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Back -- Singing toad by Lowell Washburn.

ASSET OR LIABILITY?

Wetlands -- are they valuable environmental assets or mosquito-infested blights on the landscape? Experts examine these fragile ecosystems and their importance to wildlife.

Story and photos by Lowell Washburn

When European settlers first began to rush westward across the Mississippi River into what is now Iowa, they beheld a vast complex of three million acres of natural prairie wetlands. Although these ponds and marshes occurred statewide, the greatest densities were found in northcentral and northwestern Iowa. These areas were so wet, in fact, that most early travelers steered their wagons clear of these regions, preferring to cross the drier more southerly portion of the state.

Of course, a number of immigrants did eventually settle in northern Iowa, and these early homesteaders lost no time in making use of the marshes' seemingly endless resources. During spring and summer, Iowa wetlands provided rural families with fresh and abundant supplies of meat, fish, turtles and eggs. Broods of newly hatched mallard ducks and giant Canada geese were routinely "captured" and reared as a later food source. In autumn, sky-darkening clouds of migrating waterfowl offered meat for the taking, and during long prairie winters the marsh provided warm, high quality pelts from a variety of furbearer species.

It was also discovered that, once drained and tilled, wetland basins made the very richest farmland. Within the span of one short generation, over half of

BENEFITS OF WETLANDS PART TWO

ASSET OR LIABILITY?

the vast wetland had vanished. As Iowa marshes declined, so did wildlife. Some simply lacked former abundance, while others, such as the whooping crane and trumpeter swan, ceased to exist as nesting species.

In Iowa, as elsewhere, misguided public perceptions and the implementation of several laws greatly hastened the eradication of our state's natural wetlands. During the mid-1800s, three separate swamp land acts deeded 65 million acres of federally owned wetlands to 15 states, including Iowa, for the purposes of "reclamation." As recently as the 1960s, the Soil Conservation Service was still aiding farmers to drain marshes.

Today, only about 27,000 acres of Iowa's prairie wetlands still exist. Those that remain serve a variety of critical functions that range from erosion and flood control to the removal of chemical contaminants from supplies of surface water.

However, the most obvious value of wetlands to most people are their benefits to wildlife. Scientists point out that acre for acre, the prairie wetland is the most productive of all temperate ecosystems. The fertility or value to wildlife of virtually all prairie wetlands can be linked directly to its plant communities. Wetland plants, such as cattail and bulrush, may produce 25,000 pounds of dry plant matter per acre. (This compares to 12-15,000 pounds per acre for 120 to 160 bushel per acre corn.) This lush growth is utilized all year long by wildlife for food, escape cover and as breeding habitat. A marsh without abundant plant life is the equivalent of a bank without money.

In Iowa, the value of natural marshes to wildlife cannot be overstated. Migratory birds are certainly the most visible and popular of the wetland's many inhabitants. And of this diverse group, waterfowl are of the greatest economic and recreational importance. Iowans annually invest large amounts of both time and money to pursue ducks and geese, and the ability to protect and purchase the majority of the state's public wetlands has been a direct result of these activities. Excluding license and stamp fees, waterfowl hunting generates over $10 million annually to local Iowa economies, according to a 1984 survey.

Although waterfowl use wetlands at all stages of their life cycles, prairie marshes are especially critical to the overall abundance of wild ducks. In

North America, these marshes represent only 10 percent of the continent's available breeding habitat, yet in an average year contribute a full 50 percent of total duck production.

Another wildlife group of economic and recreational significance are the furbearers which, in the marsh setting, are represented primarily by muskrat, raccoon and mink. Although furbearer pelts are traded commercially, a roller coaster cycle of values makes prediction of economic impacts impossible. In a single decade, pelt prices have fluctuated between record high and record low values. However, both trappers and wildlife managers are quick to point out that it is outdoor recreation and not "fur checks" that represents the biggest dividend received by trappers. As is the case with waterfowl hunting, the aesthetic benefits are immeasurable.

Iowa wetlands also serve as critical habitat for a number of species that we don't often think of as marsh animals. The ring-necked pheasant is a classic example. During the warm season, pheasants often utilize wetland margins and associated uplands as nesting cover. During the winter months, dense stands of cattail provide warm, safe areas for loafing and roosting. In fact, during particularly harsh winters and heavy accumulations of snow, the impenetrable tangle of heavy marsh cover often represents the only habitat in which pheasants can survive.

In addition to providing homes for numerous game birds and furbearers, prairie wetlands are also crucial to the survival of countless nongame species, each living in its own wetland niche. Some, such as marsh wrens and red-winged blackbirds, often utilize shoreline vegetation located along drier portions of the marsh. By contrast, large and colorful yellow-headed blackbirds nest in colonies where they weave their well-made nests into stands of cattail over deeper water. Pied-billed grebes and coots prefer to nest over the water in medium dense cover. Redhead ducks also nest over water, but use very dense stands of vegetation. Muskrat families build their lodges wherever they feel like it, and these domed structures are used as sunning platforms by painted turtles. Canada geese and meadow voles use muskrat houses for nesting structures and northern harriers visit the lodges to search for voles.

Prairie wetlands also serve as valuable habitat for many threatened species or species of special concern such as Forester's terns, American and least bitterns, and short-eared owls. During spring and autumn migrations they provide areas of food and rest for trumpeter swans, bald eagles and peregrine falcons.

As is the case with furbearers, waterfowl and pheasants, nongame wildlife is of great economic importance. According to a 1985 survey conducted by the U. S. Fish and Wildlife Service, outdoor enthusiasts in Iowa

▲

North American marshes provide only 10 percent of the continent's available breeding habitat, yet contribute 50 percent of the ducks on an average year.

BENEFITS OF WETLANDS PART TWO

ASSET OR LIABILITY?

▲
Red-winged blackbird

spend an estimated $127 million annually on nonconsumptive wildlife activities. Over 11,000 people may show up to enjoy a bald eagle appreciation day. During one such event staged earlier this year at the Quad Cities, eagle watchers generated an incredible $250,000 in the span of a weekend.

Currently some very exciting developments are occurring in the often difficult crusade to preserve these fragile ecosystems. The most significant is the North American Waterfowl Management Plan, a $1.5 billion plan that is a blueprint for restoring waterfowl breeding and wintering habitats across the continent.

Under that plan, Iowa is currently adding 2,000 acres of marsh and uplands each year to the wetland inventory. The ultimate goal of this provision is to increase the amount of publicly owned wetland and upland by an additional 30,000 acres.

Efforts are also being made to restore drained marshes on private lands and to encourage farmers to restore around 200 basins per year. As of January this year, 720 basins encompassing over 3,000 acres had been restored on private lands. In virtually all cases, wildlife and its related benefits were the incentive for farmers to restore wetlands to their natural condition.

Lowell Washburn is an information specialist with the department at Clear Lake.

Iowa's Nesting Waterfowl

by Guy Zenner

Contrary to what many may think, Iowa's remaining wetlands still provide habitat for the majority of the nesting waterfowl species that were found here when the European settlers first arrived. That is not to say that some species, such as trumpeter swans, are not conspicuous by their absence, but a good variety of ducks and, now Canada geese, return each spring to nest.

The mallard by its distribution alone is probably Iowa's most abundant nesting duck. But within the state's prairie-pothole region, our primary waterfowl breeding area, the blue-winged teal far outnumbers the mallard during the spring.

Both the mallard and blue-winged teal are ground nesters, using hay fields, road ditches and other idle grasslands. Mallards normally arrive earlier than blue-winged teal so their first nests are usually in the dead grass from the previous year. If the first nest does not hatch, both these ducks will attempt to renest, in some cases as many as three times.

Some of the less common dabbling duck species nesting in Iowa's grasslands are northern shovelers, gadwalls and northern pintails. Occasionally, even the green-winged teal, the smallest dabbling duck and a common nester in the northern half of Canada's prairie provinces, will attempt to set up housekeeping this far south.

More secretive, and therefore more difficult to count, the wood duck may be as common a nesting duck in Iowa as the mallard. It nests across the state, but unlike its other web-footed relatives, the wood duck nests in hollows of trees. Only one other duck, the hooded merganser, nests in tree cavities in Iowa; this bird is relatively uncommon here but quite common to our north.

All the dabbling ducks seek out very shallow wetlands each spring in which to feed on invertebrates -- primarily insect larvae. Ponds that are only 6 to 12 inches deep are the first to warm up in the spring, enabling millions of insect eggs to hatch and larvae to grow. These insects are the main source of protein for hens that are laying eggs. When shallow ponds are abundant, hens find food easily and may nest several times if necessary. But if shallow ponds are scarce, as in times of drought, pairs compete for the limited food resources and some may not even attempt to nest.

A large but overlooked group of ducks that commonly nest in Iowa are the diving ducks. Species like the redhead and ruddy ducks are found on most marshes that have cattails or bulrushes that they use for their over-water nests. Canvasbacks, ring-necked ducks, hooded mergansers and even an occasional lesser scaup, can be found nesting on some larger marshes, but they are not as abundant here as they are in other parts of the prairie-pothole region.

For nearly six decades, the Canada goose could not be found nesting on Iowa's marshes. Common in the 1800s, the giant Canada goose was gone from the state by the turn of the century. Its return to Iowa and surrounding Midwest states is one of the great success stories of modern wildlife conservation. Now, Canada geese can be found nesting throughout the state and are one of the most common waterfowl nesting species on northern Iowa wetlands.

