2.1 million acres, or approximately six percent of the state's land area. The white oak/red oak/hickory forest type represents the largest species mix (46 percent), followed by the maple/basswood (25 percent) and elm/ash/soft maple (25 percent) types. Growing-stock growth exceeds

The western expansion of the railroads had a major impact on Iowa's forested acreage. It was estimated that one mile of railroad track required approximately 800 average-sized oak trees, just for ties.

▼ **The wood industries of Iowa produce a wide range of products, including veneer logs, hardwood-grade lumber for furniture, corrugated papers, planting mulch and animal bedding. This photo, taken in October 1951, shows walnut logs ready for the sawmill.**



Jim Sherman

Iowa's first sawmill was established in 1831 on the Yellow River, in the northeastern part of the state. Lieutenant Jefferson Davis, who became president of the Confederacy, constructed a dam to develop water-wheel power for the sawmill.

removals and about 92 percent of the state's timberland is in private ownership. Iowa has the potential to grow some of the finest hardwood species in the world.

Iowa's first sawmill was established in 1831, on the Yellow River, in the northeastern part of the state. Lieutenant Jefferson Davis, who became president of the Confederacy, constructed a dam to develop water-wheel power for the sawmill. For many years, water power was used to operate the numerous sawmills along the Mississippi River and its main

tributaries. During the mid-1800s, Clinton, Iowa, was recognized as having more wood-based businesses than any other town nationwide. Professor G. Hartman of Iowa State University, reported that during the mid-1870s the lumber production of 15 Mississippi River





American Images

towns, from Lansing to Keokuk, amounted to about 300 million board feet of lumber annually.

Today, the wood-using industries of Iowa are a small segment of the state's economy, when compared to the agricultural sector, but they do represent an important contribution to Iowa.

This year there are 78 primary sawmills and more than 230 secondary wood processors operating in Iowa. According to a 1989 report by the Department of Economic Development, these wood industries employ more than 12,000 persons, with an annual payroll of more than \$210 million. Value added to the state's economy, by harvesting and processing of the raw materials, plus the manufacturing of products, represents more than \$474 million annually. The wood industries of Iowa produce veneer logs, hardwood-grade lumber for furniture and millwork markets, sliced veneer, crating, pallets, corrugated paper, crafts and wood residues that are processed into fuel, planting mulch and animal bedding.

Value added to the state's economy, by harvesting and processing of the raw materials, plus the manufacturing of products, represents more than \$474 million dollars annually.



Wood is the leading industrial raw material (25 percent) used in the United States. We all benefit from the agricultural goodness of our forests, as we do from the art and science of forestry which helps direct resource management decisions.

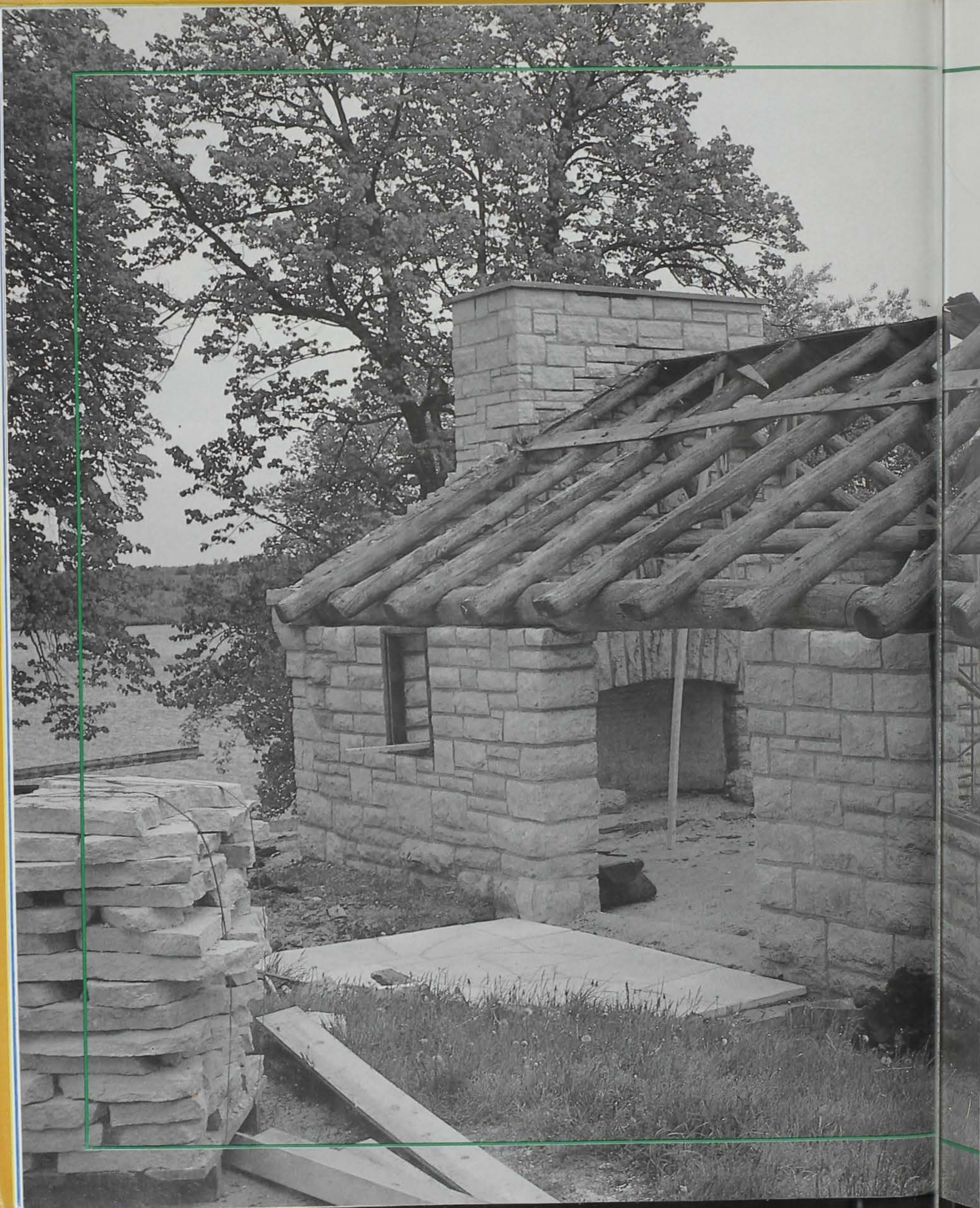
Dennis Michel is the rural development/forest products and marketing forester for the department in Ames.



DNR Photo

▲ **The Big Timber Sawmill, Vinton, Iowa.** This year there are 78 primary sawmills and more than 230 secondary wood processors operating in Iowa. These wood industries employ more than 12,000 persons, with an annual payroll of more than \$210 million. (Top photo)

◀ **Oak is one of the most-often harvested tree species in Iowa; however, growing-stock growth exceeds removals.**



Fourth in a Series

HOME IMPROVEMENTS

Iowa's Resource Enhancement and Protection (REAP) program is working in several ways to make Iowa a more enjoyable place to live and visit. Its emphasis is on helping assure the well-being of Iowa's natural and cultural resources, and providing people with opportunities to wisely use and benefit from those resources.



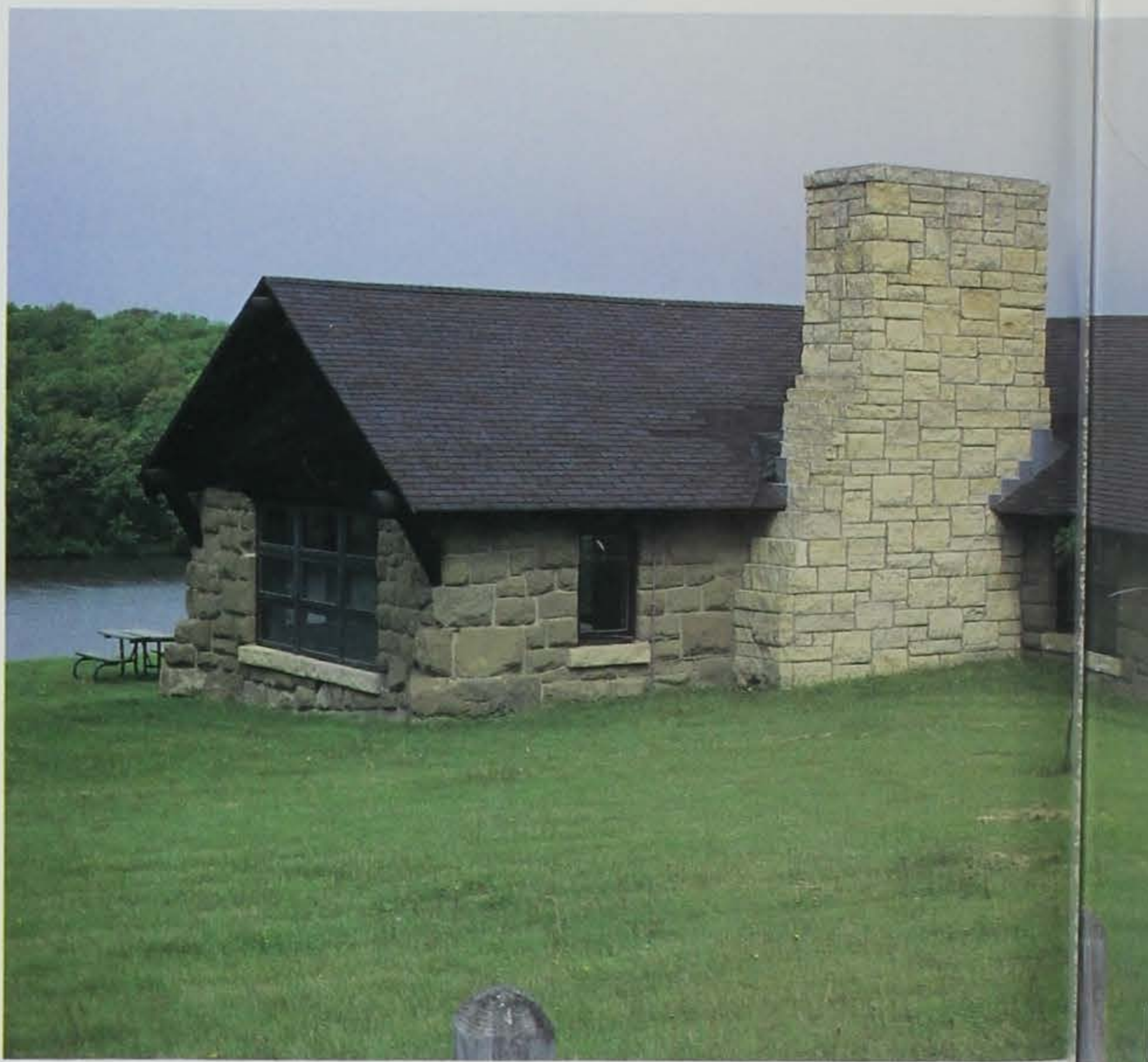
Article by Jim Scheffler
Photos by Ken Formanek

▲ The historic Civilian Conservation Corps (CCC) shelter at Red Haw State Park, in Lucas County, is undergoing extensive reconstruction with REAP land management funds.

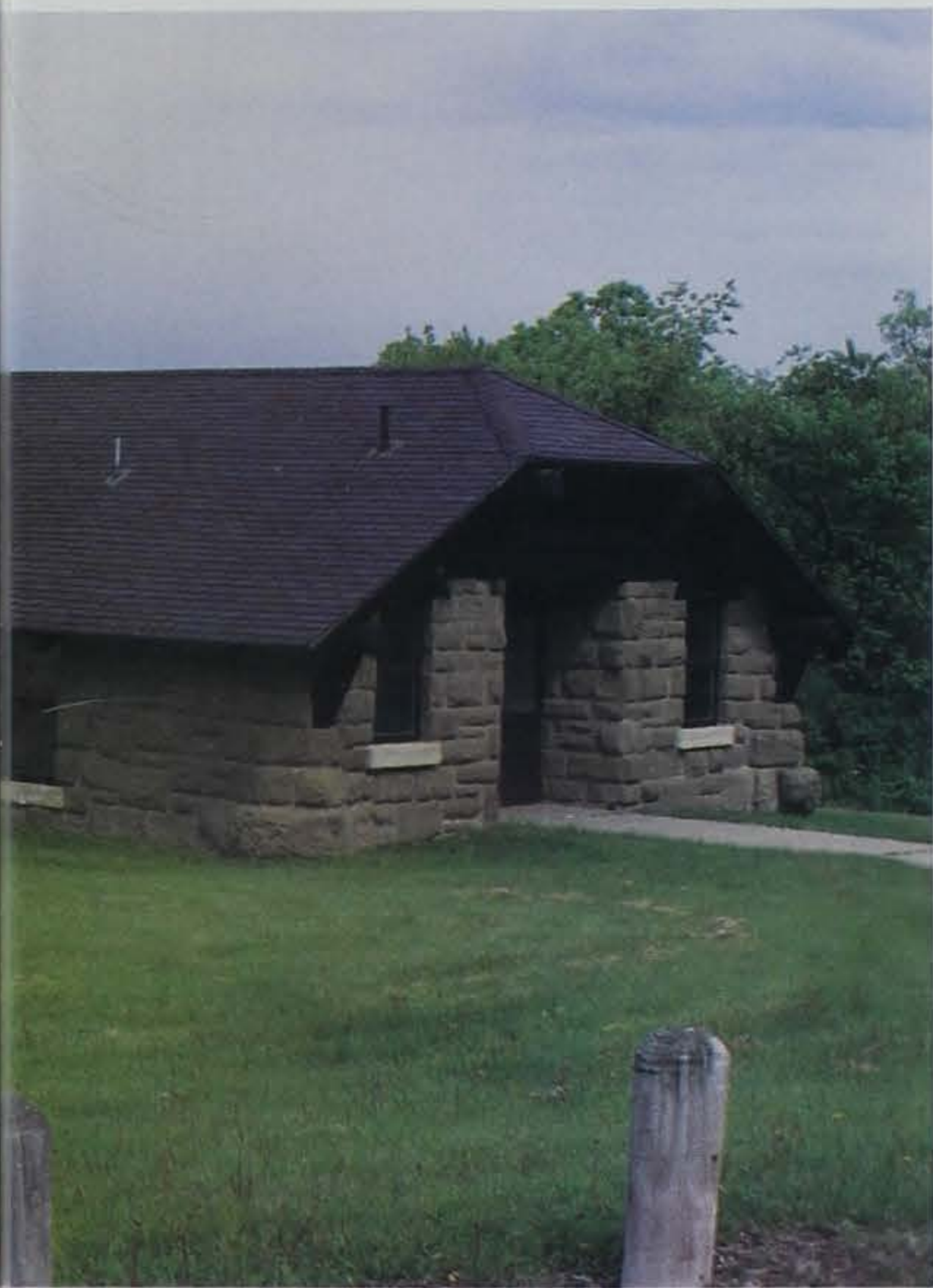
When people think of Iowa's state parks, images usually appear of wooded hillsides, inviting trails, sparkling lakes and streams, busy beaches and campgrounds, rustic lodges and cabins, and quiet picnic areas. Photo albums throughout the state are full of pictures that awaken pleasant memories in park visitors. But, very seldom are cameras focused on the pipes that bring water to rest rooms and shower buildings, the electrical boxes that bring modern conveniences to campers, the hidden structures that keep a hiking trail from eroding, or the shelter that protects picnickers from weather. All of these things can make or break an enjoyable park outing. If they are available and in good working condition, they usually go unnoticed. But, if they are in disrepair or run-down, they are what park visitors will probably remember most.

Iowa's Resource Enhancement and Protection (REAP) program has been working behind the scenes to help assure that only good memories are taken home, and that Iowans have a sense of pride in their state parks. No, this

►
REAP funds paid for rehabilitation of the CCC-vintage dam and spillway at Springbrook State Park in Guthrie County.



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◀ Iowa's state park system is nearly 75 years old and just like a house built in the 1920s, needs a lot of "home improvements." Efforts are being made in restoring historic buildings in state parks, like the Lake Ahquabi State Park lodge in Warren County.

▼ The modern shower/toilet buildings such as the one at Palisades-Kepler State Park in Linn County (below), as well as the new concession building at Big Creek State Park in Polk County (bottom) have been built with REAP land management money.



doesn't mean that REAP can control the weather and guarantee bright, sunny 78-degree days! What it does mean is that toilets will flush, you won't lose your three-year-old in a trail rut, and you won't get wet while enjoying your lunch in a shelter or lodge.