With continued management, land stewardship and wetland preservation, all these species should be around each spring for our children to view well into the next century.

Guy Zenner is the waterfowl research biologist for the department at Clear Lake.

Ruddy duck

Female northern shoveler

Wood duck pair

R E D E A R

Iowa's Forgotten Sunfish

Iowa's waters are full of sporty, smaller-fighting fish, and the redear sunfish can hold its own against the best of them. This member of the sunfish family has several common names such as: shellcracker, chinquapin, stumpknocker, yellow bream, G.I. bream, strawberry bream, Texas-improved bream and tupelo bream.

This fish is slab-sided like other sunfish with a small mouth, similar to a bluegill. The upper jaw does not reach past the front of the eye when the mouth is closed. The dorsal fin has 10 spines like a bluegill. The pectoral fins are long and pointed and the earflap is rounded with a thin, whitish, flexible border around a prominent red or orange spot. Redears are the same length as bluegills but are usually heavier because of their thicker body. The Iowa record redear sunfish weighed one pound, nine ounces and was caught in Central Lake in Jones County.

Young redear feed almost entirely on zooplankton, but as they become adults they eat more aquatic insects and snails. Snails are a common food item for adult redears which they crush with pharyngeal teeth -- "teeth in their throat." The name shellcracker comes from their propensity to eat and crush snails.

Redear spawn in nests like most other sunfish and usually spawn in late May and June. The nests are grouped into colonies near submerging vegetation. These nesting sites become prime fishing areas during the spawning season when magnum male redear can be caught off the beds.

Anglers are in for an exciting rare treat -- the tenacious struggle of a hooked magnum redear.

Redear sunfish are found in most southern Iowa lakes but were not stocked until the early 1960s. This fish is very rarely found in either the Mississippi River or the Missouri River.

Although the redear shares characteristics with the bluegill, such as spawning seasons, males guarding nests and body shape, the redear is much harder to catch on hook and line. When it is hooked, a real battle occurs, especially with ultra-light tackle.

Because redear change their habits with the different seasons, anglers must also change their fishing techniques. The best time to fish redear is in the spring when the larger male and females are on or near the spawning beds. Fishing for redear guarding the nests is an exhilarating experience.

One of the best techniques is to wade or boat within easy casting distance of the nests and use a small jig tipped with bait suspended with a small bobber. Cast the jig, worm or leech beyond the bed and slowly retrieve it through the nests. The depth of the nests determines the depth of your jig or bait as you want the jig or bait as close to the nests as possible. Use very light line and jigs and small bobbers because the less resistance felt by the fish the better your success will be. Be prepared to set the hook quickly to prevent the males from swallowing the bait. Usually most of the redear caught from the nests will be males because they are protecting their nest and attempting to remove any foreign object from their nest.

Female redear are more often caught on casts in deeper water just beyond the nests where they congregate before they are driven to the nests by males to spawn.

B Y K A Y R. H I L L

William Pflieger

As the season progresses, the redear eggs hatch and the fry swim off to forage. The adults then move to deeper water, where they spend their summer. They can be found near the edges of weeds or in deep coves. Sometimes they are found on areas that break into old creek channels. They are usually found in about 10 to 20 feet of water where they are suspended just above the thermocline. Redear often hang out in or near lily ponds.

To catch redear in the summer, fish in areas where you think the fish congregate. Try using live bait such as worms, leeches or insects or use small jigs near lily pads or weeds and on areas adjacent to drop-offs. Remember these fish are often suspended in 10 to 20 feet of water, so fish at that depth. Either drifting in a boat with enough line out so the bait is at the required depth, or using a slip bobber works best.

In the fall, redear abandon their summer habits and move from deep water to areas at medium depths. Often they are near lily pads or near their spawning sites. The presence of rocks or brush on these areas will hold more fish. Fall fishing for redear is similar to summer fishing except the fish are usually in shallower water. The same baits and techniques should be used.

Winter fishing for redear is similar to bluegill winter fishing. Fish at depths of 10 to 20 feet through the ice. The most common tackle is a tiny sponge bobber in the ice hole or a springbobber on the rod tip, very light line and tiny jigs tipped with insect larvae such as wax worms. Suspend the bait about a foot or two above the lake bottom and jiggle the bait once or twice every few seconds. When your bobber starts down, or if the springbobber raises up slightly, set the hook and hang on. If you have hooked a magnum redear, be prepared for a fight. When they circle beneath the ice, the abrasion of the ice edge on the line will often cut or weaken the line, and "Rudy Redear" swims off your jig.

The redear sunfish is much more difficult to catch than a bluegill, so most anglers do not specifically fish for redear. Those that fish for redear and the bluegill angler who accidently hooks a redear, are in for an exciting rare treat -- the tenacious struggle of a hooked magnum redear.

Kay R. Hill is a fisheries research biologist for the department at Lewis.

Ask Bernie the Biologist

Since last summer when I answered questions about largemouth bass in the *Iowa Conservationist*, people have written in with more questions about bass as well as fishing in general. I selected a few of those questions to answer here.

Article by Bernie Schonhoff
Photos by Ron Johnson

What part does the lateral line play in zeroing in on a crankbait as a food source?

The lateral line system is a set of sense organs closely allied with the auditory (hearing) system. This system is restricted to fish and the aquatic stages of amphibians. The line consists of a canal below the skin with pores open to the surroundings. Inside the canal are tiny hair-like cells called neuromost. These cells respond to low frequency vibrations. The lower the frequency, the further away a fish can feel it with his lateral line.

A fish may be able to feel the vibrations of a wobbling crankbait or squirming fish at 50 to 100 feet away, but not be able to distinguish it from the many other sounds bombarding it. As the bait approaches, the fish can begin hearing the higher frequency vibration made by the rattling shot within a crankbait or by the hooks vibrating against the crankbait body.

There is a range of frequencies from about 20 Hz to 200 Hz that the fish can both feel and hear with its lateral line. This would be a good range for crankbaits to zero in on since the fish would be receiving stimulation from two sets of sense organs.

How long does it take a bass to grow to 12 inches and how much will it weigh?

On the average, a bass should reach 12 inches sometime during its fourth summer of growth, when the fish is what we call "three-plus." This means the fish has reached its third birthday but has not yet reached its fourth. Fish of this size will weigh right around one pound.

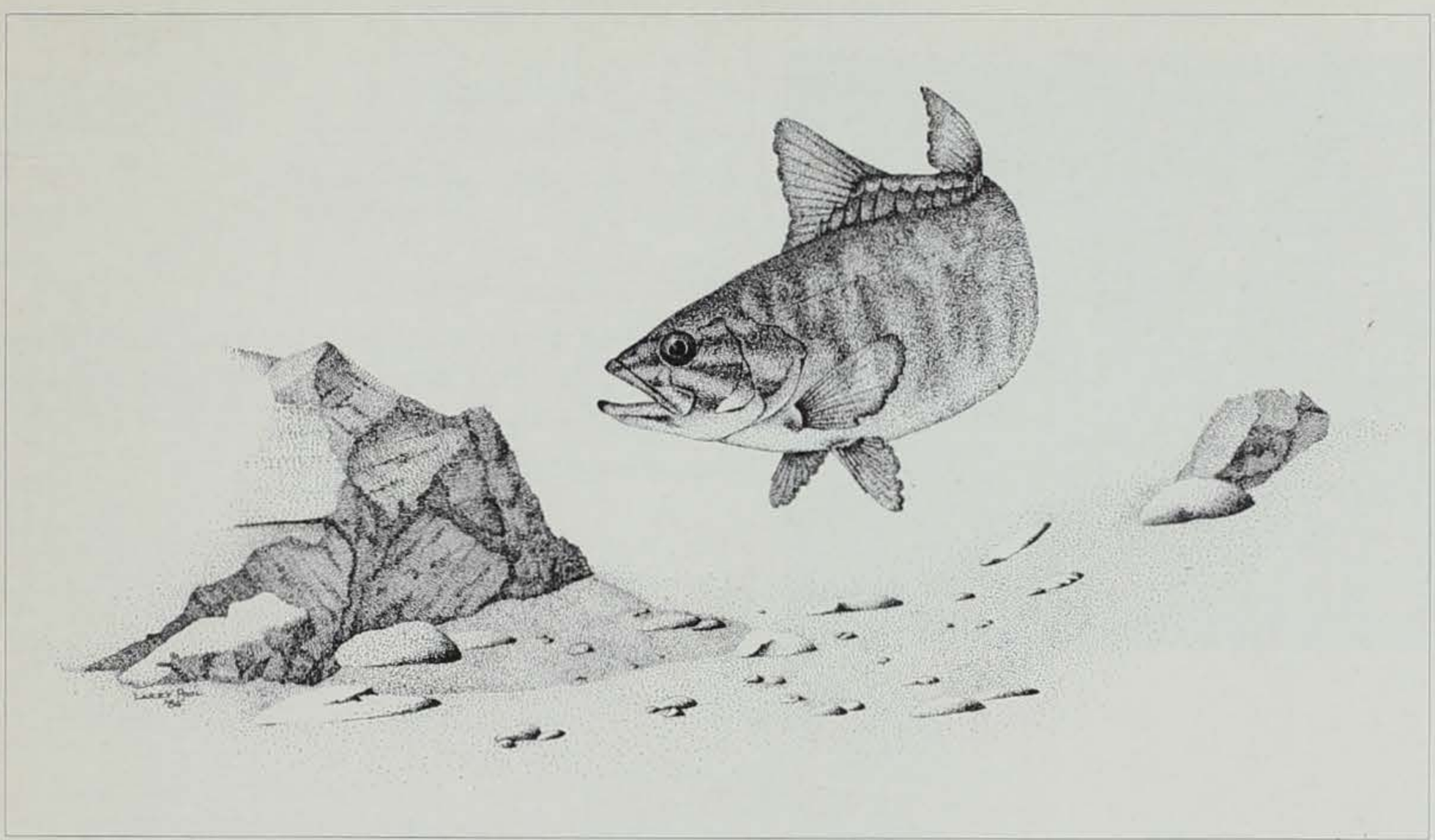


Illustration by Larry Pool

What size bait can a largemouth bass handle?