For three and one-half years prior to REAP, these kinds of projects in state parks were funded through the state park user permit. More than \$3 million was contributed by park users, and headway was made in restoring historic buildings, replacing old and unsafe electrical, sewer and water systems, building new rest rooms and showers and renovating trails. Because of the user permit, park visitors were beginning to see a real difference.

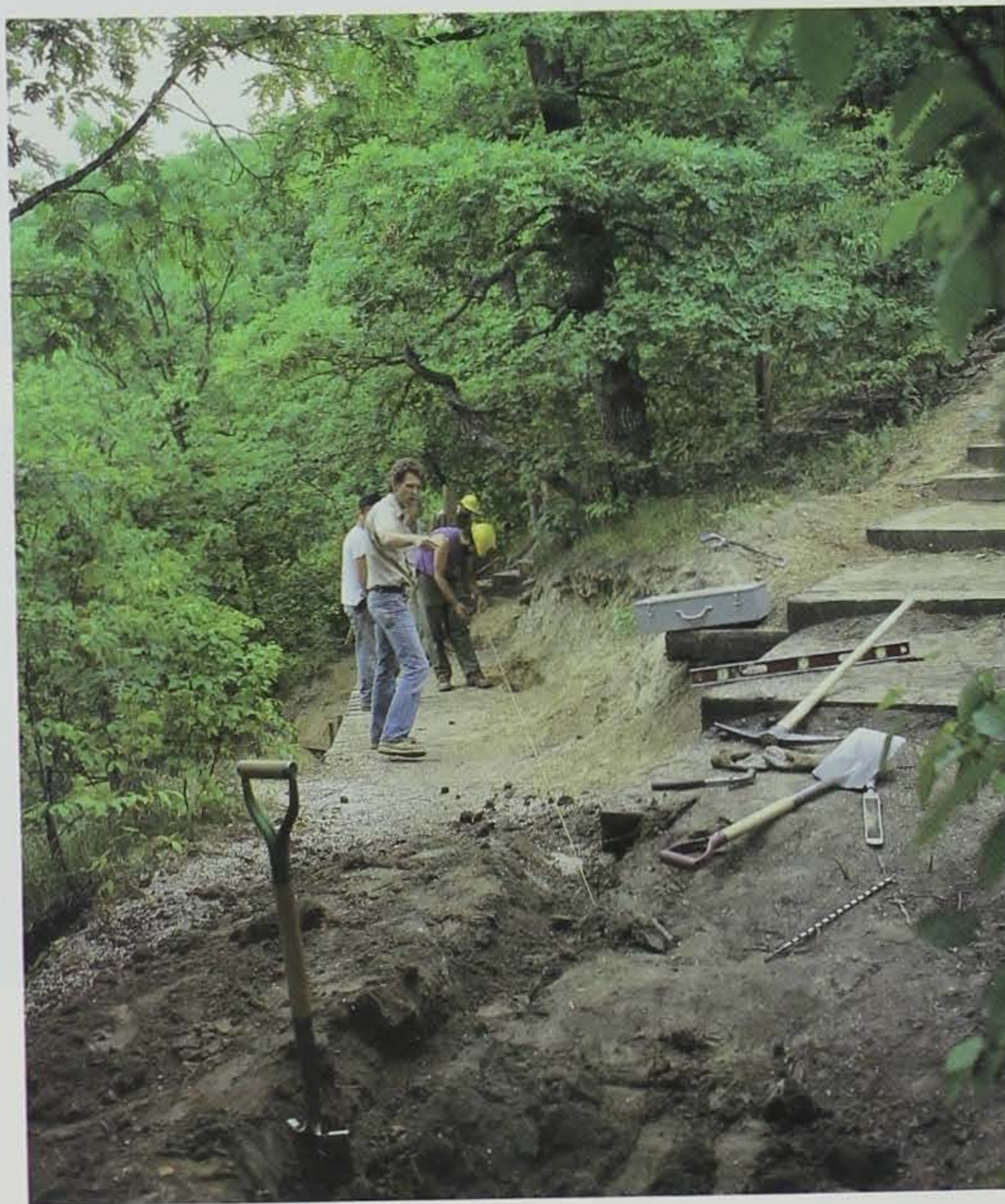
The permit era ended in 1989 when REAP was established. The land management element of REAP began where the park user permit left off -- accomplishing badly needed work in the state park "infrastructure." REAP's land management element receives nine percent of the program's budget. A small percentage (seven percent to date) of land management funds are also used for similar projects in state forests and wildlife management areas.

Good strides are being made in putting life back into many DNR facilities. However, the list of projects is currently much longer than available REAP funds can accomplish. After all, Iowa's state park system is nearly 75 years old and, just like a house built in the



REAP's land management portion has done a lot to address trail problems in state parks. Crews have worked at Pikes Peak, Ledges (below and right), Pine Lake, Beeds Lake, Bellevue and Wildcat Den state parks and Mines of Spain State Recreation Area. These projects have received national attention and also provide increased accessibility to people of varying abilities. The REAP trail program has received wide community support and has been supplemented by grants from the Department of Transportation and Department of Economic Development.

Ron Johnson




Ron Johnson

1920s, needs a lot of "home improvements." New requirements spelled out in the 1990 Americans With Disabilities Act, require Iowans in both government and private enterprise to make places like public buildings, park lodges, campgrounds and restaurants accessible to citizens with disabilities. REAP funds will be used in state parks to help provide accessible picnic and camping facilities, as well as improve access to park lodges, cabins and beaches.

So, it's vital that REAP continue to be a viable program with adequate funding. The REAP "pie" has many "slices." If the pie is small because of reduced funding, then REAP land management and the other "slices" will be less effective in meeting their important goals. Citizen understanding and support of REAP are crucial if the program's early successes are to continue into the future.

Jim Scheffler is an executive assistant for the department's recreation programs bureau in Des Moines.



Are Owls "Wise" To Pesticides?

by Karen Peterson Craft

Adult great horned owl. Photo by Lowell Washburn

▶ Juvenile great horned owl. (Far right)

▶ Owls are equipped with "tools" that make them very efficient predators. Their specially designed feathers give them silence in flight (top). And their dagger-like talons produce a very effective "death grip."

By human nature we tend to view happenings of the twilight hours with a degree of mystique. Many of us who stumble helplessly after dark without a flashlight marvel at the amazing adaptations of nature's nocturnal predators, particularly owls. How can a creature fly down and catch a small mouse in the dead of night? It is with great curiosity of the unknown that inspired wildlife biologists to investigate the owl's secretive habits and specialized adaptations. As biologists have learned about the benefits these nocturnal raptors provide, more people have grown to appreciate them and other predators as integral parts of the ecosystem. As the biological and aesthetic value of owls has increased, so has society's concern about the exposure of these and other animals to environmental pollutants, habitat destruction and pesticides.

Since pesticides are often used on agricultural lands frequented by foraging owls, and exposure-effect questions have gone unanswered, a research project was conducted in south-central Iowa to investigate both the owls' behavior and their potential exposure to these chemicals.

Increased awareness and concern over environmental effects of industrial by-products, emissions and disposal of hazardous wastes have generated public concerns about the impacts of agricultural chemicals of all kinds. Not only are university researchers interested in the answers to these questions, but conservation organizations, industry, state and federal agencies, and individual farmers have shown interest, as well, in identification and resolution of existing problems.



Jon Stravers

The owl study conducted in Iowa was just one component of a complex, multi-year investigation assessing possible effects of insecticide application on corn to various wildlife species. The Institute of Wildlife and Environmental Toxicology (TIWET) located at Clemson University, Clemson, South Carolina, became interested in the influence agricultural pesticides may have on owl behavior and survival. The study began after discovering, in earlier investigations, that common prey items of the owl, such as mice, may be exposed to the insecticides and may carry chemical residues. The study was undertaken in the agricultural community near Chariton, Iowa. The National Wildlife Federation provided Jeremy Buck, graduate research assistant at Clemson, with an environmental conservation fellowship to undertake field work for the owl study.

Organochlorine insecticides such as DDT, mirex, dieldrin and heptachlor attracted much attention and



Lowell Washburn

concern in the past, due to their negative impacts on wildlife and persistence in the environment. Most have since been banned in the United States and replaced primarily by the less-persistent organophosphate and carbamate insecticides. Some organophosphate and carbamate compounds are highly toxic under certain conditions and can cause immediate impairment, sickness or death to exposed animals. Because of their acute toxicity, these compounds must undergo various testing procedures before they can be registered by the Environmental Protection Agency for pest control.

Wildlife toxicity tests have been done for various chemicals in laboratory

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Roger A. Hill

studies with pen-reared animals and are now being compared to studies conducted in the wild on treated fields where wildlife actually lives. Both laboratory and field studies are important to accurately assess the impacts of organophosphate insecticides to wildlife. Laboratory studies show the level of toxicity of an insecticide and indicate likely effects. Field studies, like the owl project, are essential for determining the degree to which wildlife may actually be exposed to an insecticide.

For decades, scientists have learned about wild creatures through direct observations. This is where owl

researchers are disadvantaged. Overcoming "night blindness" is essential. So how does Jeremy Buck do it? He has a truck equipped with an enormous set of "rabbit ears," radio telemetry receiver and headphones. He has adapted, like the owl, by artificially increasing his "stereophonic sound perception." That is, instead of having to see his subject he locates it by hearing signals from a small radio transmitter attached to an owl. After releasing a "transmittered" owl, Buck can generally pick up the signal emitted from the transmitter at a distance of two kilometers or better, depending on the terrain and weather

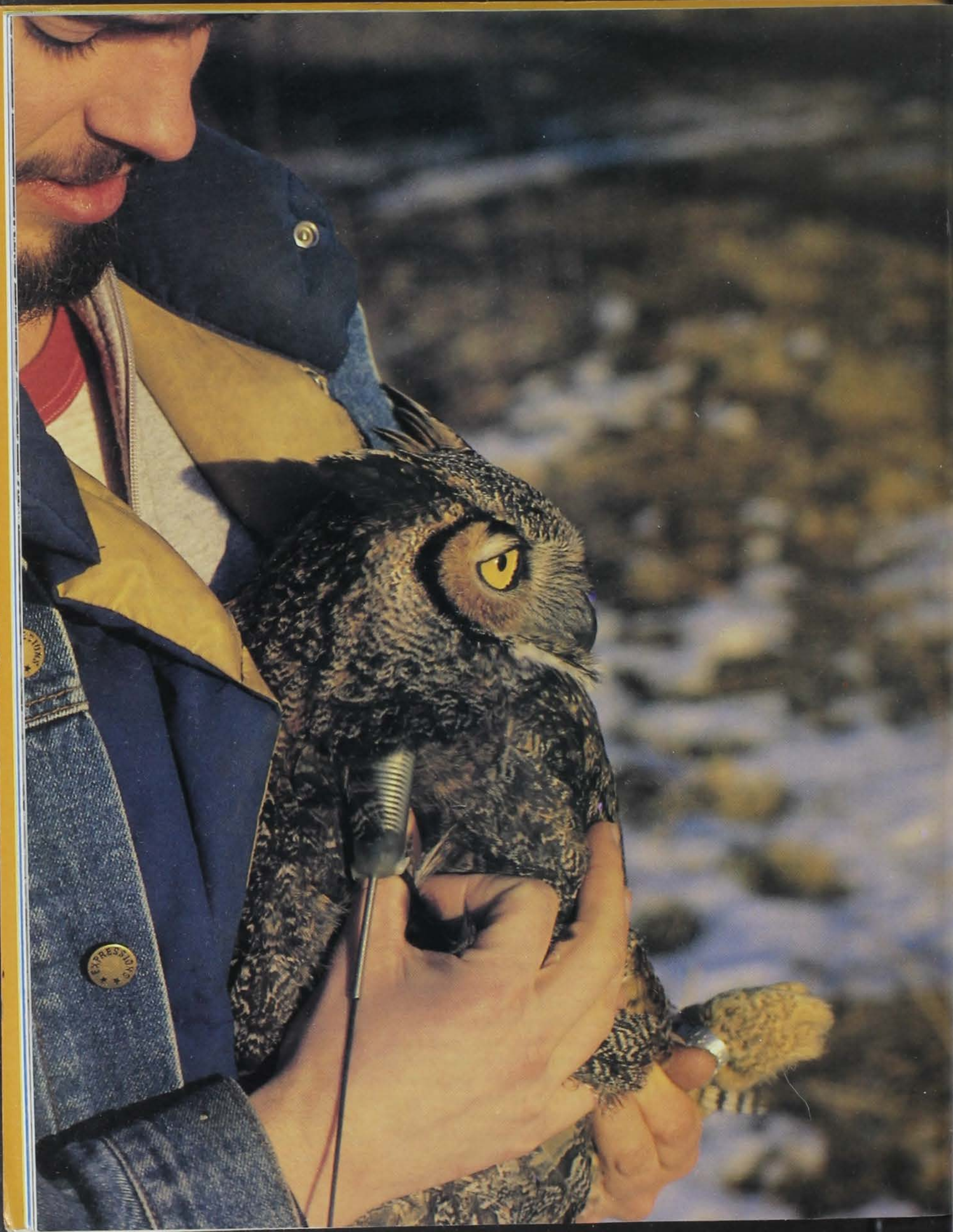
conditions. He then maps the location of the owl, based on a number of these signal readings, and "sees" whether the owl is in the woods, a corn patch or some other type of habitat.

Buck used radio-telemetry as part of a project to determine the risk of organophosphate insecticide exposure to great horned owls. The telemetry aspect of the project allowed him to determine if the owls were active in fields treated with organophosphate chemicals. "The owls may be attracted to these areas because prey may be more vulnerable," says Buck. "On the other hand, the owls may avoid the treated areas or not change their habitat use patterns at all after insecticide treatment. Obviously, the more owls use the treated areas the greater the chance of insecticide exposure."

By polling local farmers, Buck found several organophosphate insecticide products being used by landowners within the range of owls he was monitoring. "Although the response of the owls to these treated areas was difficult to understand," says Buck, "we did obtain some interesting results." First, it was determined by radio-telemetry that owls were indeed using agricultural areas treated with organophosphate chemicals.

Second, although organophosphate products are known not to accumulate in birds like DDT and other organochlorines, evidence was found of some exposure to organophosphates in a few of the owls. Buck concludes that although exposure to these chemicals was indicated, there was no mortality of great horned owls documented during the study, and changes in feeding habits and reproductive behavior from exposure to organophosphates have not been evident.

Agricultural chemical use is as high in Iowa as anywhere in the country. Farmers in the Chariton area have shown much interest in effects of chemicals on their environment. With this heightened



Roger A. Hill

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◀ A great horned owl equipped with a radio transmitter. The owl's movements will be tracked with the use of radio telemetry. (Far left)
Photo by Jon Stravers

◀ Great horned owlets.

▼ Graduate student Jeremy Buck approaching a juvenile great horned owl, near its nest, for tagging.

concern in mind, TIWET, with sponsorship from American Cyanamid Company, undertook a new venture in the Chariton area. To continue research on the environmental effects of agricultural chemicals, the Edith Angel Environmental Research Center, a field station affiliated with TIWET at Clemson University, was established.

Goals of the center are to establish long-term research efforts to examine the implications of agricultural chemical use on farmland. The success of these efforts depends on involvement of students, researchers, agencies, industry and the public. Habitat management techniques continue to be developed at the center to reduce soil erosion, improve water quality, and enhance habitat for many species of wildlife, such as the great horned owl. The 160-acre site is farmed similarly to surrounding small farm operations for grain and hay production, while demonstrating sound land stewardship and wildlife management practices, particularly with regard to chemical and wildlife interactions. Agricultural chemicals are used where needed as they are on most Iowa farms. The center provides an ideal location to examine chemical pathways throughout biological

systems and to determine practical farming methods which pose the least risk of exposing wildlife to agricultural chemical use. Currently, collaborative work with the Iowa DNR and Iowa State University is being planned at the site.

Increasing human populations and resultant world markets have contributed to the push to maximize agricultural production, bringing with it high-tech agriculture and often compromised land stewardship practices. Current work at the Edith Angel Environmental Research Center will address improved methods to better integrate modern agricultural techniques with improved habitat management for wildlife and soil conservation.

As illustrated in Buck's great horned owl study, we must continue to investigate promising new methods for assessing the true impacts of toxic

The Institute of Wildlife and Toxicology Photo



substances in the environment. The use of pesticide chemicals in agriculture is no exception and must be carefully evaluated. As nature so aptly built its own system of checks and balances, we too must devise checks on our own agricultural production practices.

Karen Peterson Craft is the research center coordinator for the Edith Angel Environmental Research Center in Chariton.