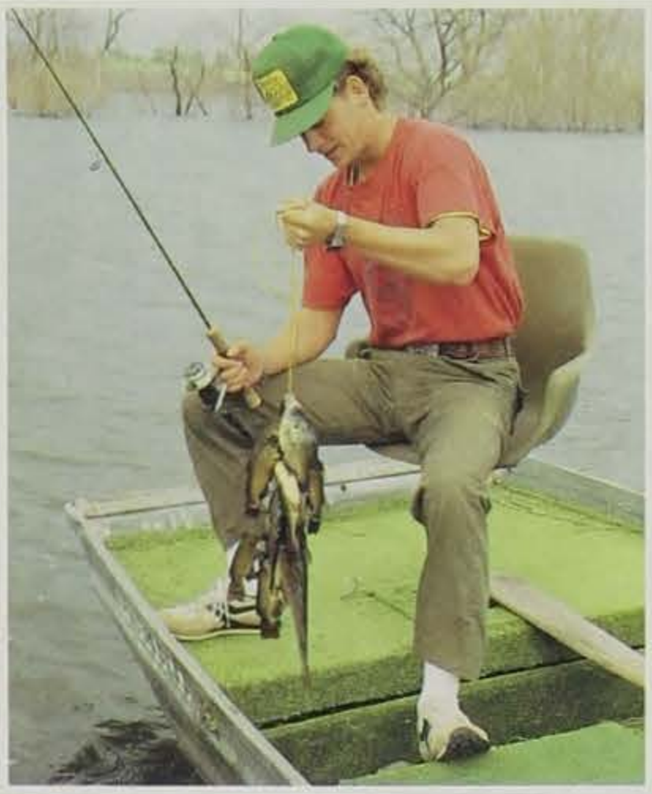
Basically, a bass can handle a bluegill or sunfish-shaped fish about one-third its own length, so a 12-inch bass can swallow a four-inch bluegill. A bass could swallow a fish about half its length in the case of a more streamlined fish like gizzard shad. So, that same 12-inch bass could take a six-inch gizzard shad. That is why the old saying, "Bigger baits catch bigger fish" is very true for largemouth bass.

What are the black spots often seen on the skin of fish? Are they harmful?

The fish have what is called "black spot disease." The black spots are actually pigmented cysts of larval tremotodes. These tremotodes are a parasite of the kingfisher, which is a fish-eating bird. The life cycle begins with eggs being released from the kingfisher. These eggs hatch into small larval stage called miracidia, which must find a snail as its first intermediate host. Inside the snail, the larvae transform into a stage called cercaria, which then exits the snail and enters the fish. It then stays in the fish until the fish is eaten by a kingfisher where it finally matures.

These tremodotes cannot infect humans, and even heavily-infested fish are safe to eat. It may be more aesthetically pleasing to skin the fish before eating it. In any case, cooking kills the parasites. The fish seem little-affected even if heavily infested with cysts.

Today there are 148 species of fish in Iowa representing 127 different families.



Bernie Schonhoff is a fishery biologist for the Mississippi River area at Fairport.

In your last article, you mentioned that the amount of oxygen in water changes with temperature. Can you explain?

Actually the amount of dissolved oxygen in water can vary with a number of different factors. First a definition of saturated water, then the explanation. Water holding the amount of dissolved oxygen which it should theoretically hold at a given temperature, pressure and salinity is said to be saturated with oxygen.

Dissolved oxygen saturated levels are greater at 32°F, and decrease with increasing temperature assuming atmospheric pressure and salinity remains constant. Saturation levels for oxygen at some representative temperatures are given in the accompanying table. As you can see by the table, saturation of water at summertime temperatures of 80°F is almost half of what the water could hold in the winter.

Temp. (°F)	D.O. Level (ppm)
32	14.2
40	12.6
50	10.9
60	9.7
70	8.6
80	7.9

Saturation levels decrease with decreasing atmospheric pressure. Atmospheric pressure is influenced by altitude so at higher altitudes saturation levels are lower even if temperature remains constant. Saturation levels also decrease with increases in salinity. For example, 60°F the solubility of oxygen in sea water is 24 percent less than that of pure water.

So, you can see water has some interesting properties that greatly influence the organisms which live in it.

How many different kinds of fish are there in Iowa?

At last a question with a simple, straight forward answer. Referring to the *Iowa Fish and Fishing* published by the department in 1987, at the present time there are 148 different kinds of fish in Iowa. These 148 species are in 127 different families, with the minnow family being largest with 50 different species.

Last in a Three-Part Series

Referred to as the "wonder chemicals," chlorofluorocarbons (CFCs) are nontoxic, nonflammable, relatively inexpensive and extremely stable substances that have become a vital part of everyday life in much of the world. But . . .

The Wonder Chemicals Must Go

by Patricia S. Cale and Kim Heiting

Used in air conditioners, refrigeration, foam production and as electronic cleaners, CFCs have helped make life comfortable at an affordable price.

Now, however, with the realization of the link between CFCs and the depletion of the Earth's protective ozone layer, the world has reached a conclusion -- the wonder chemicals must go. Global recognition of ozone depletion has spurred unprecedented international agreements on reducing the production and use of CFCs. In addition, national, state and local actions to address CFCs are attempting to further speed the process.

The Montreal Protocol, ratified in 1988 by 57 nations, set the stage for a phase-out of CFCs. It called for a 50 percent reduction in production by 1998.

The "Second Montreal Protocol"

■ Chlorofluorocarbons
50% reduction by 1995
85% reduction by 1997
100% reduction by 2000
(Study by 1992 to see if earlier phase-out is possible.)

■ Halons
50% reduction by 1995
100% reduction by 2000 with exemption for essential uses

■ Other halogenated CFCs
20% reduction by 1993
50% reduction by 1997
100% reduction by 2000

■ Carbon tetrachloride
85% reduction by 1995
100% reduction by 2000

■ Methyl chloroform
Freeze in 1993
30% reduction in 1995
70% reduction in 2000
100% reduction in 2005

■ HCFCs (transitional substances)
Resolution calling for use only where other alternatives are not feasible with phase out by 2020 if feasible and no later than 2040.

However, after Montreal, scientists began warning that the 50 percent reduction would not be enough. Even with strict implementation of the Protocol, the amount of emissions from CFCs already in use could continue to increase. According to Ted Flanigan, manager of the Rocky Mountain Institute, an energy and environmental think tank, "We have a huge amount of CFCs banked in our environment. Even if we stopped CFC manufacturing this minute, we'd still have a time bomb on our hands just waiting to be released."

In response, the "second Montreal Protocol," a follow-up agreement signed in London in June 1990, went even further to reduce production of CFCs, halons used in fire extinguishers and two other chlorine-based solvents. If this

One question remains -- Can we repair the damage that has already been done? The estimated life of CFCs in the atmosphere is 100 years.

latest pact between nations becomes a reality, no more CFCs will be produced after the year 2000.

Ninety-three nations approved the second agreement, including China and India, which had refused to sign the first Montreal Protocol. Britain's secretary of state for the environment called the agreement "a triumph of reason." And William Reilly, head of the U.S. Environmental Protection Agency, said that it was the most significant international agreement ever reached on the protection of the environment.

One of the keys to the new treaty was how it addressed developing countries. Poor nations have been reluctant to make concessions on CFCs because of the expense of finding substitutes.

The new agreement set up a fund to help developing countries make the transition to CFC-free technologies. Out of a budget of $240 million for the first three years, the U.S. contribution will be $40 to $60 million.

Clean Air

In the United States, CFC phase-out will proceed under schedules and requirements set up by the new Clean Air Act, passed in the fall. The final passage and signing of the bill ended nine years of deadlock over clean air. The act addresses acid rain, smoggy cities, alternative fuels, toxic emissions as well as ozone-depleting chemicals.

Beside the phase-out of CFCs, halons, carbon tetrachloride and methyl chloroform, the Clean Air Act also provides for the following:

- a freeze on HCFC production in 2015 and elimination in 2030. HCFCs have been touted as replacements for CFCs;
- recapture, recycling and safe disposal regulations to be phased in beginning January 1, 1992;
- a July 1, 1992, ban on venting during appliance service, repair and disposal; and
- restrictions on the sale of small cans of Freon.

(Source: INSIDE EPA, Nov. 2, 1990.)

States Take Action

While waiting for agreements among nations and for passage of clean air legislation, a number of states have taken their own steps to address CFCs. Hundreds of environmental bills were introduced in state legislatures during 1989 and 1990. Most of those dealing with CFCs sought to restrict or ban foam packaging containing CFCs.

Several states, however, have begun to require recovery and recycling of refrigerants. Hawaii, Oregon and Connecticut have all passed legislation mandating recycling. Connecticut's law, for example, requires government agencies and businesses with fleets of more than 10 cars to recycle the CFCs from air conditioners. Vermont has gone the furthest, with a prohibition on the sale of automobile air conditioners using CFCs scheduled to go into effect on January 1, 1993.

CFCs from Iowa's state vehicle air conditioners are being recovered and recycled. Another avenue Iowa is exploring is recycling CFCs from salvaged cars. According to Katherine Sibold of the DNR's energy bureau, this program alone has the potential to recycle up to 14,000 pounds of CFCs yearly.

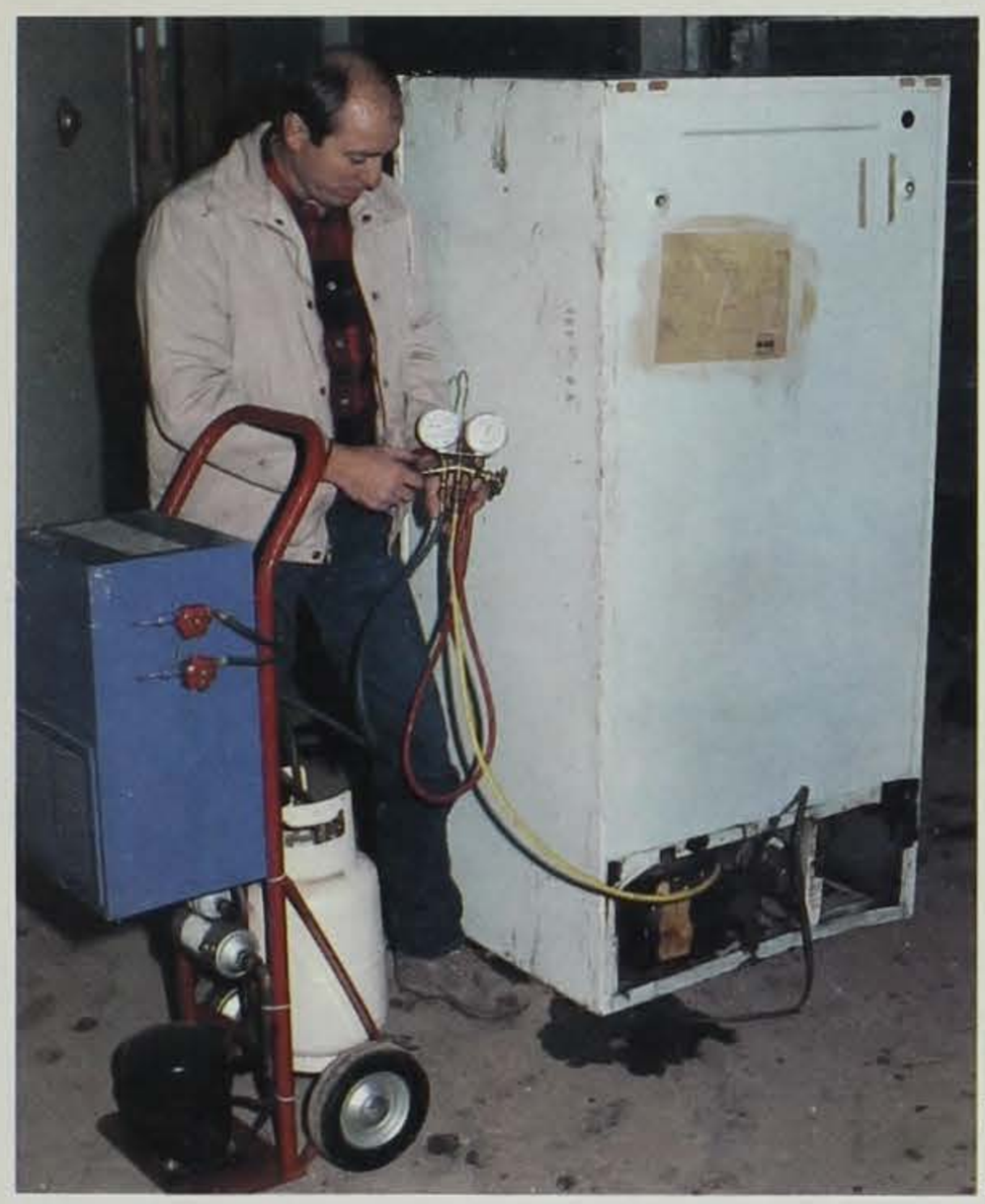
In addition, the DNR has been directed by the Legislature to produce a comprehensive study on global climate change and ozone depletion. The results will help determine further state strategies.

Ahead of the Crowd

Local communities across the country have also moved ahead without waiting for international and national guidance on CFCs. For example, a Scott County group is ahead of the crowd on CFC recycling.

The Davenport landfill has begun recovering CFCs from refrigerators, freezers and air conditioners being thrown away. The Scott County waste commission asked Mark Lewis, who owns a heating and air conditioning company and teaches at the local community college, to develop a small recovery unit portable enough to work in a landfill setting.

According to Keith Crambeck, the landfill's recycling coordina-



Ron Johnson

◀ **CFCs are recovered from refrigerators, freezers and air conditioners at the Scott County Landfill.**

tor, the landfill is recouping its investment in the relatively inexpensive unit by using the recycled CFCs in its other cooling equipment.

In addition, Crambeck said, the landfill is having an environmental impact and setting an example for other refrigerant users. "If we can show that this works on a small level, perhaps larger users can see that they can take advantage of it," he said.

A Bettendorf company, Custom Controls, is interested in manufacturing and selling the new equipment. Joe Hetzel of the company points out that while the Scott County Solid Waste Management Commission is the only landfill in Iowa now recycling CFCs, after 1992 all landfills, junkyards and appliance service companies will be required to do so. "There will be a scramble for equipment close to 1992," he said.

Can the Damage be Repaired?

One question remains when discussing efforts on CFCs -- Can we repair the damage that has already been done? The estimated life of CFCs in the atmosphere is 100 years. Over the next decade, because of the amounts of CFCs and other compounds already in the stratosphere, ozone depletion is likely to continue.

According to Michael Prather and Robert Watson of NASA, if the stringent requirements agreed to are carried out, eventually the amounts of ozone-destroying chemicals will return to "pre-ozone hole" levels. With a 100 percent cut by 2000, for example, chlorine levels should subside by the year 2073. However, the NASA scientists warn, if some countries don't comply with the phase-out, the problem could continue well into the 22nd century.

The first steps in solving the ozone problem have been taken in recognizing the problem and agreeing on the solution. Now what will be required is immense cooperation on all levels — international agencies, countries, states, local governments, companies and individual consumers — to say, "The wonder chemicals must go."

-- *Reprinted from the* Iowa Energy Bulletin, *January/February 1991.*

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

Kim Heiting was an energy bureau intern for the DNR in Des Moines last summer. She is a junior at the University of Iowa majoring in public relations.

Getting To The Point

Iowa has been blessed with rich, black soil that is the envy of the world. With intensive management, and the right weather conditions, these soils produce an abundance of crops. But with this abundance comes a price, because Iowa's surface waters are contaminated with the very resources that make the state so productive. Sediment, fertilizers and pesticides are finding their way into the water. Consequently, farmers, the general public and government officials are looking into ways to change farming methods, thereby reducing agricultural impacts on water quality.

This type of impact on water quality from agriculture is called nonpoint source (NPS) pollution. NPS pollution occurs when rainfall or snowmelt runoff carries contaminants from large land areas, such as farm fields, into surface or ground waters. In Iowa, efforts to control NPS pollution have focused on agricultural sources, because these sources are having the greatest impacts on Iowa's water quality. For example, a 1990 study by the DNR found that of the 83 significant publicly owned lakes in Iowa affected by NPS pollution, agriculture was the major source of impact on lakes. Sediment from eroding farm fields was the major pollutant with plant nutrients a close second.

The problems associated with NPS pollution are many and varied. Sediment fills lakes, streams, rivers and reservoirs, smothers fish larvae and eggs, and increases drinking water treatment costs. Excessive nitrogen and phosphorus (plant nutrients) in a water body can cause an over-abundance of aquatic plant life and algae blooms. When these plant materials decompose, oxygen is consumed, lowering dissolved oxygen levels in the water to the point where fish kills occur. Pesticides, including herbicides, insecticides and fungicides, can wash off crops and fields and enter lakes and other surface waters. There they may affect fish and other aquatic life, and water high in nitrates may be toxic to infants.

SCS Photo

by Ubbo Agena and Tom Oswald

One way to illustrate the problems caused by NPS pollution and the practices which can be used to control them is to look at West Lake, located west of Osceola in Clarke County.

West Lake is in many ways a typical Iowa lake -- people use it for fishing and boating. Wildlife around the lake is abundant and families enjoy spending Sunday afternoons there. However, something makes it atypical -- the lake is the source of drinking water for the town of Osceola. As a result, pollutants in the water have many people concerned.

The lake provides water for 10,000 people plus a number of industries. Sediment entering the lake has reduced its water volume and water treatment costs have gone up as a consequence of having to do more backflushing and filtration at the treatment plant. In 1987 Osceola issued a public health advisory notice after a

routine water sample found two commonly used herbicides, atrazine and Bladex, exceeding the Environmental Protection Agency's federal drinking water health advisory standards.

Most of the water quality problems of West Lake are attributed to the sediment, nutrients and pesticides which wash from its agricultural watershed. Since its initial construction in 1933, the lake's dam has been raised 22 feet to offset water volume losses due to sedimentation and accommodate the needs of an expanding population. Since the dam was last raised in 1983, 25 percent of the lake volume below the level of the water supply intake has been displaced by sediment.