Tom Putnam

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by R.H. (Dick) McWilliams

GIZZARD SHAD

A Bad Idea For Small Lakes

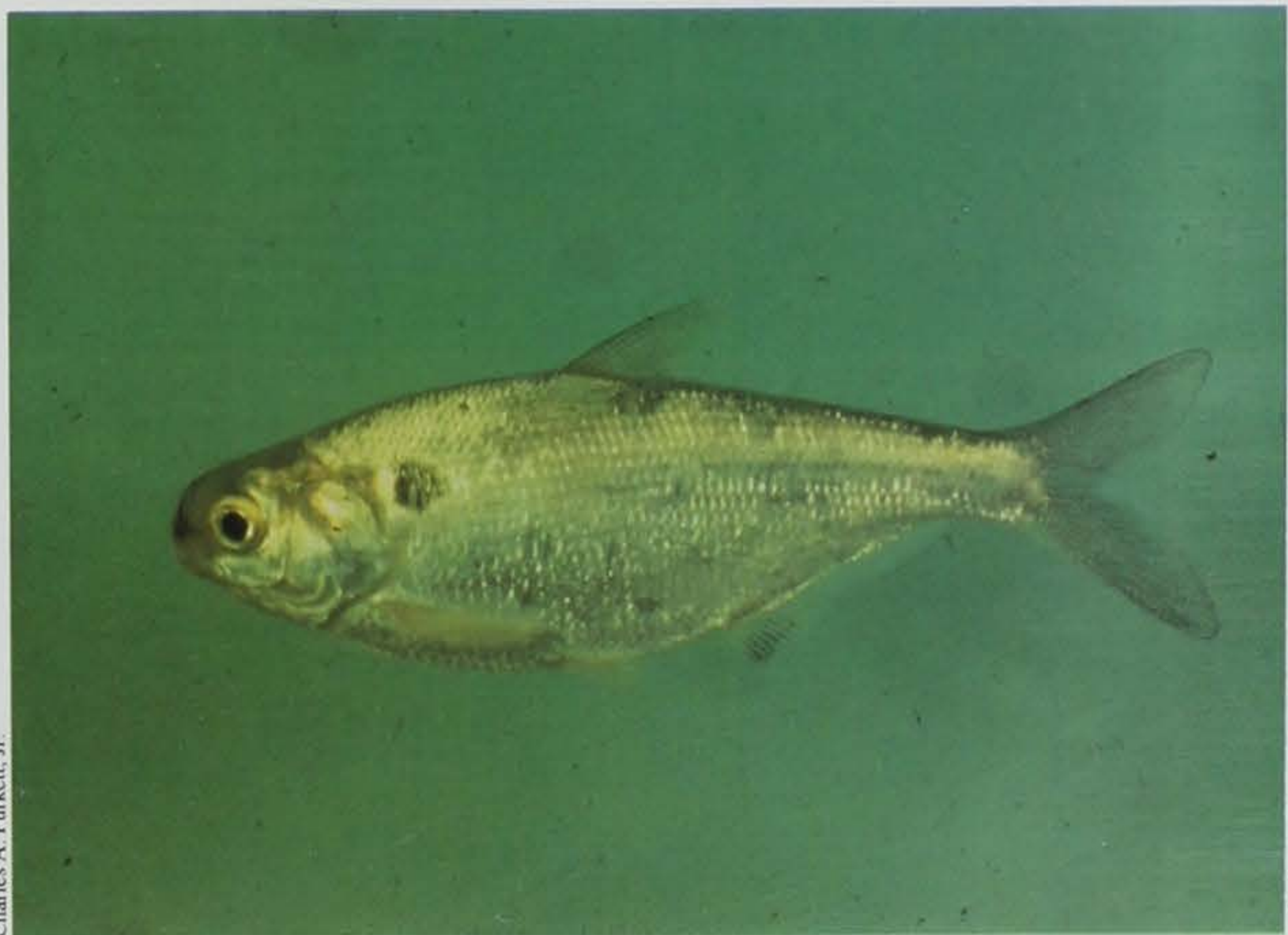
A scenario: an angler discussing the fishing history on a small lake.

"Fishing used to be real good here. We used to catch nice-sized crappie, bluegill and all kinds of bass. Then a few years ago things started to slow down. We caught a few larger crappie, but mostly just some smaller crappie and a few small bluegill. Bass fishing picked up though, at least for awhile, then kind of tapered off. Now about all that we catch is small crappie, a few bluegills and once in a while a real nice bass."

Does this sound familiar? In our smaller lakes this scenario can be, and at times is, real. In many of these lakes a major culprit in the decline of the fishery is gizzard shad. Gizzard shad can, and do, play a major role in management and management problems in small lake fisheries.

In a well-balanced small lake fishery, bluegill, crappie, largemouth bass and channel catfish are the abundant fish. Small bluegill and crappie are prey for largemouth bass, and in turn, largemouth bass keep the bluegill and crappie populations in check. With this population balance, largemouth bass, bluegill, crappie and channel catfish all provide anglers with excellent fishing opportunities. When gizzard shad are introduced into this fishery, a shift occurs and the result is usually a decline in the overall health and well-being of the fishery.

The gizzard shad is a member of



Charles A. Purkett, Jr.

The best way to avoid problems with gizzard shad in small lakes is to avoid introducing them in the first place.

◀ The chemical kill, during the renovation of Lake Ahquabi in 1981, yielded mostly shad and few game fish.

By the end of their first year of life, shad in small lakes are most often too large to be forage for all but the largest predators.

the herring family of fishes. It is native to Iowa, and found throughout our larger streams and rivers. Gizzard shad, or shad, as it is more commonly known, is primarily a forage fish. It is a prolific spawner and the population can literally explode, from a few individuals to thousands of fish, in just a few years. Shad are very efficient plankton feeders. They are known as pump filter feeders, which means that as they draw in and release water through the gills, food is strained out by rakers found on the gills. They are able to filter out almost all the larger plankton passing through these gill rakers. For instance, in one study large gizzard shad were shown to filter more than one gallon of water every four minutes, and over the course of one day this means one large shad could filter more than 350 gallons of water, and that's just one fish.

Shad compete directly with panfish, particularly bluegill, which are dependent upon plankton as food during most of its life. Bluegill that do survive are in stiff competition for food, and as a result grow slowly throughout

their lives. That's a major reason why lakes with high gizzard shad populations have low, slow-growing bluegill populations. Shad also compete directly with young crappie and small bass during various stages of their development, although as they grow, shad in turn become forage for them. However, the long-term result is usually a decline even in these fisheries.

Shad are also unusual for a forage fish in that they grow rapidly. By the end of their first year of life, shad in small lakes are most often too large to be forage for all but the largest predators. Consequently, they no longer provide a needed and valuable forage resource for the many small predators in the lake.

What about other areas? Why don't shad seem to be such a problem in larger lakes or rivers? The gizzard shad is a primary forage fish in large flood control reservoirs. There are a number of factors controlling shad populations in these waters -- some understood and some not. However, the primary factor appears to be low winter water temperatures. Shad are quite sensitive and when water temperatures are near freezing for extended periods of time, the result is usually a large winterkill. The small population of adults that survive spawn, and the young fish again provide a summer forage. In contrast, in small lakes, shad normally do not winterkill, and as a result the population can expand to a point where it is out of control. The combination of prolific spawning, rapid growth of young fish, efficient feeding and competition, particularly with panfish species, and their overall survival, are primary reasons for the "shad" problem in small lakes.

How big an impact can shad have in a small lake fishery? Studies have shown shad can make up most of the biomass, or weight, of fish in a lake. For example, shad composed 67 percent of the total weight of fish collected in Lake Ahquabi following its renovation in 1981 (see table). In addition, a large portion of the remaining fish in Lake Ahquabi were

Species composition and weight of fish collected following renovation, 1981 (from an article by T. Putnam, "Lake Ahquabi Renovation," *Iowa Conservationist*, August 1983).

Species	Percent composition by weight (lbs)	Average weight of fish (lbs)
Gizzard shad	66.8	.09
Bluegill	7.4	.04
Crappie	5.6	.12
Redear Sunfish	1.1	.17
Bullhead	3.1	.22
Catfish	1.7	.35
Catfish	2.7	12.00
Largemouth bass	.5	.10
Largemouth bass	2.0	1.35
Tiger muskie	.22	.40
Grass Carp	2.33	.00
Carp	6.9	7.40

small, and that left only about five percent of the total weight of fish in the lake of catchable size!

Unfortunately, there are few options for small lake fisheries with high densities of shad that have a good chance of success. One option that has been used with some success is to selectively control shad using a fish toxicant. Shad are more sensitive to fish toxicants than most gamefish. Toxicants are applied at levels which generally do not cause large numbers of desirable fish to die, but

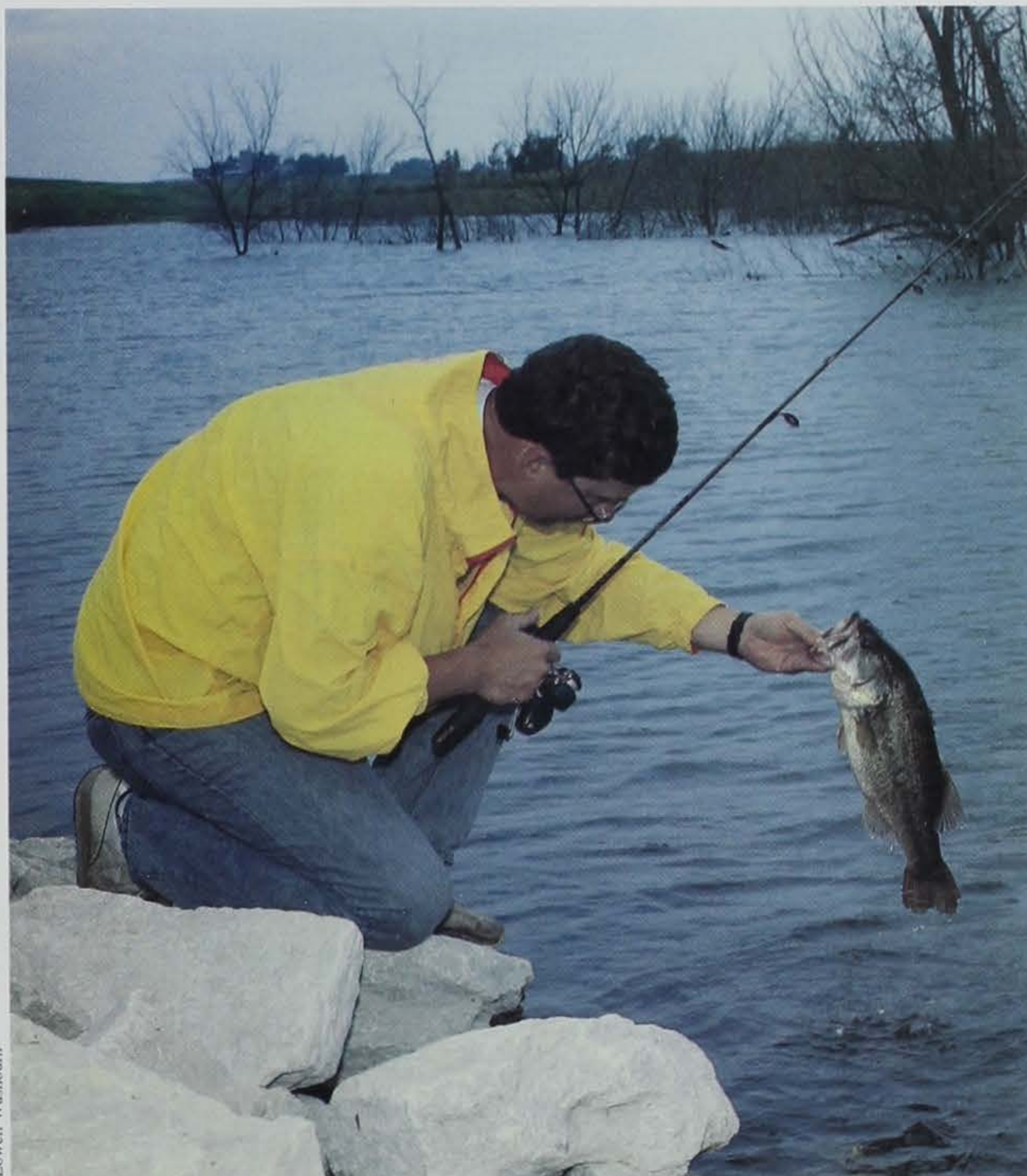
high enough to kill shad. The trade between loss of some desirable sport fish to many shad is more than offset by the increase in production and populations of sport fish in following years, if enough shad can be eliminated. In situations where the fishery is so poor that even this technique has only a slim chance of success, the best option is to drain the lake, or completely renovate the population with fish toxicants, and restock with desirable fish.

The best way to avoid problems with gizzard shad in small lakes is to avoid introducing them in the first place. This can be accomplished by use of vertical drops in spillway structures, which the DNR has incorporated, where possible, into recent lake developments and renovations. This prevents shad from moving into these lakes from the adjoining streams and rivers. Anglers can also help by being aware of the types of bait fish used and make sure shad are not used or released accidentally in areas where they are not present. In some instances

well-meaning individuals have introduced gizzard shad into a small lake in the mistaken belief shad will help increase the forage in the lake and lead to improved fishing. Experience in our small lakes has shown shad provide few benefits for a fishery, and that shad truly are a bad idea for small lake fisheries.

R.H. (Dick) McWilliams is a fisheries management biologist for the department in Boone.

▼ **Gizzard shad create problems in small lakes by stunting other forage fish, such as bluegill, and competing directly with young crappies and small bass during their development. A balanced lake system will provide plenty of forage fish in the form of panfish, as well as game fish for trophy fishing.**



Lowell Washburn



Northwest Iowa The Saudi Arabia of Wind Energy

Article and photos by Patricia S. Cale

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SPIRIT LAKE SUPERINTENDENT OF Schools Harold Overmann and one of his school board members were watching a Little League game when they both realized something -- the wind was blowing awfully hard. Overmann pointed out to Dr. Craig Newell that, as a non-Iowa native, the constant wind in northwest Iowa was the first thing he'd noticed when he moved there.

That conversation provided a flash of inspiration for the two men -- the schools needed to harness that wind as a renewable energy source.

Previously, the school district had explored installing a wood-fired or refuse-burning boiler in the new middle school. Overmann and the school board were enthusiastic about using a renewable energy source, but ultimately, the project just didn't work out.

"We ended up putting in a conventional heating system, and

▼ **This summer wind energy will begin powering Middle Elementary School in Spirit Lake, saving the school district \$29,000 per year in utility bills.**

everyone felt disappointed," said Overmann.

After their conversation at the Little League game, Overmann and Newell started investigating wind energy. They contacted the Department of Natural Resources, and with their help, will begin powering the Spirit Lake Elementary School with wind energy by mid-summer.

In the Midwest, wind resources are measured by a class system, from Class I to Class V. Most of northwest Iowa is considered to have Class IV wind resources, and certain sites are Class V (the very best).

WHEN OVERMANN CONTACTED the DNR about wind, energy bureau staffers Ed Woolsey and Rick Buckley got to work. "We helped identify the path to getting the project done," said Buckley. "We helped find technical resources, and most importantly, money."

There were wind speed data to collect and engineering studies to be

done, consultants to hire and financing to arrange. The DNR was able to arrange a beneficial financial package for the school district -- using a grant from the U.S. Department of Energy and a loan through the Iowa School Energy Bank Program -- to fund the entire \$238,000 project. The loan will be paid back in about four years, using the savings in utility costs the school will reap.

The district, with its technical advisors' help, chose to install a 250-Kilowatt turbine on land just south of the elementary school building it will power. The turbine, with 87-foot blades, will sit on a 140-foot tower.

The school building won't be completely disconnected from Iowa Electric, the area's utility company. Because wind speeds vary throughout the year, some months the turbine won't generate enough for the building's needs, and the district will buy some electricity from Iowa Electric. During other months, however, the wind turbine will generate a surplus and the district will sell the excess to the utility.

Electricity generated by a school district fits both the school's yearly cycle and the utility's as well,





according to Overmann. The utility needs more power in the summer, when the school is shut down and not using most of the electricity it's producing. The wind resource peaks in the spring and fall.

ALTHOUGH THE SPIRIT LAKE community school district will save \$29,000 per year in utility bills, according to Overmann that wasn't the primary motivation for installing a wind turbine. "Education was the first priority," he said. "We need to teach preservation of the environment, and to do that we have to model it."

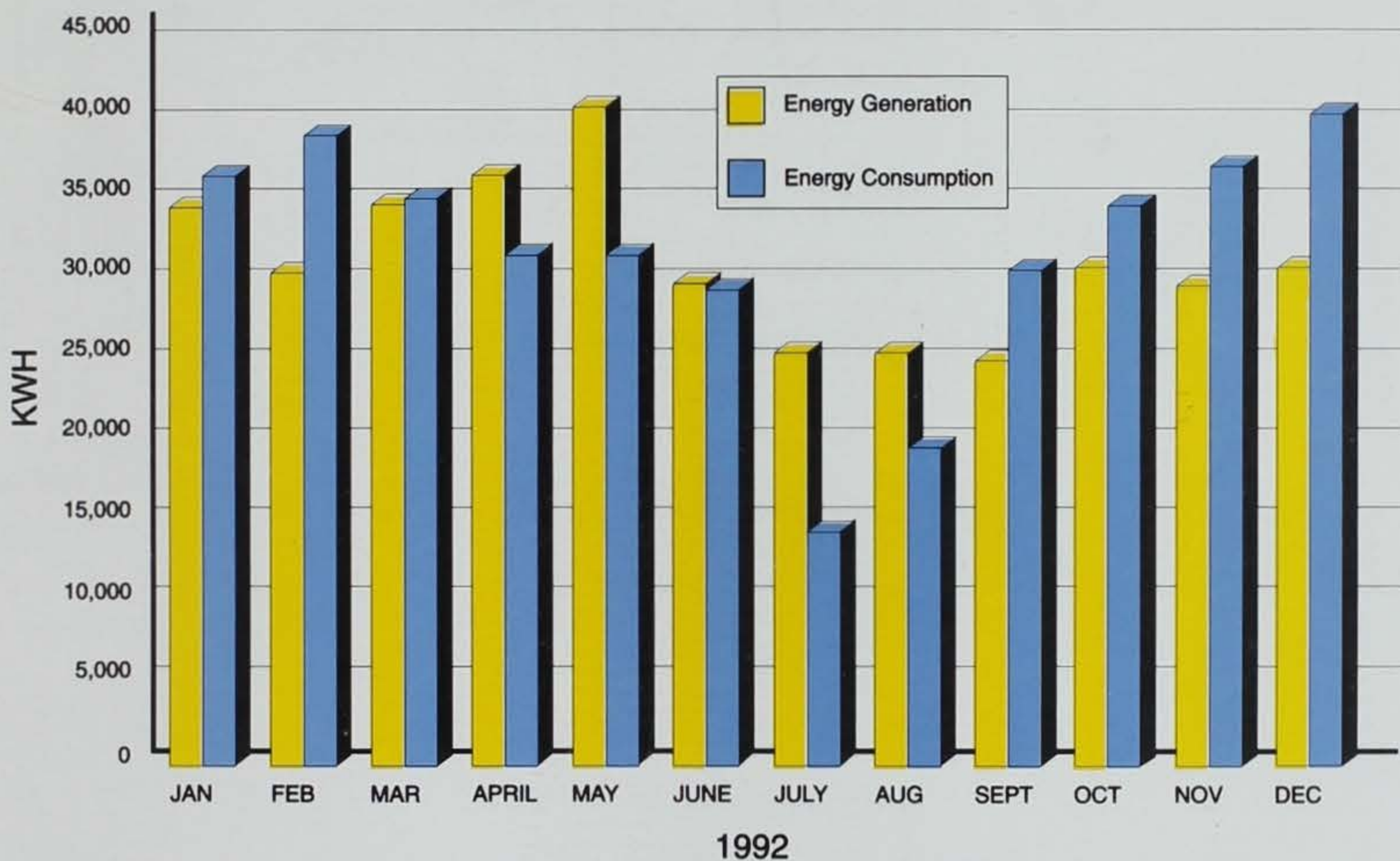
PARTS OF THE MIDWEST, INCLUDING much of northwest Iowa, have been called the "Saudi Arabia of wind energy" because of their wind resources. The wind resource is measured by wind speed -- how fast the wind blows -- and wind availability -- how often it blows. In the Midwest, wind resources are measured by a class system, from Class I to Class V. Most of northwest Iowa is considered to have Class IV wind resources, and certain sites are Class V (the very best).

About 90 percent of the U.S. wind power potential lies in 12 central states, including Iowa. According to a study by Battelle Pacific Northwest Labs, Iowa possesses the wind resource to produce more than six times its own energy needs, with the potential for becoming not only energy self-sufficient, but an energy exporter.

FINDING THE SITE LOCATION IS THE key to taking advantage of wind energy, according to Ty McNeal of Windway Technologies, the developer of Iowa's first wind farm. To locate the project's five wind turbines, McNeal needed a site that combined

◀
About 90 percent of the U.S. wind power potential lies in 12 central states, including Iowa. Iowa possesses the wind resource to produce more than six times its own energy needs.

SPIRIT LAKE WIND POWER GENERATION --Monthly Electric Generation & Consumption--



the right wind speeds, a high enough elevation, access to transmission lines and a cooperative landowner.

He found all these elements on land owned by George Braaksma, Jr. just south of Allendorf, Iowa, next to Highway 59. Since last winter, five 65-Kilowatt turbines have been spinning out electricity that is sold to Iowa Electric Light and Power. The five turbines produce enough electricity to power about 100 homes.

According to McNeal, the project is a "great deal" for everyone involved. The utility, Iowa Electric, will be able to buy the power for about six cents per kilowatt hour for the next 33 years, regardless of how much electric rates and costs go up.

The landowner not only receives a guaranteed royalty on the sale of electricity -- McNeal estimates it at \$800 per year for each turbine -- but

can also continue to farm all but a few acres of the land leased for the equipment. "This can be a benefit to farmers, especially if they've had a tough year in farming," said McNeal.

The Allendorf wind farm is a pilot project in which McNeal hopes to prove wind energy's reliability and economic viability in Iowa. He chose a Windmatic, a wind turbine manufactured in Denmark, because it's known to be sturdy and reliable. "The Windmatic is the DC3 of wind turbines. Just as the airline industry didn't exist before the development of the DC3 airplane, until the Windmatic came along the commercial generation of electricity through wind didn't exist," said McNeal.

WIND ENERGY IS THE CLASSIC "overnight sensation" that has been

around for years. According to John Saylor, president of the newly reformed Iowa Wind Energy Association, the wind industry is nothing new. "There were six million wind systems sold in the U.S. in the 1920s through 1940s. You could buy a windmill from the Sears catalog, and they'd throw in a Zenith radio with it," he said. Some of the world's largest windmill manufacturers were located in Iowa.

Wind power declined with the advent of rural electric cooperatives and large centralized coal-fired plants. A brief revival in the 1970s, spurred by the energy crisis and federal tax credits, was squelched by poor technology, high costs and changing federal policies.

Why is wind the energy resource for the 1990s? According to Saylor, two factors are most important.



▲ Since last winter, the 65-Kilowatt turbines have been spinning out electricity that is sold to Iowa Electric Light and Power.

"First, in the past decade, the cost of wind power has declined by 75 percent. Generation costs have dropped from 25 cents to between five and seven cents per Kilowatt hour," he said.

Second, wind technology has advanced dramatically. With the work of aeronautical and electrical engineers and helicopter rotor designers, recently developed wind turbines have a 98 percent reliability factor, according to Saylor. This makes them reliable enough for utility companies and makes large-scale generation possible.

THESE FIRST PROJECTS IN NORTH-west Iowa are "setting the tone for future development of wind energy in Iowa," said Woolsey. "They're a visible example of the renewable energy potential -- making economic

as well as environmental contributions."

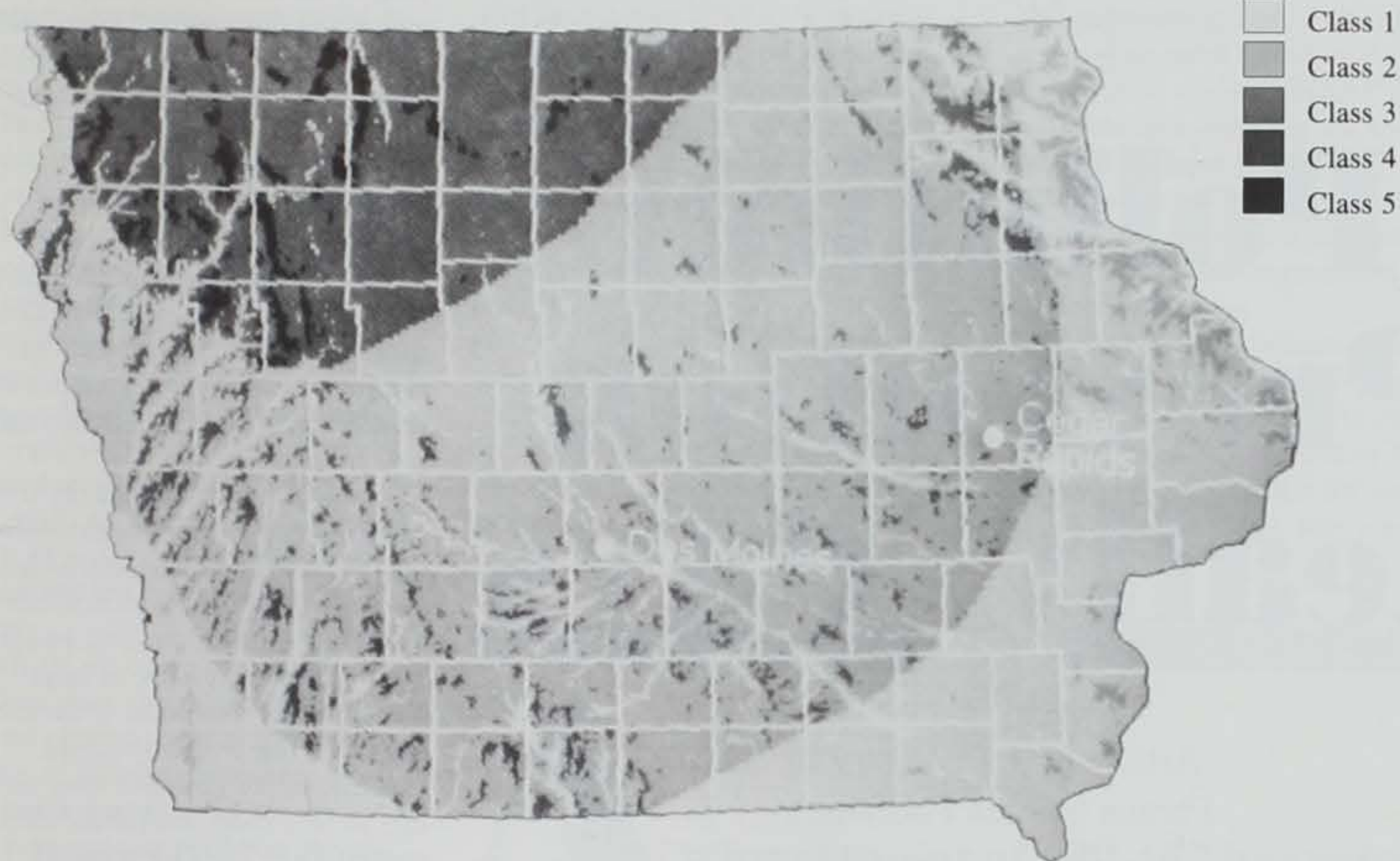
The DNR is interested in wind, according to Woolsey, not only because it's environmentally friendly, but because it can be an economic development tool, especially in rural areas. It can help Iowa stop exporting so many energy dollars.

When the wind farm projects currently on the drawing board are underway, there will be both short-term and long-term employment opportunities created, according to McNeal of Windway Technologies. "Forty to 50 people will be hired for the construction of the projects, and after completion, people will be needed to operate and maintain the turbines," he said.

McNeal and Saylor envision

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WIND RESOURCES



a future in which Iowa regains its status as a leading manufacturer of wind turbines. "We could bring hundreds of jobs to Iowa and export wind turbines all over the country and the world," said Saylor.

WITH THE PROJECT AT ALLENDORF underway, "It feels good to wake up in the morning and say, 'Yes! It's really happening!'" said McNeal.

McNeal is already planning to construct more wind turbines at the Allendorf site and to develop several new wind farms at other locations. At Allendorf, the plan is to put in 40 new 250-Kilowatt turbines.

Two new sites are planned for Sioux and Osceola counties, with a total of 420 turbines in the 250-Kilowatt class. According to McNeal, each of these machines will supply 65 average homes with their electrical needs. "The entire output of these two projects will supply the residential needs of a city of about 100,000 people," he said.

ANOTHER WIND PROJECT IN eastern Iowa will also be in operation by this summer. Waverly Light and Power received a grant from the American Public Power Association to demonstrate wind technology for municipal utilities.

Ninety-eight percent of Iowa's electricity is currently produced by coal-fired or nuclear-powered generating plants. In the future, will Iowa continue to be dependent on imported fossil fuels or nuclear power? Or can it live up to its potential as the "Saudi Arabia" of renewable energy and become an energy exporter? The answer, as they say, is blowing in the wind.

Patricia S. Cale is an energy information specialist with the department in Des Moines.

▲ Winds are created by the sun's heating of the earth's surface and are strongly influenced by local terrain, bodies of water, weather patterns and other factors. In the Midwest, the predominant winds are associated with large-scale air movements driven by the jet stream, although daily temperature-induced effects can be important. Wind energy promises to be one of the least expensive and most abundant new sources of electricity -- fossil or renewable -- for the Midwest.



Pollution Prevention Really Pays

Article by Larry Gibson
Photos by Ken Formanek

At first glance, Waterloo Industries and Douglas & Lomason do not seem to have much in common. True, they are both Iowa companies, but they make entirely different products and are located in different regions of the state. Waterloo Industries, located in its namesake city, produces tool boxes, medical cabinets and other specialty products. Douglas & Lomason, at Red Oak, produces automotive hardware in a very competitive market. Yet, these seemingly different companies have one very important thing in common -- they have reduced the amount of pollution they generate while saving money and becoming more competitive in the process. Another common theme -- they have both worked closely with the Iowa Waste Reduction Assistance Program (WRAP).

When you first meet Bob Madison, you might wonder how a retiree from Northwestern Bell Telephone, living in Ankeny could have anything in common with manufacturing industries like Waterloo Industries and Douglas & Lomason. How can a retired mainte-

nance troubleshooter, who devotes much of his time to Boy Scouts, have anything to do with factories in other parts of the state. It may help if you understand that "retiree" is somewhat of a misnomer for Madison. He is a member of the WRAP senior team -- one of 12 retired and semi-retired industry professionals who have provided their expertise to Iowa companies seeking assistance in reducing waste. Madison has used his years of experience in utilities along with many other skills, to help Iowa companies identify opportunities to reduce waste, prevent pollution and save money.

WRAP is a non-regulatory technical assistance program administered by the DNR's Waste Management Assistance Division and offers assistance in waste reduction to any Iowa business of 100 or more employees, or large-quantity hazardous waste generator of any size. The program uses the expertise of the 12 senior team members to help client companies identify cost-effective ideas for reducing wastes. WRAP also provides an on-site workshop to help companies determine how to integrate pollution prevention into the way they conduct everyday business. The program also provides ongoing support through a clearing-house that networks with programs around the nation and the world to provide up-to-date information on pollution prevention technologies.

Bob Madison says that he works with WRAP for his grandkids, to help provide a better world for them. These two companies, and more than 75 other Iowa businesses assisted by WRAP to date, provide ample proof that Madison's hope is justified. These kind of people don't retire, they merely shift gears.

WATERLOO INDUSTRIES

Waterloo Industries manufactures tool boxes, supply cabinets and medical cabinets for several national brands, in addition to the proprietary "Waterloo" brand. Household and business recycling carts and containers have recently been added to the company's product line. Virtually all components

are manufactured in Waterloo through fabrication, assembly and finishing processes. In early 1991, the company requested that WRAP perform an on-site opportunity assessment to assist in implementing a waste reduction program.

The WRAP site team, led by Bob Madison, identified 11 categories of waste reduction suggestions. The ideas ranged from straight forward changes in procedures, such as implementing paper and cardboard recycling, to more sophisticated options, such as the on-site distillation and recycling of painting solvents. A company team was already studying paper and cardboard recycling and had many other ideas. As soon as they received the WRAP team's report, they began to evaluate and implement suitable projects.

WRAP returned to the Waterloo Industries plant several months later, when the company was introducing its new line of recycling products, and conducted a workshop on how to develop an ongoing pollution prevention program. A company team attended that workshop.