▼

Runoff from farm fields can contaminate surface and ground waters. Farmers, the general public and the government are working together to reduce agricultural impacts on Iowa's water quality by incorporating environmentally sound farming practices such as stripcropping.

G. Morrhauser

Farmers will be able to select the practice or practices that fit their farming operation, as well as their pocketbooks.

To reduce the water quality problems of West Lake, the Clarke County Soil and Water Conservation District has now received funding to carry out a comprehensive lake protection project. Funding for this project is being provided through a combination of EPA funds from the Iowa Department of Natural Resources and state water protection funds from the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship.

Under this project, farmers will be able to select the practice or practices that fit their farming operation, as well as their pocketbook. These practices are called "best management practices," or BMPs. They are effective, practical means of preventing or reducing nonpoint pollution.

In the West Lake project, the traditional soil conservation BMPs offered to farmers include no-till, terracing, contouring, contour stripcropping and contour buffer strips. Many of these BMPs are offered as a combination of practices rather than a single practice.

No-till farming leaves the residue from the previous crop on top of the ground in order to intercept falling rainfall and reduce erosion.

Terraces slow the movement of water down hillsides by blocking and temporarily storing the water.

Contouring is an inexpensive practice which can cut erosion in half on moderately sloping land, and involves planting on the contour around a hill rather than farming up and down slopes. By contouring, the plant rows form miniature dams that slow down runoff water.

Contour stripcropping increases the effectiveness of contouring by mixing strips of hay or small grains with row crops on sloping land.

Contour buffer strips go one step further, with strips of permanent grass mixed in with the row crops.

Although reducing soil erosion with the above practices will reduce sediment movement into West Lake, additional practices are required to reduce the impacts of nutrients and pesticides on the lake.

Soil testing will be used to advise farmers on how much fertilizer they need to apply to produce a crop, without putting on more than the crop needs. Excess fertilizer can run off with eroding soil or runoff waters, or may leach into groundwater.

Finally, the farmers in the West Lake watershed will be offered "integrate pest management," or IPM. IPM involves scouting fields for weed and insect pests, treating for pests only when treatment can be economically justified, and using a variety of chemical and non-chemical pest control methods.

Although these BMPs will work well in the West Lake project, they may not be adequate in other areas of the state. Other BMPs which may be used to reduce NPS pollution in Iowa include: filter strips, field borders, crop rotations, animal waste management, grassed waterways, wetland development, and water and sediment control basins.

Although none of these practices are effective in controlling all NPS pollution problems, some are more effective than others. Selecting the appropriate practices for a given farm requires considering a number of factors, such as soil types, field conditions, types of farming operations, and financial status of the farmer. As a result, the selection of BMPs needs to be farm specific.

A number of projects similar to the West Lake project are now underway in Iowa. These projects, as well as the West Lake project, offer participating farmers the opportunity to both protect Iowa's surface waters from NPS pollution while improving their farming operation.

Additional information on BMPs may be obtained by contacting your county soil and water conservation district and county extension service offices.

Ubbo Agena is an environmental engineer with the department in Des Moines.

Tom Oswald is a Soil Conservation Service employee working as a staff liaison with the department in Des Moines.

WARDEN'S DIARY

CHUCK HUMESTON

WALLY WORLD

When I was working out of Emmetsburg, the annual rite of spring was to go to the lakes in Dickinson County for the opening of the fishing season for Wally . . . er . . . walleye, muskellunge and northern pike.

The object of the game was to try to apprehend the impatient who wanted these fish in the hours before the season would open at midnight.

I always drew Spirit Lake as an assignment, and it never failed to prove interesting. My rookie year, fellow conservation officer Bob Moats kicked me out of the car at a row of cabins after explaining I was to sneak around the cabins, pick out persons fishing off the docks, watch them catch an early fish, then run out on the dock and issue a ticket.

I peered around a corner of a cabin and saw a person fishing. The first thing I found out was that it was hard at this distance to even figure out what kind of fish was being caught. There was quite an open distance between me and the dock, so I decided to crawl stealthily on my belly to the end of the dock. I was out in the middle of the yard when lights came on all around me. I was panic-stricken. I looked behind me to see Bob and Mike Ashby, district supervisor, shining their flashlights on me like a floodlight. I tried to crawl like a salamander to cover. They kept giggling and spotlighting me. So much for peer respect.

It wasn't easy. The usual angler reaction was to take all the fish and throw them into the lake upon our approach. So, one would wait until the angler

. . . I decided to crawl stealthily on my belly to the end of the dock. I was out in the middle of the yard when lights came on all around me. I was panic-stricken.

was walking back to the cabin with the fish, yell "CONSERVATION OFFICER!" then try to beat them to the door or the edge of the lake. Sometimes this didn't work. We had an officer a little poor in eyesight who kept identifying himself as he approached an angler at the end of the dock, but the officer was being ignored. He finally, in poor humor, reached the end of the dock to find he had been demanding license and fish of a gas pump.

Different tactics were developed. Paul Magnussen waded out in plain clothes to fish among the hopeful. He noticed an angler with a stringer of marble-eyed fish and asked if they were walleye. The indignant angler asked,"What do you think you are, a game warden?" Need more be said?

One night I drew the job of going out in a boat with a night-vision scope. This is a device with a zoom lens enabling you to see in the dark. We would cruise off the ends of the docks watching anglers with the scope, then radio their location to officers on shore. But through a zoom lens, any movement of the boat was greatly exaggerated when looking at the shore. I ended up being seasick and asked to be taken to shore.

Sometimes, the weather at Spirit Lake would be its usual unpredictable self. One storm was so bad it was blowing the water almost over the road at Buffalo Run, but we were still out there trying to catch the early anglers.

It was and probably always will be a tradition.

Illustration by Newton Burch

CONSERVATION UPDATE

Growing List of Automakers Recognize Benefits of Oxygenated Fuels

With recent passage of the Clean Air Act by the U.S. Congress, a significant step has been taken toward realizing the environmental benefits of cleaner-burning oxygenated fuels. While every major automobile manufacturer in America now recognizes the performance attributes of ethanol by warranting the use of properly blended formulated gasoline/ethanol blends in their vehicles, auto manufacturers have also come to realize the need to use fuel oxygenates as part of a clean air strategy.

Prior to 1980, few auto manufacturers even mentioned ethanol or other oxygenates in their owner's manuals because their use as fuel components was minimal. However, with increasing consumer acceptance and the availability of more comprehensive technical data about ethanol, auto manufacturers developed a recognition of the performance and environmental benefits of ethanol and started including language in their vehicle owner's manuals acknowledging the acceptability of such fuel in their vehicles. As a result, the warranty language pertaining to ethanol and other oxygenates in auto manuals has grown more favorable.

The most recent example of this was the announcement by the Chrysler Motor Corporation of new wording of their fuel recommendations contained in their 1991 model year vehicle owner's manuals to reflect their support of attempts to provide cleaner air. Chrysler products include the Dodge, Plymouth and Eagle nameplates. Specifically, their new fuel recommendation regarding oxygenates reads:

"Ethanol -- (ethyl or grain alcohol) properly blended, is used as a mixture of 10 percent ethanol and 90 gasoline. Gasoline blended with ethanol may be used in your vehicle."

"Clean Air Gasoline -- In some areas of the country where carbon monoxide levels are high, gasolines are being treated with oxygenated materials such as MTBE (methyl tertiary-butyl ether) and ethanol. Chrysler Motors supports these efforts toward cleaner air. You can help by using these blends as they become available."

Chrysler joins General Motors (GM) who in 1990 began recommending oxygenated fuels for use in their cars. In 1990 the fuel recommendation section of the vehicle owners manual for all GM products (Chevrolet, Buick, Oldsmobile, Cadillac and GMC) carried the following language:

"What about gasoline with blending materials that contain oxygen, such as MTBE or alcohol?"

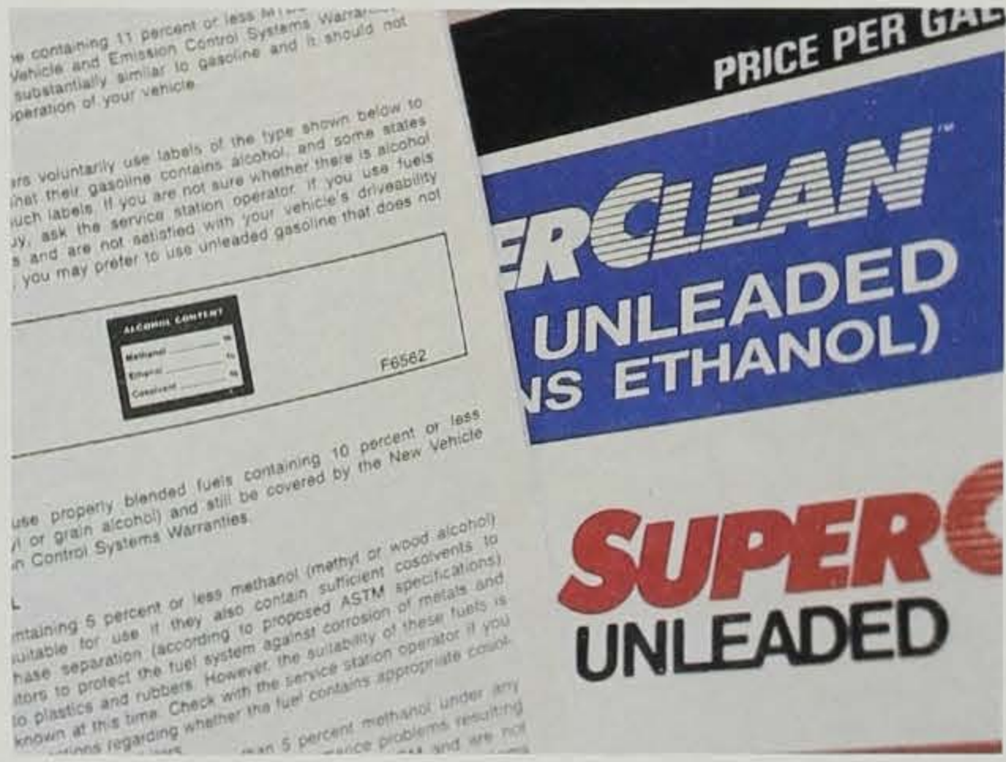
"Gasoline for Cleaner Air."

"The use of oxygenated materials in gasoline can also contribute to cleaner air, especially in those parts of the country where carbon monoxide and ozone levels are high. Where available, General Motors recommends use of oxygenated compounds such as MTBE and ethanol in gasoline."

GM continues to support oxygenated fuels in their 1991 language.

Clearly Chrysler and GM stand above other manufacturers in recommending ethanol and other oxygenates as clean air gasolines.

However, other manufacturers have also made recent changes to more clearly reflect their approval of using oxygenated fuels.



Ron Johnson

For instance, Volvo has also changed their fuel recommendation wording:

"Alcohol-Ethanol: Fuels containing up to 10 percent ethanol by volume may be used."

Some manufacturers have even issued statements regarding oxygenated fuel use which were retroactive to previous model years. In preparing the fuel recommendation for their 1991 model cars, BMW made their wording applicable to all previous models operating on unleaded (1975 and later). The wording from BMW is as follows:

"This statement will first appear in model year 1991 owner's manuals. However, this statement is applicable to all BMW's which use unleaded gas regardless of model year. Therefore, although the older statement appears in 1990 owner's manuals, it is superseded by this new statement which is effective immediately."

Other auto manufacturers whose owner manuals approve of the use of properly formulated ethanol blends include, Ford, Mitsubishi, Alfa Romeo, Nissan, Honda, Peugeaot, Hyundai, Porsche, Mercedes Benz, Saab, Subaru and Toyota. In fact, every major automobile manufacturer who sells cars in America permits the use of properly formulated gasoline/ethanol blends.

While the recent changes in warranty language regarding the use of ethanol and other oxygenates is both welcome and encouraging, it is equally significant that many of the automakers — GM and Chrysler as examples — are going the extra mile and suggesting that ethanol and other oxygenates can create a more environmentally acceptable fuel for existing and future automobiles.

-Reprinted with permission from the Ethanol Report, *Renewable Fuels Association, 201 Massachusetts Ave., N.E., Washington, D.C. 20002.*

Water Safety Poster Contest Winners Announced

Winners of the Water and Boating Safety Committee of Iowa's 11th annual water safety poster contest have been chosen. The theme for this year's contest was "Take a Boating Coarse."

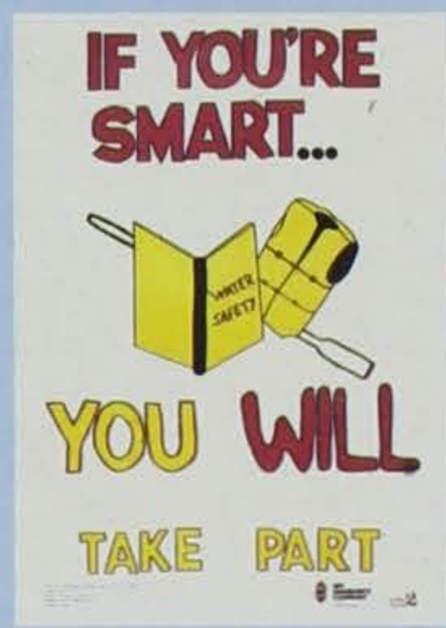
Brice Erichsen, a sixth-grade student from LeMars Junior High School, won first place for his poster, "If you're smart . . . you will take part."

In addition to winning $100 and a certificate provided by IMT Insurance, Brice has been invited to meet Governor Branstad and witness the signing of Iowa's safe boating proclamation in May.

Second place winner Kelly Sherer of Missouri Valley, a fifth-grader in Missouri Valley Middle School, receives $50, and third place winner Audrey Hanson, a sixth-grader from Charter Oak-Ute School, receives $25. Honorable mention certificates will be mailed to 24 additional students whose drawings were selected by the judging panel.

According to Sonny Satre, recreational safety coordinator for the DNR, the poster contest was a big success. "Choosing the best designs from more than 500 entries proved to be a difficult task for our judges," he said. "The committee was pleased with the interest shown by students across Iowa. Every poster carried an important safety message."

Satre said the objective of the project is to develop water safety awareness among young Iowans.



"We are happy with the response. Participating school administrators and teachers, as well as the students, are making a real contribution toward water safety in Iowa."

Co-sponsors of the annual program are the Iowa Department of Natural Resources, U.S. Coast Guard Auxiliary, Des Moines Power Squadron, and the Iowa Marine Dealers Association.

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 Commision:
--June 6, Fort Dodge
--July 11, Corning

Environmental Protection Commission:
--May 20-21, Des Moines
--June 17-18, Clayton County, Osborne
--July 18-19, Des Moines

State Preserves Advisory Board:
--June 11, Des Moines

***Conservationist* Printed with Soy Ink**

The *Iowa Conservationist* magazine is now being printed with soy ink, a more environmentally sound alternative to traditional inks. Soy ink is water-soluable and is made using Iowa soybeans. It does not include the toxic metals other inks contain (for example, lead, chromium and cadmium) and is therefore less harmful to Iowa's groundwater supply.

Because of the improvements in printing technology, soy ink prints with the same high quality as traditional inks, yet without the harmful consequences. Look for the "Printed With Soy Ink" logo in future issues of the *Conservationist.*

WRIGHT PRINTING AND PUBLISHING CO.

FOR THE WRIGHT IMPRESSION

PRINTED WITH SOY INK

Firearm Accidents Increase During 1990

The total number of hunting firearm accidents increased during 1990 to a total of 61, according to Iowa Department of Natural Resources' officials.

Of the 61 accidents, seven resulted in a fatality. This is an increase from 1989 figures which reported 48 total accidents resulting in four fatalities.

The most common type of accident is a victim covered by a shooter swinging on game. Other types of accidents (intentional and unintentional firing) include victim being mistaken for game, victim moving into the line of fire, shooter stumbling and falling, riding with a loaded gun in vehicle, defective firearms, trigger catching on an object, careless gun handling and clubbing game.

Both trained and untrained hunters were involved in similar numbers of mishaps. Hunters who graduated from the Iowa's hunter education program were involved in 30 firearm accidents, resulting in two fatalities, while non-trained hunters were involved in 29 accidents, resulting in five fatalities.

According to Sonny Satre, recreational safety coordinator for the DNR, there are three very important things every hunter must keep in mind: point the gun muzzle in a safe direction; treat every gun as if it were loaded; and clearly identify every target before you shoot.

"People really have to use good common sense when they are out there hunting," said Satre.

Any person born after Jan. 1, 1967, must take a hunter education course before purchasing an Iowa hunting license. For more information concerning hunter education programs, contact your local conservation officer or recreational safety officer, or call (515) 281-6852.

DNR Publications

New and recently revised publications of the Iowa Department of Natural Resources are listed below. These publications are free unless otherwise noted ($). We reserve the right to limit quantities. To request copies, write the Iowa Department of Natural Resources, Wallace State Office Building, Des Moines, Iowa 50319-0034.

State Parks Brochure (Reprint: 8-page booklet on Iowa's state parks and recreation areas.)

Fish Hatchery Brochures (Reprint: Rathbun Fish Hatchery, Spirit Lake Fish Hatchery, Fairport Fish Hatchery, Manchester Trout Hatchery and Big Spring Trout Hatchery.)

Fish Iowa Brochure/ Poster (Reprint: color brochure folds out to 19 x 25" poster of 31 varieties of fish found in Iowa.)

Nature Trail Brochures (New, available for trails in the following parks: Ledges State Park, Honey Creek State Park, Pilot Knob State Park, Black Hawk Park and Stone Park.)

CLASSROOM CORNER

by Robert P. Rye

The concern for issues such as energy shortage, air and water pollution, habitat destruction or species loss requires an understanding of the words behind the issues. Match the following words and definitions for a better understanding of environmental terms. In addition, see what trade-offs you would be making by: buying only rechargeable batteries for games; turning off the home or school air conditioner; and making a list or doing school assignments on a paper written on both sides.

1. Species	a. An underground water source, usually a river or seepage that provides water.
2. Pollution	b. The use of natural resources in a way that assures they will be available for future generations.
3. Recycle	c. A condition in which the earth's atmosphere traps heat in the same way as greenhouse glass.
4. Toxic Waste	d. Location of garbage and trash that is buried and covered with soil.
5. Reuse	e. Harmful substances deposited in the air, water and land that cause a dirty, unhealthy or hazardous condition.
6. Aquifer	f. Poisonous, dangerous and other lethal waste that is harmful to the environment and humans.
7. Greenhouse Effect	g. The total of our surroundings - air, water, land, animals and people - which influence how we live.
8. Conservation	h. An action where we create ways to use things in other forms.
9. Landfill	i. A group of similar plants or animals which live in a natural habitat.
10. Environment	j. A method of actions where we fix items instead of throwing them away.