Using the ideas presented in the WRAP report and workshop, plus the company's own engineering and employee expertise, Waterloo Industries has implemented a number of waste reduction and efficiency projects and is evaluating many more.

Office Paper Recycling

Two grades of paper are collected from office areas and picked up by City Carton, an Iowa City recycler. The desk-side collections are transferred to large plastic area-bins and finally to cardboard containers at the loading dock for pickup. White ledger paper and ground-wood paper recycling total about 24 tons per year. This recycling project reduced landfilling costs by \$1,348 per year and generated \$456 per year in revenue from selling the paper, for a total savings of \$1,804. It required an investment of only about \$500 for collection equipment, with a payback on that investment in only three and one-half months.

Cardboard Recycling

Waste corrugated cardboard is baled and sold to City Carton for recycling. Waterloo Industries worked with the recycler to identify available quantities in order to properly size a baler to compact the material for storage and shipping. Currently, 23 tons per year are baled and recycled. This recycling project reduced landfilling cost by \$3,874 per year and generated \$172 per year in revenue from selling the paper, for a total savings of \$4,006. Investment for a baler and collection equipment was approximately \$7,000 and was paid back in less than two years. Waterloo Industries is now implementing steps to reduce the amount of cardboard and

also produced sludge and was expensive to operate. WRAP recommended either converting the paint booths from water-wash to dry-filter type or installing a sludge-skimming device on existing water-wash pools to reduce the generation of paint sludges. WRAP also recommended replacing the chemical paint stripping of paint line hooks with a gas-fired burn-off oven to reduce the paint on the hooks to a harmless ash instead of the sludge generated by the stripping operation.

The company evaluated the ideas and decided to convert two paint booths to dry-filter operation and to install a burn-off oven. Conversion of the paint booths substituted filters for water in capturing paint solids, thus eliminating



An investment of \$89,457 has returned \$57,060 annually, which has paid back Waterloo Industries' investment in a little more than one and one-half years. This is substantial proof that pollution prevention pays.

other waste entering the plant with incoming supplies and parts. This requires working closely with suppliers to minimize packaging and maximize the use of reusable containers where possible.

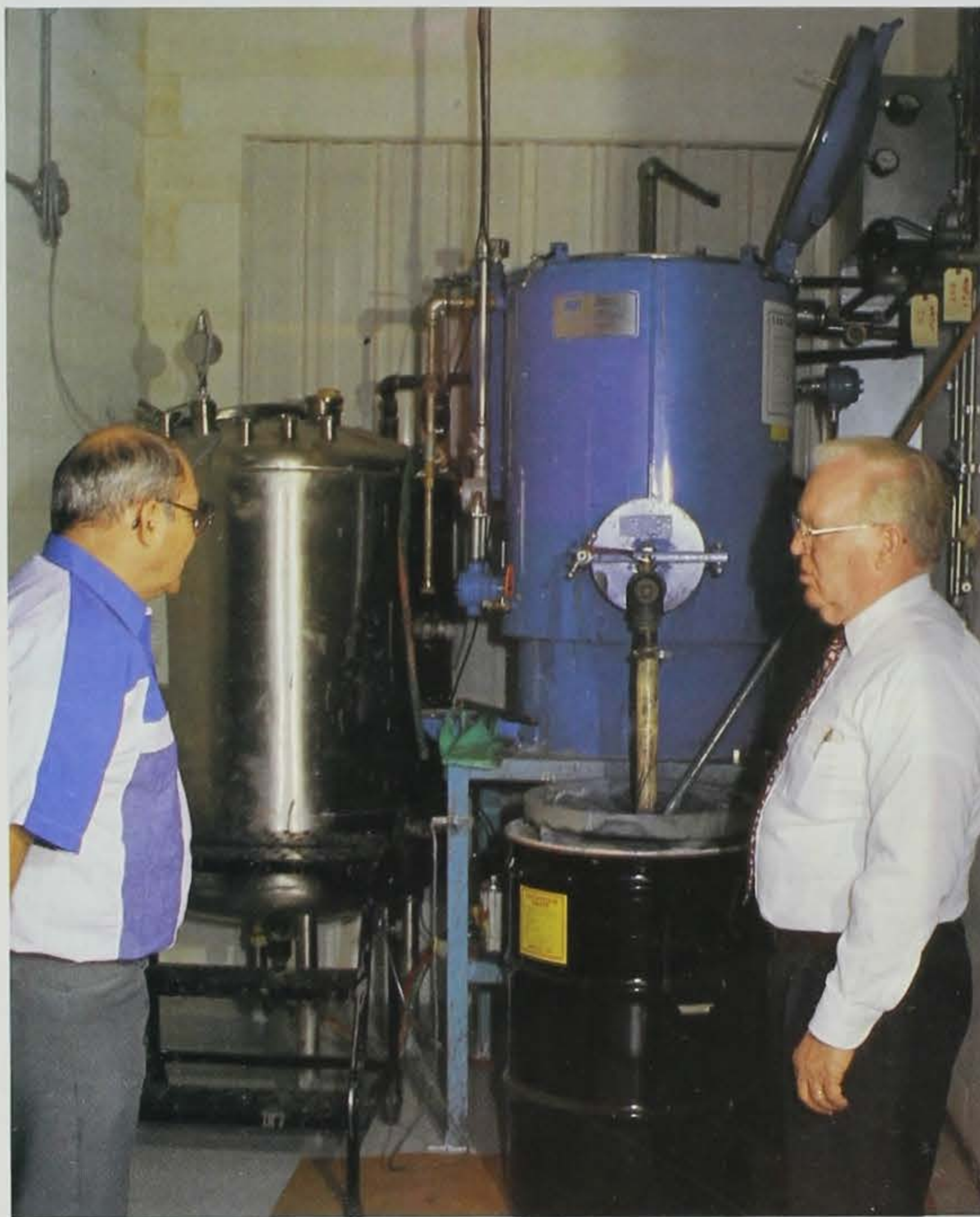
Paint Sludge Elimination

Waterloo Industries' previous paint spray booths used a water curtain to collect paint overspray and minimize air emissions. The paint from these water pools formed a sludge that had to be sent to an out-of-state hazardous waste disposal facility. Paint line hooks, which carry parts through the paint spray booths, were being cleaned with a chemical cleaner. That process

is a hazardous waste. The filters can be disposed of safely in the local sanitary landfill. The burn-off oven is used to clean paint from paint hooks and cure paint filters for safe disposal. The project eliminated the disposal of sludge and the need to pre-treat and clean the paint booth water pools. The cost of filters and of operating the oven are less than the previous operations by more than \$28,000 per year. The investment for the paint booth conversion and the oven was approximately \$43,000, which was paid out in just one and one-half years.

Solvent Recycling

Four solvents were being used to



▲ Barney Skiles, plant engineer with Waterloo Industries, shows Bob Madison the still used to recover toluene.

▶ Barney Skiles and Bob Madison inspect the gas-fired burn-off oven used to reduce paint which collects on the paint line hooks at Waterloo Industries.



clean paint equipment between color changes or for reducing the paint to be applied. WRAP identified many options for improving the painting system, including on-site solvent recovery if the solvent blend could be economically distilled to recover usable solvents.

The company studied the paint solvent system more closely and decided to change from the four-solvent system to two solvents, one being toluene. This simplified the spent-solvent situation enough to make on-site distillation of toluene cost-effective. A small, automated distillation still was purchased and installed to recover toluene for in-plant recycling. The toluene, previously sent out-of-state for incineration as a hazardous waste, is now used on-site as spray gun and line cleaner. The still recovers approximately 75 percent of the toluene for reuse as cleaner. The remaining 25 percent amounts to only 10 drums per year compared to the 95 drums per year of solvent previously requiring disposal. Waste disposal costs have been reduced by nearly \$11,000 per year. Solvent purchase costs were reduced by about \$4,000 per year. Taking all savings into account, the recycling project saved more than \$18,000 per year, paying out the equipment cost in less than two years.

Involving the total workforce in scrutinizing operations for waste reduction opportunities can also

uncover unexpected opportunities for cost-savings and efficiency. At Waterloo Industries the solvent recovery project had the added benefit of saving additional money even before the on-site recovery and recycling of solvents began. The switch from four to two solvents reduced purchasing costs by more than \$4,100 per year, in addition to the benefits of the recycling project.

Lighting Revisions

Following up on a general recommendation from WRAP to closely evaluate opportunities for energy conservation, the company team surveyed facilities for places where utility efficiency could be increased. Planned revisions to a remote warehouse provided the opportunity for lighting revisions which will improve energy efficiency.

Mercury vapor lamps were replaced with high-efficiency metal halide fixture and lamps. This change was made in conjunction with lamp relocation necessitated by layout changes. The number of fixtures was reduced from 71 to 47 and lumens per square foot of light was almost doubled with the same wattage. These changes cost \$3,750 and resulted in \$712 per year in savings from reduced utility bills plus a \$1,200 rebate from the utility company for installing energy-saving devices. The investment will be paid back in about three and one-half years.

This simple project is typical of the energy savings and resultant pollution prevention that can be obtained in many Iowa facilities. Energy efficiency is directly related to pollution prevention. If the power is not required, then less fuel is burned at the power plant resulting in less pollution and waste.

The combined statistics from these projects are impressive. Together, they have resulted in reducing Waterloo Industries' waste by 69.1 tons per year and 3,542 gallons per year. An investment of \$89,457 has returned \$57,060 annually, which has paid back Waterloo Industries' investment in a little more than one and one-half years.

This is substantial proof that pollution prevention pays.

Waterloo Industries has continued to look for new pollution prevention opportunities not only at its own plant, but also in the community. The company has co-sponsored a business waste reduction conference each of the last two years. In addition, its line of recycling equipment is helping to promote the concepts of recycling wherever it is used.

DOUGLAS & LOMASON

Douglas & Lomason manufactures automotive hardware for several national accounts. Manufacturing incorporates stamping and forming, fabrication, assembly and coating. In late 1990, the company requested that WRAP perform an on-site opportunity assessment to assist it in implementing a waste reduction program. Bob Madison was again part of a team which identified 13 categories of waste reduction opportunities for the company to consider. WRAP also returned to give the workshop to a company team. The WRAP workshop assisted the company in organizing an ongoing program to involve all employees in identifying and implementing new waste reduction opportunities.

Using an employee involvement team and other company resources, Douglas & Lomason has implemented many of the ideas presented in the WRAP report and workshop. The employee involvement team has also identified many additional ideas for reducing waste. The company has shared some of these success stories with WRAP.

Eliminating Zinc Phosphating

Previously, many parts were coated in a zinc phosphating process using multiple stages of immersion tanks. The process

▼ Phillip Lamb, plant systems coordinator for Douglas & Lomason, and other team members (below) show Bob Madison one of the plastic collapsible crates used to eliminate waste generated by traditional shipping containers.

▼ Bob Madison and Douglas & Lomason committee members (bottom) inspect the rust-proofing line loading and assembly area.





Douglas & Lomason continues to pursue other ideas identified by both WRAP and the company employee involvement team . . . Preliminary data indicate a material savings of at least \$90,000 per year, plus the elimination of hazardous waste disposal costs and reduced utility costs.

was costly and experienced some operational difficulties as well as generating considerable wastewater requiring treatment and a sludge requiring disposal. WRAP recommended a number of options to improve the zinc phosphating operation and encouraged the company to evaluate alternatives to eliminate it, which the company was already considering.

Douglas & Lomason evaluated the zinc phosphating process further and determined that the zinc process could be eliminated altogether by implementing changes in other manufacturing steps and using alternative protective methods. (The details of the changes are considered confidential by the company.) The zinc phosphating process was discontinued in August 1992. The wastewater and sludge from this process are no longer being generated and the obsolete equipment and tanks have been removed.

Upon further review, the company also finalized options to reduce the water used by another coating process, autophoretic deposition, as well as reducing the sludge generated by that process. The company is also reviewing wastewater generation, treatment and the potential for water reuse throughout the plant. Douglas & Lomason expects to implement further improvements this summer.

Eliminating zinc phosphating has drastically reduced the load on the in-plant wastewater treatment facility and thereby reduced its operating costs. Treatment and sludge disposal costs have been reduced approximately \$20,000 per year. The material cost savings for eliminating the process will total more than \$125,000 annually. Some additional operating cost-savings have not yet been documented. The improvements to the autophoretic deposition process have reduced sludge generated by that process by 85 percent, but cost-savings data are still being documented.

Reducing Solid Waste

WRAP recommended a number of options to reduce solid waste generation and improve recycling efforts.

Douglas & Lomason evaluated and implemented WRAP's recommendations, where appropriate, and the employee involvement team identified several more options for reducing solid waste going to the local sanitary landfill. A few of the innovations implemented by the company include:

- Greases will soon be received in company-owned returnable totes. This will reduce the number of 55-gallon drums requiring disposal.
- Returnable, collapsible containers are now used to ship a number of products eliminating the cardboard and wood waste previously generated by traditional shipping containers (at both ends).
- The number of sizes of steel raw materials stocked was reduced, therefore reducing incoming wastes such as wood, banding, etc.
- Wood scrap such as pallets and weld wire spools is now sent to pallet rebuilders or to other factories instead of to the local landfill.

Douglas & Lomason has reduced landfill disposal by 70 percent. This has resulted in a yearly savings of approximately \$20,000 in landfill fees and handling costs at current rates.

Reducing Aerosols

Parts requiring rework or correction were previously marked with aerosol paints. This process generated empty aerosol paint cans and also released hydrocarbon propellants from the solvent-based paint into the air. The paint purchased in aerosols was considerably more expensive than that purchased in larger containers. During the on-site assessment, a recommendation was made to use marking pens or other alternatives to eliminate the cost and waste of aerosols.

The company employee involvement team studied the process in more detail and identified an alternative using wax pencils to replace aerosol painting. The wax washes off in the parts-cleaning process and does not inhibit coating. The use of aerosol cans for marking has been

discontinued, eliminating empty cans and air emissions. The savings in paint purchase over the wax pencils totals \$11,000 per year.

Other miscellaneous changes made in association with these projects have reduced waste management costs by \$31,000 per year. These projects have saved Douglas & Lomason more than \$200,000 annually and, while the company did not divulge the amount of investment required, company officials are pleased with the return on investments.

Douglas & Lomason continues to pursue other ideas identified by both WRAP and the company employee involvement team. According to company officials all Douglas & Lomason employees are particularly proud of one of the most recent achievements -- an expensive painting process replaced by a less-toxic and less-expensive rust-proofing process that has actually increased product quality while reducing waste. Preliminary data indicate a material savings of at least \$90,000 per year, plus the elimination of hazardous waste disposal costs and reduced utility costs. A full documentation of savings and benefits is still in progress.

IT REALLY PAYS

The cost-savings and other enhancements to business exhibited by Waterloo Industries and Douglas & Lomason are not unique. Preventing pollution by reducing waste and using less-toxic materials really pays off. Doing the right thing for the environment at the right time can reap significant dividends for a business. These companies also prove that many waste-reduction projects cost little or nothing to implement and require only simple changes in procedures and technology. While not all pollution prevention projects have short payback periods, like many of those illustrated in this story, some may require a longer-term commitment by companies. However, most will pay good dividends in environmental benefits, long-term worker and community safety, and a more competitive company. Steve Warywoda, Douglas &

Lomason's plant manager, credits pollution prevention with helping the plant remain competitive in a very tough marketplace. For Waterloo Industries, pollution prevention means that in addition to saving money, the company has additional credibility when marketing its recycling products, because Waterloo Industries is also doing the right thing for the environment.

Both of the companies highlighted in this story, WRAP's other clients and many other Iowa companies are leading Iowa industry into the 21st century. They are concerned about doing the right thing for the environment while proving that pollution prevention can pay economic dividends and help them remain competitive in world markets. With this kind of enlightened, proactive approach, they are helping themselves as well as Iowa's economy and environment. Every time a waste is eliminated, a business saves costs, reduces regulatory workload and becomes more viable. Scores of businesses in Iowa are beginning to take this approach to pollution prevention aided by the DNR's Waste Reduction and Assistance Program, and many other resources. Bob Madison's grandkids just may have that better world after all.

Larry Gibson is an environmental engineer for the department's Waste Management Assistance Division in Des Moines.



▼ Gary Gresham, waste minimization committee leader at Douglas & Lomason, shows Bob Madison and other committee members parts coated by the autophoretic deposition process.

Starting a Bird Feeding Program

Article and illustration by
Pat Schlarbaum

Anyone who has enjoyed listening to songbirds and watching their colorful flight can appreciate seeing a favorite bird at their bird feeder. Feeding birds has become a multi-million dollar industry supported by people of all professions and ages.