ANSWERS:

1. i 2. e 3. h 4. f 5. j 6. a 7. c 8. b 9. d 10. g

HELPING KESTRELS IN IOWA

Article by Amy Ahrends
Photos by Bonnie Winslow

▼ The kestrel's adaptability to nest in wooden boxes was instrumental in helping to keep its numbers from declining.

For many people throughout Iowa, sighting the American kestrel is a common occurrence. It is a bird that goes by many names, such as the sparrow-hawk or the wind hoverer.

The kestrel is the smallest member of the falcon family, and frequents all areas of the state. The distinctive face coloring which resembles a moustache, gives it a characteristic look. The kestrel exhibits distinct dimorphism; the males have blue wings and an unbarred tail; brown wings and a barred tail is characteristic of the female's coloring.

This falcon is often found perched on a power line with its tail bobbing, while searching for food in the grassy ditch below. It also may be found hovering over an open field looking for its favorite foods: mice, grasshoppers and small snakes.

The kestrel's population has not always been so abundant. Throughout the 1960s and the 1970s the kestrel was on the Audubon Society's Blue list, indicating that its numbers were declining and a concern for their survival was warranted. The decrease in the kestrel's population numbers were attributed to the reduced and declining habitat. The kestrel is a cavity nester, often utilizing woodpecker and flicker holes made in large old trees that are often the first to be removed. Also, the destruction of many open grassy areas caused a decrease in the kestrel's hunting grounds.

The kestrel's adaptability to nest in wooden boxes was instrumental in helping to keep its numbers from declining in Iowa. In 1986, the Kossuth County Conservation Board decided to help the kestrel locally by starting their kestrel box program.

The first step of the program was to have the nesting box participants build a kestrel box of their own, using a variety of materials. Plywood boxes were cheaper to build, but fell apart after a few years in the harsh elements. Nesting boxes built out of cedar or redwood are a little more expensive but hold together better.

The next step was to have the participants find a suitable location for their box, usually on a utility pole by a grassy area. Some creative people have located their boxes on unique objects like a barn, radio tower and a windmill. The recommended height was 12 to 15 feet with the box's opening oriented in a southerly direction. Because kestrels are territorial, boxes were placed no closer than one-half mile apart. The final preparation was to put a two-inch layer of wood chips in the bottom of the box. Kestrels do not use any nesting materials, so the wood chips help prevent the eggs from rolling around on the nesting box floor.

The participants are responsible for monitoring their boxes weekly in the spring to note any activity. If an invader such as a starling or a squirrel has built a nest in the box, it is promptly removed.

◀

If a nest box is successful, four to five brown speckled eggs will transform into white kestrel young within 30 days.

▲

Two to three weeks after the kestrels are hatched, county naturalists band the young with information about the birds' age, sex, date and the box's location.

If the box was successful, it will have four to five brown speckled eggs that will transform in 28 to 30 days into small white kestrel young. Two to three weeks after they hatch, the participants call the county board naturalist to come and band their young. The metal band is easily opened and closed onto the kestrel's leg with banding pliers. The data that is recorded includes the band number, age, sex, date and the box's location. This information will later be sent to the Iowa Department of Natural Resources for the Iowa study, and then to the National Banding Institute in Maryland.

After the young are banded and the information is recorded, they are placed back into their nesting box. There they will finish growing undisturbed. When they are about four weeks old, they will venture out to take their first flight.

Of the 183 kestrels that the county board has banded in the past five years, four of the bands have been recovered. One was on a brooding female. She was found on her nest 15 miles north of where she had been banded two years earlier. That year she hatched five young from her redwood nesting box.

If you are interested in learning more about how to put up a kestrel box or how to initiate a community project, contact Amy Ahrends, Kossuth County Conservation Board, Rte. 2, Box 216A, Algona, Iowa 50511, (515) 295-2138.

Amy Ahrends is a naturalist with the Kossuth County Conservation Board.

CALENDAR

JUNE 7-9

Lewis and Clark Festival. Lewis and Clark State Park is the location for early 1800s trades, foods, crafts, history and games. Also, demonstrations of the keelboat, "Discovery." For more information, contact Ron Williams, Lewis and Clark State Park, Onawa, Iowa 51040, (712) 423-2829.

JUNE 9-15

State Park Week. Special events, including interpretive activities, fishing contests, movies and drawings for prizes at individual state parks. Also, pay for six nights of camping and receive the seventh night free. Register at any state park to win 30 days of free camping (20 names will be drawn). For more information, contact the individual state parks.

JUNE 15

Great Annual Springbrook Bike Ride. A 40-mile bike ride beginning and ending at Springbrook State Park. For more information, contact David Hebrank, Springbrook State Park, Rte. 1, Box 142, Guthrie Center, Iowa 50115, (515) 747-3591.

JULY 14

Cedar River Festival. Canoe float, July 13; arts and music festival, July 14. For more information, contact the Cedar River Festival office, P.O. Box 114, Cedar Falls, Iowa 50613, (319) 277-1885.

Wrapping Up Waste With Iowa Businesses

With the help of the DNR's new WRAP program, several Iowa businesses are significantly lowering the amount of waste they put into landfills.

HON Industries

▲ **HON Industries of Muscatine has reduced waste and recovered raw materials to be reused in their office furniture manufacturing process.**

by Tom Blewett

Last spring, the DNR began employing senior industry professionals in a new program known as the Waste Reduction Assistance Program, or WRAP. The purpose of the program is to provide technical assistance to larger Iowa businesses in the search for ways to reduce the amount of waste being generated at their facilities.

The WRAP program provides free and confidential services that include an on-site waste reduction opportunity assessment, a report with recommendations, an on-site workshop for each company, and a continuing commitment by WRAP to provide waste reduction information resources to companies.

The WRAP program is available to companies of 100 or more employees or companies that are classified by the U.S. Environmental Protection Agency as "large quantity generators" of hazardous wastes. A similar program is available to smaller companies, not exceeding 200 employees, through the Iowa Waste Reduction Center at the University of Northern Iowa.

The on-site waste reduction opportunity assessment is conducted by a WRAP team which is tailored to each company's needs. The typical WRAP team consists of three to five members who work at the facility for two or three days reviewing plant operations and waste streams.

After the completion of the on-site review, the WRAP team advises company officials of initial findings and then after closer review, presents them with a written report identifying waste reduction opportunities.

The most important part of the WRAP program is a free on-site workshop designed to help companies establish or improve

existing waste reduction programs. The primary emphasis of the workshop is to promote an internal "team" approach to waste reduction. There is a role for all employees to play including management, technical staff, supervisors, and production personnel. The workshop helps to identify the various roles and resource opportunities within the plant as well as outside resources. The long term benefit of this approach is that companies begin to incorporate waste reduction and costs associated with waste into ongoing facility planning and management operations.

After the completion of the report and the workshop, the WRAP program is still available to companies as an ongoing source of information. WRAP maintains a library of technical information and networks with similar programs across the country to access new and innovative approaches to waste reduction. In addition, WMAD maintains an updated directory of recycling facilities and is working with Iowa State University to develop recycling marketing information for the Midwest region.

The typical factory in Iowa involves some kind of metal manufacturing along with painting or finishing the final product. What follows are examples of common observations made at companies visited by the WRAP team.

The company has already begun to look at ways to reduce its waste by eliminating some of its hazardous wastes and recycling some of its solid wastes. Scrap metal is recovered and sold to the salvage yard, but most solid wastes such as paper, cardboard, wood, paper towels, rags and miscellaneous materials are found thrown together in dumpsters and trash barrels.

One of the easiest things to begin is solid waste segregation so that companies know how much of each type of material they have and what types of markets are available for each type of waste. The company must also start keeping accurate records of how much waste is generated and of all the true costs associated with waste, including lost raw materials, management costs, liabilities, transportation, disposal and others.

In the cutting and stamping operations used to make a metal product, the machines use water and oils for cooling and lubricating purposes. The water and oils can often be recycled or reclaimed instead of going directly into a waste stream. This cuts down on disposal costs and also saves money by reducing the need to buy coolants and lubricants.

Another source of waste occurs when the metal parts are cleaned prior to painting. Traditional parts cleaning operations have depended on the use of organic chemical solvents such as TCE (trichloroethylene), mineral spirits, or CFCs (chloroflourocarbons) such as Freon.

These solvents result in significant air emissions as well as hazardous wastes. The WRAP team identifies alternative solvents or processes that can reduce or eliminate the need for the more environmentally hazardous chemicals.

For example, there are many new paint technologies available that range from simple changes in spray guns, application techniques, and high solids paints to powder coating systems that eliminate the use of solvents.

Other significant sources of waste may occur in shipping and receiving, off-specification raw materials, office wastes, poor energy conservation practices, inefficient plant layout, and excess packaging practices.

The many opportunities to reduce or eliminate waste indicate there is a significant role for Iowa businesses to play in protecting our groundwater, soil and air from contamination. In

Douglas & Lomason

▲ **The old system of product packaging at Douglas & Lomason generated cardboard, steel bands and pallets as wastes for the buyer.**

Douglas & Lomason

▲ **The recycling system used at Douglas & Lomason today includes stacks of foldable, reusable plastic pallets that are returned to the company for repeated use.**

addition to the environmental benefits that all Iowans can enjoy, the companies often discover significant cost savings in producing their product with less waste. That means that Iowa businesses can be more competitive in the market place which means more job security for Iowans.