Bird feeding benefits people who enjoy seeing birds at close range. Feeders offer a food supplement for songbirds, but seldom provide all of a healthy bird's diet. However, local bird populations seem to benefit from stable feeding regimes, especially at nesting time. While winter feeding focuses on viewing, summer feeding and an accompanying bird bath can provide tremendous entertainment. It's thrilling to see a mother cardinal coax her young to the feeding station for the first time, or to hear the chickadees and house finches welcoming a refill. Songbirds are much more vocal in summertime and contribute to the aesthetics of any home.

Bird feeders should be located near a favorite window. Songbirds prefer protected areas out of prevailing winds, so locate feeders near shrubs or thickets, with a sunny exposure where possible. Shrubs provide quick escape cover from attacking predators, but avoid placing feeders too close to shrubs if neighborhood cats threaten birds at your feeder.

A feeder designed to provide a continuous supply of seed is called a "hopper" style, as opposed to a feeder containing only a small food supply that requires daily maintenance. Hopper style feeders need to be

designed to keep the seed as dry as possible and to minimize waste. Different species of birds have varying feeding habits, so it is good to incorporate as many feeding options as possible into a feeder design.

The bird feeder on the opposite page has been designed to keep the seed as dry as possible, to minimize waste and to appeal to a range of bird species. A roof with a two-inch minimum overhang is required to ensure a dry feeding area. Cedar wood swells when wet, providing additional tightness. The kerf slot is positioned under the drip-line of the roof and provides aeration to the platform side of the feeder. The feeding area is a recessed trough with screened holes to provide aeration and subsequent drying. A dry feeder is a better feeder and will last longer. Moldy seeds may cause aspergillosis, a deadly bird disease caused by *Aspergillus fumigatus*, a common, widespread mold that grows on wet grain and bread.

The trough feeding area is also designed to minimize seed waste. Occasionally, birds such as house sparrows will throw seeds from the feeding area onto the ground but the narrow trough area is not conducive to this behavior.

Sunflower seeds, especially black-oil sunflower seeds, are favorites of cardinals, chickadees, nuthatches, titmice and at least 40 other species. When feeding seed mixtures, some birds will kick less-preferred seeds out of the feeder onto the ground to rot so it is best to offer only sunflower seeds in the feeder, rather than mixing it with other grains. Ground-feeding birds, such as juncos and true sparrows, prefer white millet but will eat dropped sunflower seeds.

The length of the feeder at right allows more than one bird to eat at a time. Bluejays can be quite territorial, but a length greater than 10 inches

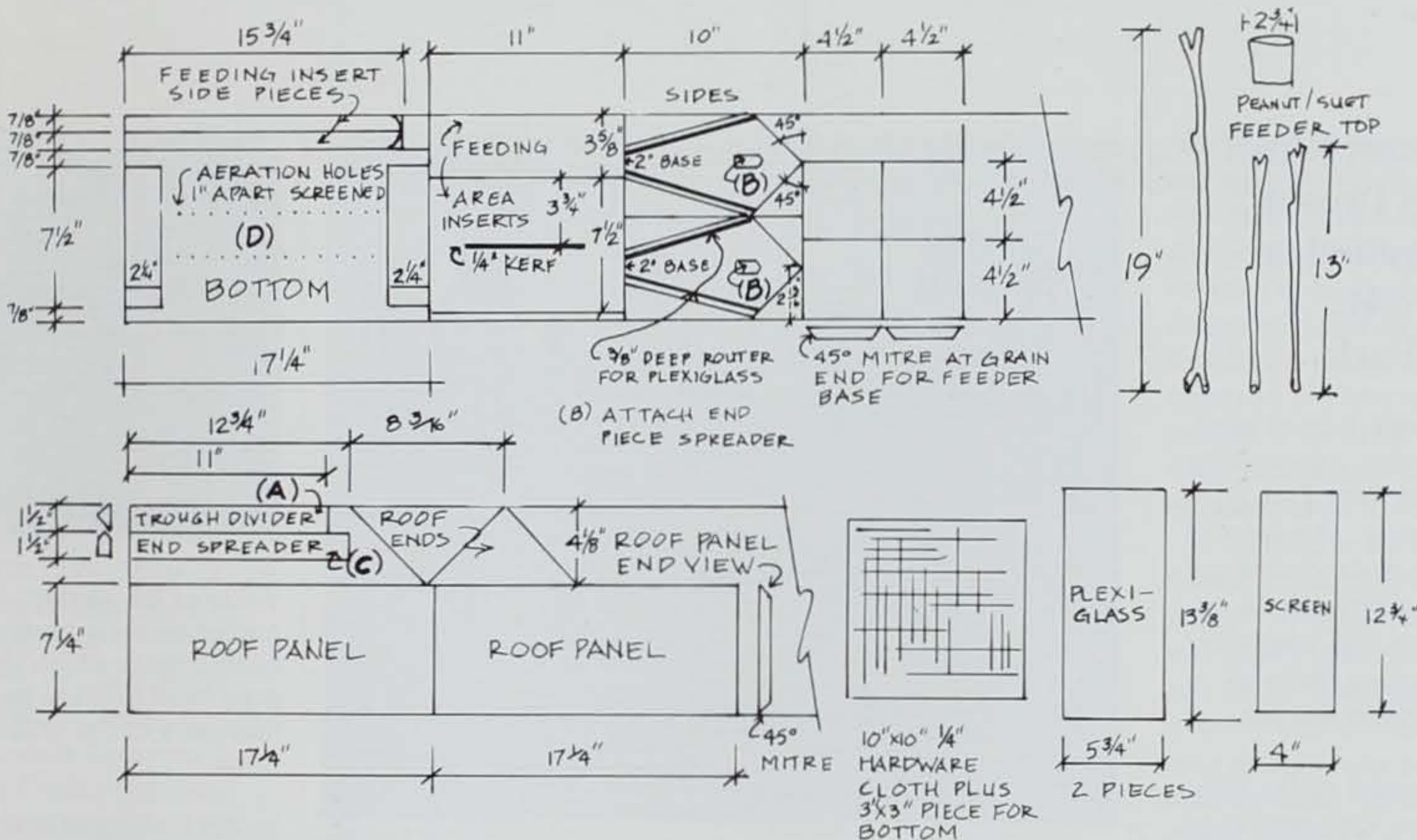
provides additional space for less-aggressive birds to feed. Perches offer chickadees and tufted titmice a place to hold the sunflower seed by their feet as they eat. Lacking perches, these birds will fly to the nearest branch, possibly out of view, to eat the seed. Birds, such as nuthatches, will use any crack to wedge the seed where they hammer it open. Ground-feeding birds like juncos and cardinals prefer flat surfaces to land upon. The platform board of the feeder entices these birds, including woodpeckers. The wire-mesh side container can offer suet or peanuts. Peanuts are a favorite food of tufted titmice and downy woodpeckers.

To attract the greatest variety of birds, consider providing different styles of feeders. Tube feeders containing niger seed will attract finches, although finches also eat sunflower seeds at a hopper feeder. Feeders spaced at various locations and heights allow less-dominant species a means to feed away from more-aggressive birds.

By constructing a feeder that is screwed together, replacement pieces can be easily installed. Pre-drilling the screw holes up from the bottom, where possible, provides a sturdy structure. Screw indentations can become a site for weathering and wood rotting. Marine varnishes are acceptable for exterior portions of the feeder, but should be avoided where contact with the seeds occurs. Linseed oil is also a good wood preservative.

Maintaining a healthy bird feeding station can provide immeasurable entertainment possibilities for your family and friends. The opportunity to share the oneness with the natural world that songbirds can provide is well worth the effort of feeding them.

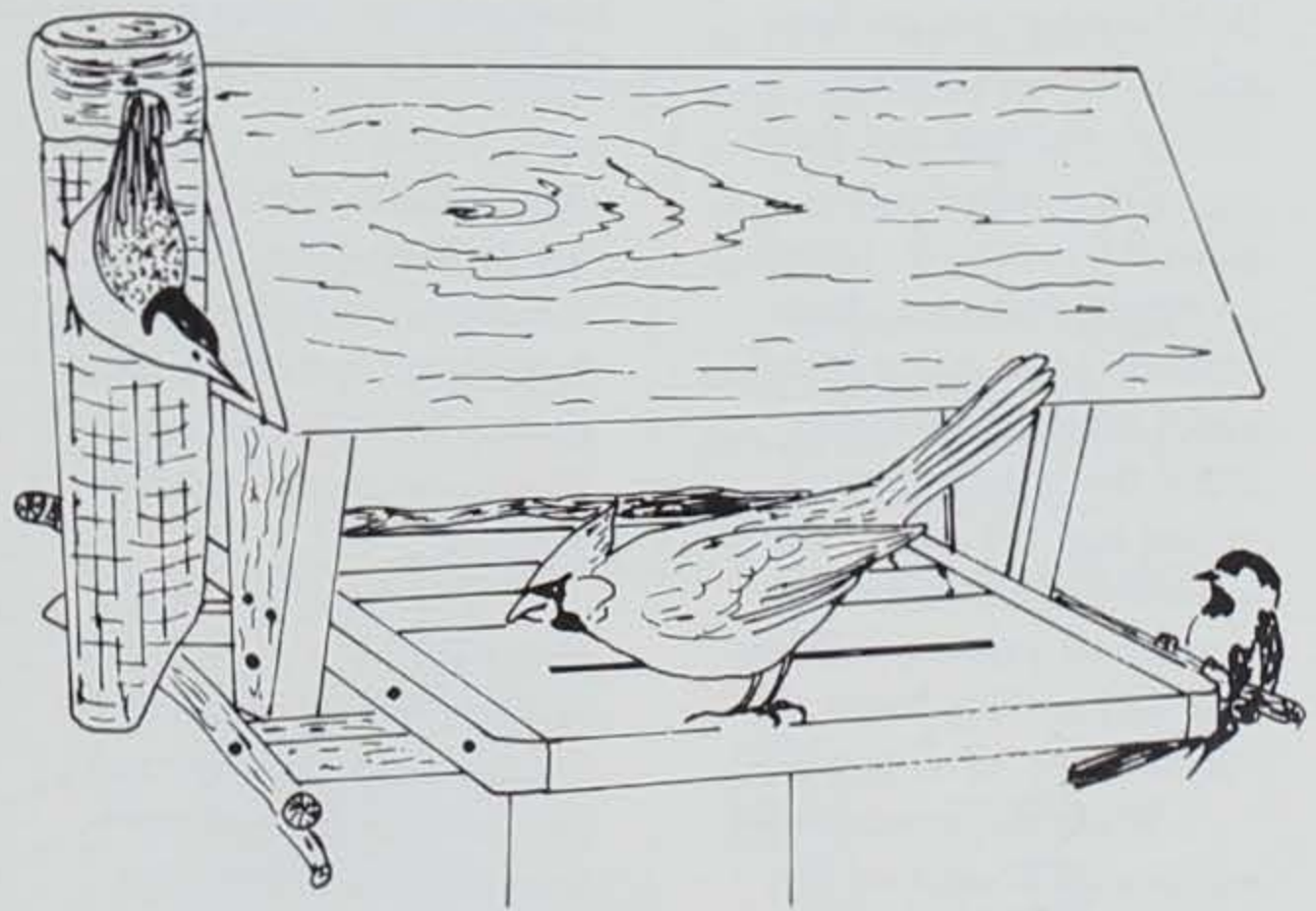
Pat Schlarbaum is a nongame wildlife technician for the department at Boone.



THE FEEDER PLANS ARE SOMEWHAT COMPLICATED, SINCE SOME PARTS ARE NOT VISIBLE IN THE ADJOINING ILLUSTRATION. THE SPREADER (C) THAT CONNECTS THE SIDES, ATTACHES AT (B) THE FEEDING TROUGH DIVIDER (A) FITS OVER SCREEN ONTO THE BOTTOM AT (D).

Successful Birdfeeding Tips

1. Occasionally birds will fly into windows. Stunned birds can be put into a paper bag (folded down at the top and held closed by a clothes pin) and placed in a warm, quiet place like a closet. Take the bag outside after about 30 minutes and release the revived bird.
2. Marauding cats that threaten feeding birds should have a bell attached to their collar to warn the birds of their presence.
3. Sometimes hawks (especially sharp-shinned and Coopers hawks) will disrupt feeding birds. Shrubs planted near feeding stations should provide protective escape cover for the birds. However, the best approach may be to simply stop feeding for a time. The birds will then disperse to natural feeding areas or other more protected feeders in your community.
4. Bird feeders should be cleaned annually with a mild bleach solution to inhibit mold growth.
5. House sparrows can be deterred from monopolizing the feeder by hanging monofilament fishing line around the feeder or feeding cracked corn or grains, their favorite foods, away from the main bird-feeding area.



Bird Feeder Construction Supply List

1" x 12" x 8' board, several sturdy twigs for perches, 46 screws, plexiglass, hardware cloth, small piece of fine screen, wood preservative

CONSERVATION UPDATE

CONSERVATION UPDATE

Volunteer Effort Brings Dream Playground to Big Creek State Park

In early June an army of volunteers converged on Big Creek State Park in Polk County. In what was a first-of-its-kind effort in an Iowa state park, the volunteers built a wooden play structure nearly an acre in size in just five days.

A special design firm from New York supervised the volunteer construction crews whose talents ranged from skilled woodsmiths to those who soaped screws and carried lumber. Because the project had to be completed before representatives from the Bob Leathers design firm left, volunteers worked through the rain and wind.

The finished playground has towers, turrets, swinging pathways, large chimes, a tic/tac/toe board and a variety of areas to spark the imagination of young and old alike. The structure is accessible to persons of varying abilities and will provide hours of fun for "kids" of all ages.

While the weather did not always cooperate, the volunteer workers truly rose to the occasion. Local citizens and DNR employees contributed their time and talents throughout the week drilling, routing, planing and bolting in the



Ken Formanek

▲ Volunteers worked through the rain and mud to complete the playground at Big Creek State Park.

"The recently completed wooden playground at Big Creek is an excellent example of the public and private sectors working together to accomplish a project that otherwise may not have been possible. The thousands of volunteer hours put forth built a quality playground area that will be available for young people for many years," said DNR director Larry Wilson.

mud, which, at times, was nearly knee-deep. Other volunteers provided snacks, beverages, two meals per day and on-site day care for those who worked on the project.

"The recently completed wooden playground at Big Creek is an excellent example of the public and private sectors working together to accomplish a project that otherwise may not have been possible," said Larry Wilson, DNR director. "The thousands of volunteer hours put forth built a quality playground area that will be available

for young people for many years."

The cost of the entire project was approximately \$60,000. The DNR funded 25 percent and the rest of the funding is being provided by the "Friends of Big Creek." This private group of citizens, also responsible for organizing the project, will continue fund-raising efforts until their goals are reached. Fund-raising efforts started in January and will culminate in a large raffle and fund-raiser on Labor Day weekend at the playground.



Ken Formanek

▲ Some of the skilled craftspersons constructed components which were then fixed in place by other members of the volunteer crew.



Ken Formanek

▲ Other volunteers sealed tires and soaped screws while those who were more proficient with power tools (see below) worked in teams to complete the playground a section at a time.



Ken Formanek

A similar playground will be built in August at Lake Manawa State Park in Council Bluffs. In order to make this project successful 200 to 300 volunteers per day and cash donations are needed. Individuals who are interested in assisting should call Sharon Kramer, general coordinator of the Lake Manawa playground committee, at (712)328-9314.

Anyone interested in buying raffle tickets or making cash donations to the Big Creek playground should call the park office at (515)984-6473.

Deer and Turkey License Applications

Several application deadlines for resident deer and turkey licenses are quickly approaching. The first deadline is for the special youth deer season. The application deadline is July 23. To be eligible for the special season, which is Sept. 11, 12, 18, 19, 25 and 26, persons must be age 12 through 15 by Sept 1.

The next deer application deadline is Aug. 13 for early muzzleloader season. The number of licenses issued will be limited to 7,500, and a random drawing will be held if more than that number apply. If the quota is not reached, applications will be accepted on a first-come-first-served basis until Aug. 27 or

until the quota is filled. Early muzzleloader season is Oct. 9 to 17.

Applications for late muzzleloader and both shotgun seasons will be accepted beginning July 19. Applications must be postmarked no later than Aug. 27 to be valid. There are no quotas on the number of licenses issued for any of these seasons. Deer shotgun season is Dec. 4 to 8 or Dec. 11 to 19. Late muzzleloader season is Dec. 20 to Jan 10.

Applicants for the free landowner/tenant license should note that free licenses will not be issued on the regular gun application. This year, free landowner/tenant licenses will be issued by the county recorder office in the county of residence. Landowners/tenants have until Oct. 31 to obtain these licenses.

All deer bow licenses will be issued by county recorder offices throughout the bow season. The deer bow season is Oct. 1 to Dec. 3 and Dec. 20 to Jan. 10.

The application deadline for a resident combination gun/bow turkey license is July 23, and turkey bow licenses are available throughout the season. The turkey gun/bow season is Oct. 11 to Nov. 28 and the bow-only season is Oct. 1 to Dec. 3 and Dec. 20 to Jan 10.

1992 Assessment Shows Americans Throw More Away Than Ever

There is both encouraging and sobering news in the latest EPA assessment of the nation's residential and commercial waste. The percentage of municipal solid waste (MSW) recovered from the nation's waste stream for recycling and composting increased from 13 percent in 1988 to 17 percent in 1990. This increase is due to the combined efforts of individuals, businesses, industry and governments. Despite this good news, Americans still threw away more garbage than ever. The total amount of MSW increased from 180 million tons in 1988 to 196 million tons in 1990, which means the per capita rate jumped from 4.0 to 4.3 pounds per person per day.

These latest statistics come from *Characterization of Municipal Solid Waste in the United States: 1992 Update*, which was recently released by the EPA. Based on data collected through 1990, the update reports MSW generation, disposal and recovery

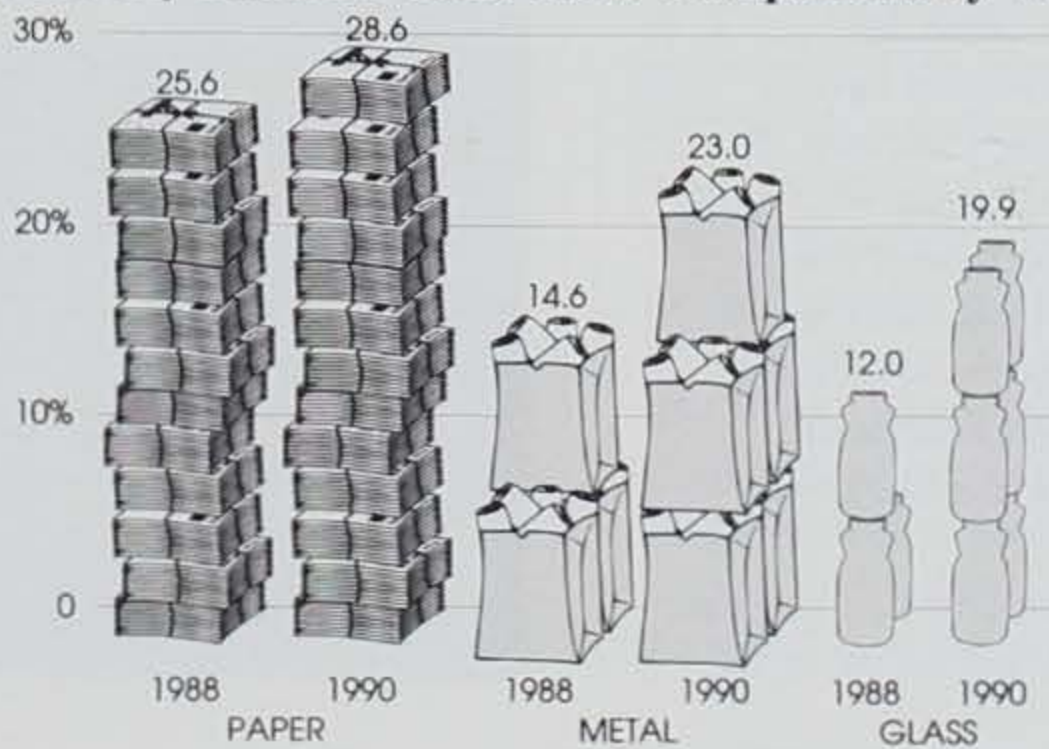
rates from the past 30 years and projects figures for 1995 and 2000. A new statistic appearing in the update is an estimate of residential versus commercial sources of MSW. Residential sources are estimated to make up 55 to 65 percent of the MSW stream, while commercial sources are estimated at 35 to 45 percent.

Looking to the future, the update projects recovery rates of 20 to 30 percent in 1995 and 25 to 35 percent in the year 2000. Such increases in recovery rates are essential to keep pace with the nation's growing waste stream. The update projects that MSW generation will increase to 222 million tons -- or 4.5 pounds per person per day -- by the year 2000.

As for the other MSW management options, landfilling declined from 73 percent in 1988 to 67 percent in 1990. By contrast, incineration of MSW showed a slight increase from 14 percent in 1988 to 16 percent in 1990.

(Reprinted from the EPA's *Reusable News* newsletter on municipal solid waste management.)

Recovery Rates for Some MSW Components by Weight



CONSERVATION UPDATE

Waverly Light and Power to Construct Wind Turbine

Waverly Light and Power has been awarded a \$25,000 grant from the American Public Power Association (APPA) to defray the cost of a project to demonstrate wind turbine operation by a small public power utility in a Midwest wind regime. The remaining cost of the project, about \$100,000, will come out of Waverly's budget.

Waverly will be the first municipal utility in the Midwest, and the second in the country, to install a wind turbine. The utility already generates a portion of its electricity from hydropower and is considered a leader in energy efficiency and integrated resource planning.

The utility will construct the wind turbine -- with a 140-foot tower and 49-foot blades -- on a farm just north of Waverly. The turbine will produce electricity at a cost of about 9 cents per kilowatt-hour, two to three times the cost of coal-generated electricity. The cost is also higher than other wind-generated electricity because of the small scale of the demonstration.

The cost was not the over-riding factor in the

utility's consideration, however, according to Glenn Cannon, general manager. "Our utility has looked at the economics of a wind turbine very seriously. In today's market, it is an expensive option, yet wind has great prospects for the future. Despite the somewhat higher cost, our customers, employees and our governing board are very enthusiastic about the prospect of locally based, clean, renewable electricity," said Cannon.

In return for the APPA grant, Waverly will collect data on performance and costs that can be used by other small utilities. Waverly Light and Power serves 3,800 customers. There are several hundred similarly sized publicly owned electric utilities in the Midwest.

Waverly residents are eagerly anticipating the new

fixture on the horizon, according to Cannon. "Customers often attend our board meetings to ask how we are proceeding," he said. Construction of the turbine should begin in June and it should be in operation by the end of the summer.

Waverly Light and Power also has an electric-powered truck, retro-fitted by the utility, that is used to gather information and as hands-on experience with electric vehicles. It features a 28-horsepower motor with 20 six-volt batteries and has been added to the fleet to do normal jobs around Waverly. The utility considers the vehicle another way to test and prepare for the future.

(See the windpower article, Northwest Iowa the Saudi Arabia of Wind Energy, on page 38.)

▼ **Waverly Light and Power is considered a leader in energy efficiency and integrated resource planning. It will be the first municipal utility in the Midwest, and the second in the country, to install a wind turbine.**



Iowa Bird Photos Needed

HELP!!!!!! The Breeding Bird Atlas project, co-sponsored by the DNR and the Iowa Ornithologists' Union urgently needs photos of Iowa birds. The final product will be a book summarizing data on each of the bird species known to breed in Iowa.

"We need pictures of all species even the common ones such as robins, cardinals, pigeons, mourning doves, house sparrows and starlings," said Laura Jackson, nongame biologist for the DNR. "People have submitted a few pictures of the uncommon, more unusual or what they consider 'attractive' birds. But we do not have many usable shots of the common, everyday Iowa species or the somewhat harder-to-photograph warblers, vireoes, grass-land songbirds and wetland species. Out of the approximately 200 birds that breed in the state, less than a dozen pictures have been chosen for the book," Jackson said.

"To make the book truly useful, we need crisp black and white photos, slides or high-contrast color photos of all of the Iowa bird species. Project coordinators would like to include a photo of each species described in the publication and need immediate assistance to

complete the project," said Jackson.

"We know that Iowans out there enjoy watching birds of all types, and we are hoping they will share their own bird shots with us," said Jackson. "We urge everyone to 'not be shy' and to submit any quality pictures of birds they think we can use as a way of sharing their interest in birding. It might be your picture of a robin that lets someone make their first identification and begins a lifetime interest in bird watching," Jackson noted.

Pictures can be of the bird itself, or adult or young birds at the nest. All photos will be acknowledged when they are received. The project cannot pay for photos but will credit each photo selected for publication. If your picture is selected you may also request a receipt, for tax purposes, noting the donation.

If you have photos for consideration in the publication, please submit them as soon as possible to John Fleckenstein, Iowa Department of Natural Resources, Wallace State Office Building, 900 East Grand Des Moines, Iowa 50319-0034. If you have questions about the type of picture or species needed, call Laura Jackson at (515)432-2823.



DNR photo

Fall '93 Toxic Cleanup Days

Toxic Cleanup Days (TCD) allow Iowans to dispose of their household hazardous wastes and provide an opportunity for education on alternatives to disposal, or in some cases, proper disposal management in the home. If you are stumped about what to do with unusable chemicals in your home, call the DNR Waste Management Hotline at (800)367-1025.

The fall '93 TCD counties and dates are listed below. Watch local newspapers for phone numbers to call for appointments.

- ◆ **September 11**
Mahaska County
Marion County
- ◆ **September 18**
Lucas County
Monroe County
- ◆ **September 25**
Emmet County
Mitchell County
Scott County
- ◆ **October 2**
Buena Vista County
Cherokee County
- ◆ **October 9**
Franklin County
Hardin County

County Conservation Park Directories

A 40-page booklet containing information on 1,464 county conservation areas is now available from the Iowa Association of County Conservation Boards. The booklet contains information on the location of all county parks, river-boat accesses, trails, camping and swimming areas, fishing and boating areas, available sports and fields, hunting areas, nature centers, historic sites, wildlife exhibits and other park features.

Send \$2 for each copy ordered to: Iowa Association of County Conservation Boards, Box 79, Elkhart, IA 50073 or phone (515)367-4000.

Bluebird Conference Aug. 21 and 22

The ninth annual Bluebird Conference is Aug. 21 and 22 at the Springbrook Conservation Education Center near Guthrie Center. Preregistration forms are available from Don Pogensee, Lake LeJune Estates, Ida Grove IA 51445.

Two Wild Turkey Chapters Make Donation to DNR

The Central Iowa Longspurs Chapter (Des Moines/Ankeny) of the Iowa Wild Turkey Federation has made a donation to the Department of Natural

Resources' wild turkey program. The chapter donated three portable blinds that will be used to watch turkeys at baited trap sites and a telemetry receiver that will be used to follow radio-marked turkeys. The Full Strut Chapter (Iowa City) has also made a donation of two cellular phones for communication between trap sites and a computer programming interface for the telemetry receiver. The donations are valued at \$1,731.

"This equipment is extremely useful and important to the successful completion of our turkey research," said DeWaine Jackson, forest wildlife research biologist for the department. "The chapters' continued support is especially important in these times of limited staff and research funds," said Jackson. The turkey research at Stephens State Forest is also being partially funded by a research grant from the National Wild Turkey Federation and Iowa State University. "Without a cooperative research program and the commitment to wild turkeys that both the National Wild Turkey Federation and the Iowa Cooperative Fish and Wildlife Research Unit (ISU) have made, the DNR would have been unable to study the recent decline in Iowa's wild turkey reproduction," said Jackson.

CONSERVATION UPDATE

Upcoming NRC, EPC and Preserves Board Meetings

The dates and locations have been set for the following meetings of the Natural Resource Commission, Environmental Protection Commission and the Preserves Advisory Board of the Iowa Department of Natural Resources.

Agendas for these meetings are set approximately 10 days prior to the scheduled date of the meeting.

For additional information, contact the Iowa Department of Natural Resources, Wallace State Office Building, Des Moines, Iowa 50319-0034.

Natural Resource Commission:

--August 5, Chariton
--September 2, Shenandoah

Environmental Protection Commission:

--July 19, Des Moines
--August 16, Des Moines
--September 20, Des Moines

State Preserves Advisory Board:

--September 7 and 8, Fayette County

Results From Iowa's First Youth-Only Deer Season

Last year was the first year of a special youth-only deer season in Iowa and the season appears to have been a success. About 1,700 youngsters took advantage of the opportunity and more than 60 percent were on their first deer hunt.

Although many states have special hunts for young hunters, Iowa is one of the first to give youngsters their own deer season. The main objective of the season is to provide young hunters an opportunity to learn to hunt deer in a safe, well supervised manner. To be eligible the youth had to be 12 through 15 years old by Sept. 1, had to pass a hunter safety course and had to be accompanied into the field by an adult who also possessed a regular hunting license. Both the young hunter and the adult had to wear hunter orange. The young hunter also had to stay in direct company with the adult at all times.

Based upon the results from the post-season harvest survey, about 40 percent of the youths got a deer. More than 70 percent of the deer taken were antlerless, but all were, in the minds of the young hunters, trophies. Although most youngsters hunted with a parent, 21 percent spent at least part of the time in the field with either a friend or relative. These young hunters spent an average of 3.6 days in the

field, with the time fairly evenly split between all three weekends. Deer were taken on all three weekends, with a slightly higher take on the second and third weekends. Nearly 75 percent of the young hunters reported being either very satisfied or satisfied with their experience. This was the highest satisfaction rating by any group of resident hunters during the past season.

About the only complaint registered regarded the timing of the hunt. The early season can be a bit warm and bugs can be a nuisance, but late September is the only time during the fall when no other deer seasons take place. The only change in the season this year allows young hunters the option of using a bow as a weapon.

When preparing for the youth season, adults should keep in mind they are helping the youth prepare for a lifetime of responsible, enjoyable hunting. Here are a few tips that can help achieve that goal. Patience on the part of the adult and pre-season practice by the youth may be the key to a successful hunt. Always remember, this is a learning experience for the youngster. Adults need to emphasize safety and the positive aspects of being in the field. Adults should make sure that bagging a "trophy" is not counted as the only measure of success. The tactics that work best are those that give the young hunter as much time as possible to react to an

encounter with a deer. A well-placed tree stand or ground blind near the edge of some timber gives the young hunter their best chance to see a deer and pick a safe, effective shot. Early morning and late afternoon are the best time to catch deer on the move. It is important to keep the stand slightly hidden as young hunters have a hard time remaining still. However, make sure the young hunter has a good view of the area where the deer is supposed to appear so that they can make a good shot.

For Iowans who have a youngster eligible for the season, this is a good way to get them started hunting deer. Those who do not have an eligible youth in their own household may know of a young person who would like to go deer hunting but does not have anyone to take them. This season gives the adult hunter the chance to introduce youth to the sport in the right way. It is a great idea to start now and plan on a hunt this coming season. The youth deer season is a terrific opportunity for Iowa hunters to share their appreciation of wildlife and hunting, pass on the tradition of responsible hunting and relive the excitement of their own first deer hunt when they watch the excitement of youths refining their own skills.

(See page 53 for application deadlines.)

CLASSROOM CORNER

by Bob Rye

Home Range

The following activity is a version of "Home Range" from the curriculum material *Lessons in a Land Ethic* based on essays from Aldo Leopold's book *A Sand County Almanac*. This exercise was in-serviced to 30 naturalists through a grant from Pheasants Forever in March 1993.

Background:

Leopold describes the area of land used by rabbits, chickadees, deer and grouse and the plants used for food and shelter. He learned about the home range of animals by observing them directly and by finding evidence of their behaviors.

Key quotes:

"The wild things that live on my farm are reluctant to tell me, in so many words, how much of my township is included within their daily or nightly beat."

"Every farm is a textbook on animal ecology; woodsmanship is the translation of the book."

Vocabulary:

home range, bud scales, budding, popple, woodsmanship, ecology



Age:

Grades -- middle and high school

Objectives:

Students will be able to:

- 1) interpret the evidence of "sign" left by at least three different animals using natural settings or pictures; and
- 2) define the term "home range" and identify the approximate size of the home range for at least the local animals.

Method:

Students will read the essay "Home Range" and then find the physical evidence in their area.

Materials:

(Outdoors)

Animal identification books.

(Indoors)

Audio/visual materials about animal evidence, sketches of animal evidence, animal identification books.

Resource Materials:

Leopold, A. 1949. *A Sand County Almanac and Sketches Here and There*, New York Oxford University Press.

Audubon Series of Field Guides: Mammals, 1980, New York; Alfred Knopf.

Chase, M. and Chase, C. 1969. *Field Guide to Tracks of North American Wildlife*, NASCO Nature Study Aids.

Murie, O.J. 1975. *A Field Guide to Animal Tracks*, Boston; Houghton Mifflin.

Peterson, R.T. 1947. *A Field Guide to the Birds*, Boston; Houghton Mifflin.

Schwartz, C.W. 1959. *The Wild Mammals of Missouri*, University of Missouri Press.



Extensions:

1. Have the students try to duplicate animal sign outdoors and have students attempt to identify the animals that made them.

2. Find out what scientists have learned about home range since Leopold wrote this essay in the 1940s.

3. Invite a biologist or bird bander into class to talk about animal signs and home range.

Procedure:

(Outdoors)

1. Discuss some of the possible animal evidence that might be found outdoors and the size of the area needed for the particular animals to find food, water, shelter and adequate space.

2. Take the students outdoors to a suitable area. In teams of two to three, direct them to locate animal evidence and make sketches of their findings on five- by eight- inch cards (one sign per card).

3. Ask them to choose one animal sign they can identify and see if it can be found in several places in the area. Have them guess what the home range of that animal might be (identification book may be used).

4. Direct each group of two to three students to pair up with another group and have them try to guess the name of the animal that left each sign, using one card.

(Indoors)

1. Show an audio/visual about animal evidence.

2. Refer to outdoor procedures, substituting audio/visual materials for the outdoor experience or use the sketches of animal evidence.

Evaluation:

The teacher should select an example of one animal sign (the actual evidence or a sketch) and ask the students to identify the animal that caused it and the approximate size of its home range.

Student Worksheet

Introduction:

The essay briefly describes some of the activities of rabbits, chickadees, deer and grouse as they find food, shelter, water and adequate space within their home range areas.

What to Do:

1. Read the sections describing each of the animals and their home range.

2. Record the names of at least three local animals and sketch an example of the evidence they leave. Estimate the size of their home range based on what you discover.

Animal	Evidence	Home Range	Area
a.			
b.			
c.			
d.			

3. Read about each animal you studied and find out more information about each, especially their home ranges.

- a. What animal did you choose?
- b. What types of evidence could be found if you studied the animal in more depth?
- c. How have humans affected the home range of the animals you investigated?



Ken Formanek

Bob Rye is a training officer at the department's Springbrook Conservation Education Center in Guthrie County.

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IC793



Fireflies

by Rob Simbeck

There are a few sights and smells and tastes and touches that stand out. They startle us awake when our senses have taken to sleepwalking. They are the things that say to us, "Life is worth living."

First kisses are like that, and blueberry pies and velvet. Fireflies are in that category, especially for those of us fortunate enough to live where they are abundant. No matter how many times you see them, fireflies are a thrill. They're hard to take for granted. There are few moments to match the one in early summer when we first see them, rising like champagne bubbles, imparting to the darkness the warm aura of a fairytale kingdom. Crickets and cicadas are transformed into a symphony backing up their delicately elegant light show.

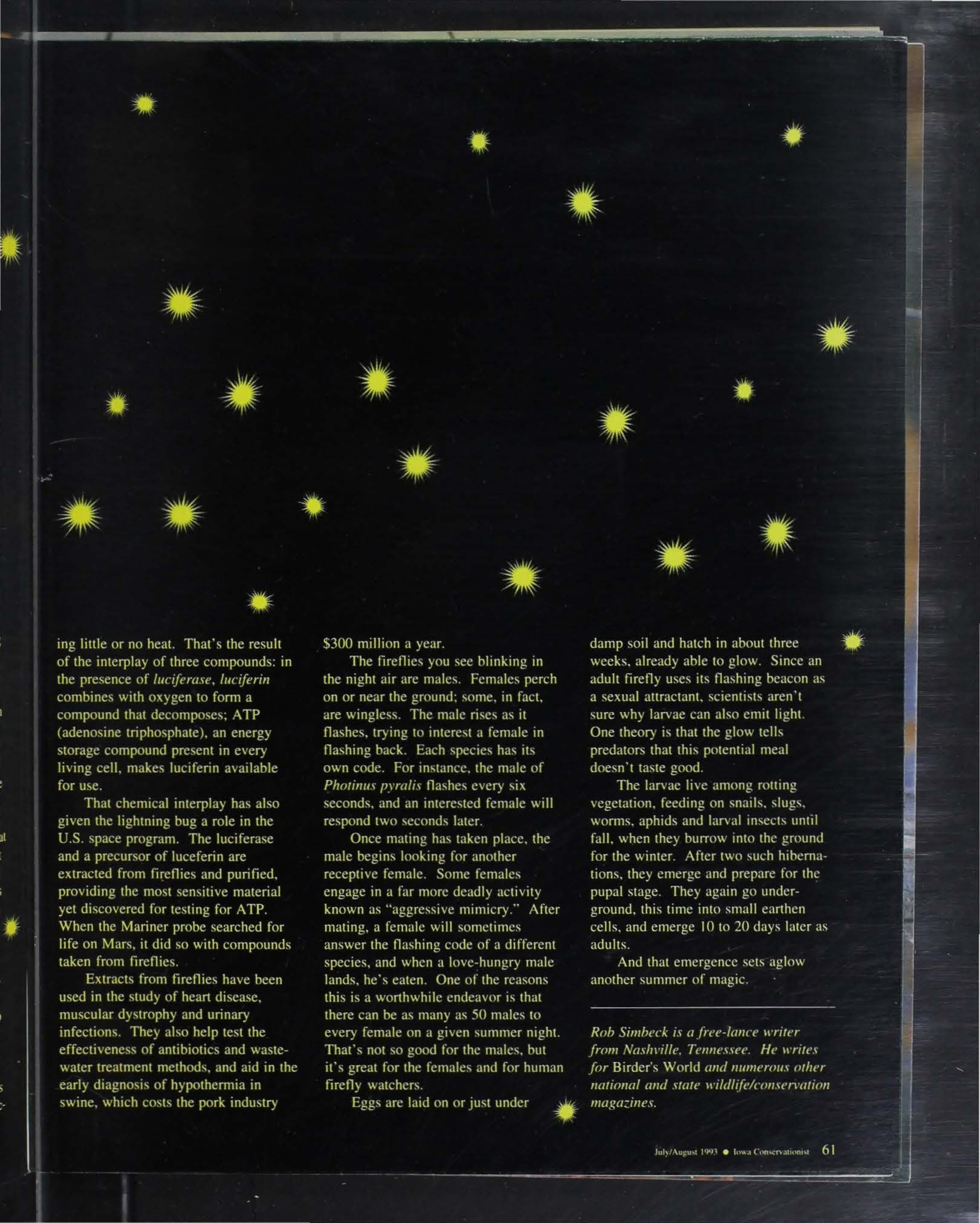
Children in this country catch them in jars. Women in the West Indies sometimes pin them to their dresses or their hair to wear them as living jewelry. Parents in some parts of Japan catch great numbers of them and turn

them loose inside the mosquito netting around their children's beds, so that they're escorted to dreamland by the cool lanterns of these magic creatures.

It's a pretty glamorous life for an insect that spends its days hiding sluggishly under leaves.

The firefly isn't a fly at all; it's a member of the order Coleoptera — the beetles. And while it's just one of the more than 300,000 members of that order, its specialty is so captivating that it gets more good press than just about any of the others.

There are more than 1,500 species in the lightning bug family, Lampyridae, with 136 in North America and most of those in the eastern U.S. Its light is a scientific marvel in that it is basically "cool" — it doesn't give off heat the way most lights do. The incandescent light bulb in your home, for instance, wastes about 90 percent of its energy in the form of heat, with only about 10 percent turned into light. The firefly's light is almost totally efficient, produc-



ing little or no heat. That's the result of the interplay of three compounds: in the presence of *luciferase*, *luciferin* combines with oxygen to form a compound that decomposes; ATP (adenosine triphosphate), an energy storage compound present in every living cell, makes luciferin available for use.

That chemical interplay has also given the lightning bug a role in the U.S. space program. The luciferase and a precursor of luciferin are extracted from fireflies and purified, providing the most sensitive material yet discovered for testing for ATP. When the Mariner probe searched for life on Mars, it did so with compounds taken from fireflies.

Extracts from fireflies have been used in the study of heart disease, muscular dystrophy and urinary infections. They also help test the effectiveness of antibiotics and wastewater treatment methods, and aid in the early diagnosis of hypothermia in swine, which costs the pork industry

\$300 million a year.

The fireflies you see blinking in the night air are males. Females perch on or near the ground; some, in fact, are wingless. The male rises as it flashes, trying to interest a female in flashing back. Each species has its own code. For instance, the male of *Photinus pyralis* flashes every six seconds, and an interested female will respond two seconds later.

Once mating has taken place, the male begins looking for another receptive female. Some females engage in a far more deadly activity known as "aggressive mimicry." After mating, a female will sometimes answer the flashing code of a different species, and when a love-hungry male lands, he's eaten. One of the reasons this is a worthwhile endeavor is that there can be as many as 50 males to every female on a given summer night. That's not so good for the males, but it's great for the females and for human firefly watchers.

Eggs are laid on or just under

damp soil and hatch in about three weeks, already able to glow. Since an adult firefly uses its flashing beacon as a sexual attractant, scientists aren't sure why larvae can also emit light. One theory is that the glow tells predators that this potential meal doesn't taste good.

The larvae live among rotting vegetation, feeding on snails, slugs, worms, aphids and larval insects until fall, when they burrow into the ground for the winter. After two such hibernations, they emerge and prepare for the pupal stage. They again go underground, this time into small earthen cells, and emerge 10 to 20 days later as adults.

And that emergence sets aglow another summer of magic.

Rob Simbeck is a free-lance writer from Nashville, Tennessee. He writes for Birder's World and numerous other national and state wildlife/conservation magazines.

WARDEN'S DIARY

by Chuck Humeston

"Don't Go Near The Dam!"

"You're going to river rescue training. You'll be on fast water and in front of low-head dams."

"WHAT? EXCUSE ME?"

"All officers will have to take the training."

"Well, I guess that's it then. High water here I come."

Training is probably one of the most important facets of law enforcement in whatever the officer does. No matter what situation occurs, it's likely the officer will react in and to the situation in the manner the officer has been trained and has practiced that training.

But, I was not too keen on the idea of working on flood-stage rivers, particularly near the face of a low-head dam. In fact, we refer to low-head dams as "drowning machines." The hydraulic effect created by the dams will trap a person who is unfortunate enough to go over one of these dams, in the face of the dam, recirculating them and pulling them under the water in front of the dam.

Dams and high-flow rivers are bad news, both to the victim and to the potential rescuer. One of the two Iowa conservation officers ever killed in the line of duty drowned in a low-head dam situation. Sadly, many times individuals underestimate the power of the river's current and take foolish risks, getting them in dangerous situations. When they do, we have to respond.

So, knowing the dangers, I approached this training with a bit of trepidation.

The first day consisted of classroom training with much emphasis on why rescues fail, preplanning rescue logistics and responses, and hypothermia. Almost all Iowa river water can be classified as cold water, making the

situation even more dangerous.

The second day consisted of demonstrations of rope, boat and pulley rigging and an afternoon of training in a swimming pool.

The last two days were hands-on training in river reading and boat-handling skills and practicing rescue scenarios.

The good part about the training was the fact the instructors stressed safe, practical, standardized techniques. These standardized techniques enable a conservation officer to assist any other department with a rescue operation. Everyone will be thinking and acting on the same wavelength as this training becomes statewide for other fire, rescue and law enforcement agencies.

The bad part about the training was the cold water, high flow and the dam itself. The very things that made the training realistic also made it dangerous, uncomfortable and more than a little worrisome.

I took my turn in an inflatable boat tethered to a backup boat in front of the backwash of the Burlington Street Dam in Iowa City. I was ready to toss a rope and throw-bag to an imaginary victim.

Now, all of my career I've told people about the dangers of low-head dams and lightning, and yet I found myself out in a thunderstorm, on a river, during high flow, in front of a low-head dam. Talk about realistic training scenarios!

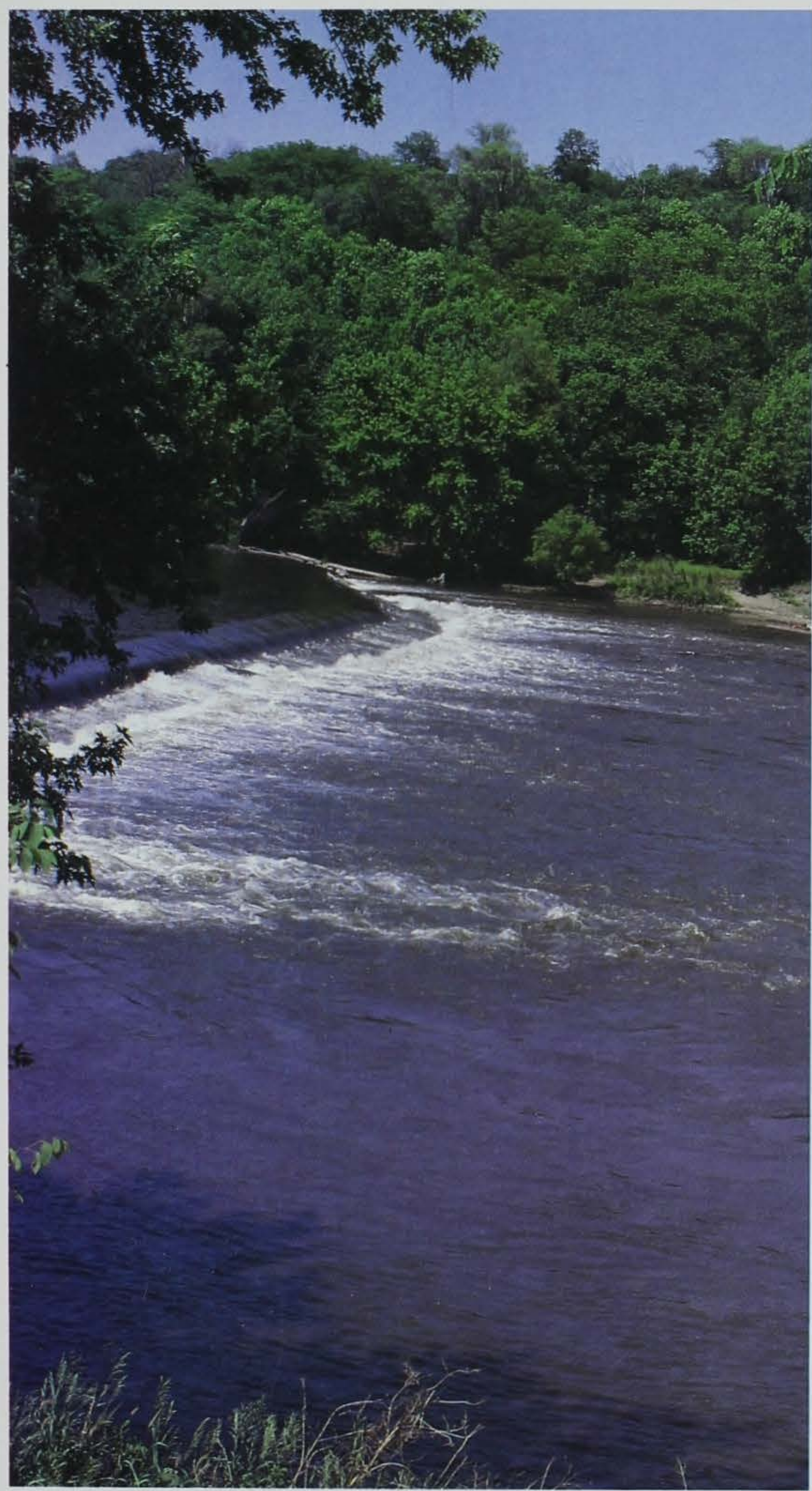
I think many officers "found religion" during the training. Being on a river during flood stage, especially in front of a dam, can be one of those "moments of truth" in your life. Based on my experience, the river training probably resulted in many officers saying, "If you get

"... all of my career I've told people about the dangers of low-head dams and lightning, and yet I found myself out in a thunderstorm, on a river, during high flow, in front of a low-head dam."

me out of this one, I promise I will never again . . ."

It was good training. It was direct, specific and covered the situation. If you ever played any sports in school, you remember how you practiced the plays and fundamentals and situations over and over until your response was automatic. We train much the same way in law enforcement. As in our river training, we cover the fundamentals again and again until the response really is automatic.

But, there are some important differences. We train for reality, not a game, and for situations and conditions in which we really hope we will never have to play. Winning in this situation means never having to play and getting the word out to Iowans -- watch that dam and be careful on the water. This season's swollen streams and rivers could give us a chance to relive our training, but as good as it was, I hope its something *no one* has to do!





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