This approach to reducing waste and its impact on the environment is a major shift from the "end-of-pipe" regulation that has been the core of environmental protection legislation in the past. Instead of waiting for the waste to come out of a pipe before implementing measures to protect the environment, companies are beginning to move towards reduction and elimination of wastes.

A number of Iowa businesses have already demonstrated significant leadership in implementing waste reduction programs and policies. Some such as HON Industries, Rockwell International, Amana Refrigeration, 3M, John Deere and Fisher Controls International have shared their waste reduction stories with other businesses through workshops sponsored by the DNR.

Two companies that have had WRAP team visits illustrate the commitment and the progress that is being made by Iowa businesses. HON Industries, with corporate headquarters in Muscatine, is a major manufacturer of office furniture, and Douglas & Lomason of Red Oak manufactures automotive hardware. Both companies had committed themselves to waste reduction before the WRAP program and have made additional progress since the WRAP waste reduction opportunity assessment.

HON Industries has a number of manufacturing facilities in Iowa and across the country. One of HON's facilities was recently recognized with an Iowa Waste Reduction Award from the Iowa Waste Reduction Center for significant waste reduction in one of its metal plating operations. For the last two years officials from the WRAP program have participated in an annual conference on environment, safety and waste management that HON has provided for representatives of its facilities across the country. HON has also played a key role in working with Muscatine businesses to address waste reduction through recycling.

As a result of the first two WRAP plant visits, HON officials are now investigating additional waste reduction opportunties.

As a result of the first two WRAP plant visits, HON officials are now investigating additional waste reduction opportunities for a number of solid wastes, including paper, wood, sawdust, fabric scrap and metals. Improved waste segregation will enhance HON's ability to assess its market opportunities for recyclable materials. In addition, HON is examining opportunities to reduce waste associated with some of its painting operations. One of HON's facilities had already implemented an innovative painting system that has resulted in a major reduction of painting wastes and emissions to the atmosphere.

Douglas & Lomason of Red Oak recently began a major initiative to reduce waste from its operations and to demonstrate its commitment to protect the environment of its employees and the community. Before the WRAP team visited the Red Oak facility, company officials had already found ways to improve operations to reduce waste and to look for recycling opportunities.

The WRAP team has been able to offer suggestions in a number of areas including recycling of solid wastes, modifications of painting systems, engineering modifications to improve operational efficiency, and energy recovery. Before the WRAP recommendations had been completed, Douglas & Lomason had already implemented some of the solid waste reduction options and reduced the number of loads going to the landfill from six per week at the time of the WRAP visit to one per week.

As a demonstration of Douglas & Lomason's continuing commitment to the community, it has organized and sponsored meetings with community leaders and businesses of the region to promote the WRAP program and waste reduction opportunities. This sharing of information and promoting technology transfer among business leaders is a key element helping Iowa businesses forge ahead with improved competitive vigor and responsible environmental citizenship.

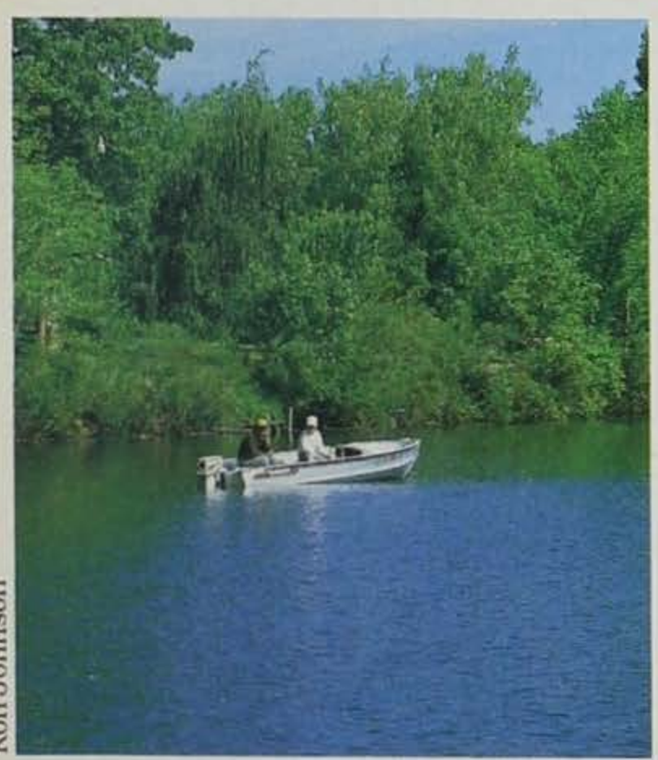
For further information about the WRAP program, contact Larry Gibson, Iowa Department of Natural Resources, Wallace State Office Building, Des Moines, Iowa 50319-0034, at (515) 281-8927.

Tom Blewett is a waste management bureau chief with the DNR in Des Moines. He initiated the WRAP program in 1990.

LAKE WATER LEVELS

What effects do lake water levels have on fish populations?

by Larry Mitzner and Bryan Hayes



Ron Johnson

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Crappie fishing at Rathbun Lake can be affected by the water level of the lake during spawning. High water years tend to yield more crappie than low-water years.

Water was lapping at the parking lot curbs, the boat ramp was 12 feet under water and people were jockeying for positions to launch their boats on the congested turn-around area. It looked like rain again, and people were not happy campers. At the time, I was talking to an elderly gentleman who had just jackknifed his trailer and was complaining about the inconvenience of the high water, using terms a young child should not have heard:

It was 1982, and the old gentleman was correct; things appeared to be a mess. Flood water at Rathbun Lake was being stored at the overall flood control management plan, one of the primary purposes of the lake. Flooding that spring and summer was causing havoc with recreation. Boat ramps were inundated as were many camping facilities. Furthermore, fishing was not the greatest; the water was turbid and fish were scattered.

But, as the lyrics from the old song say -- every cloud has a silver lining. So it was at Rathbun Lake in 1982. This was the making of some excellent crappie fishing which would occur during the future years of 1985-1987. All stored flood water provided the necessary elements for good survival of crappie young, from nesting and hatching through late summer.

Crappie at flood control reservoirs invariably rank first both in popularity and total catch. Creek census data from Rathbun Lake shows that crappie harvests of 100,000 fish or greater occurred in nine of 14 years and accounted for 80 to 90 percent of the annual harvest. The heyday of crappie fishing occurred in 1974 and 1975 when more than 500,000 crappie were taken home by anglers.

However, highly successful crappie fishing is often offset by years of less-than-desirable

DNR Photo

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Low water conditions at Rathbun Lake often mean poor spawning and recruitment into the fishery and as a result, poor fishing in the following years. Conversely, high water conditions from April through August can result in an abundance of crappie young.

catches. Cyclical crappie populations have been well documented by many biologists throughout the Midwest. The reasons for these ups and downs are not as well documented. At Rathbun Lake, 18 years of study indicated that water level during spawning and early life stage development may be crucial to the abundance of young crappie and ultimately fishing success.

A direct relationship exists between the density of young crappie and the amount of water stored from April through August. That is, high water years yielded more crappie than low water years. During the study period (1971-1989) estimates of young crappie abundance in June ranged from zero to 4,235 per acre. These year-classes produced annual angler catches ranging from 11,500 to 410,600 crappie. The highest crappie reproduction at Rathbun Lake occurred in 1973, 1978, 1982, 1986, and 1990 and has coincided with high-water years.

How does all this relate to your success or failure at Rathbun Lake? It has to do with the fact that crappie year-class abundance translates to crappie harvest two to four years later. For example, the extremely abundant 1986 year-class produced a record harvest of nearly one-half million crappie during the 1988-1989 fishing seasons. It remains to be seen what the excellent 1990 year-class will yield, but it should definitely boost the rather mediocre fishing which occurred in 1990.

On the other side of the coin, a significant cause of reproductive failure in Iowa lakes is drought. Low water levels decrease spawning habitat and increase predation. At Rathbun Lake drought conditions resulted in poor crappie production. The drought years of 1988 and 1989 yielded young crappie densities of only 22 and 449 fish per acre, respectively. These numbers

were considerably lower than some of the high water years. For example, in 1986, a high-water year, the estimate of young crappie was 3,253 fish per acre. As these weaker year-classes of 1988 and 1989 move through the fishery, a decline in angler success is expected in the early 1990s. Stronger year-classes produced either before or after 1988 and 1989 will, however, cushion the effect of these weaker year-classes.

Another example of the effects of low water was shown at Red Haw Lake. This 64-acre bass/bluegill lake in Lucas County saw its water level drop by six feet between 1988 and 1989. During this same period, the bluegill population went from an estimated 126 pounds per acre down to 23 pounds per acre, a fivefold decrease. The bluegill population is now dominated by a few larger fish (greater than six inches) indicating poor reproduction and survival. The reason behind this poor reproductive success was a combination of a reduction in prime bluegill spawning habitat in conjunction with predation of young bluegill by largemouth bass.

Similar findings have been observed in Iowa's natural lakes as well. When water levels are low, some spawning grounds are left high and dry. Water level fluctuations also influence the density and location of weed beds which are vital to successful reproduction of many species and to the survival of many young-of-the-year fish. Yellow perch harvest estimates from Spirit Lake, for example, have ranged from 6,000 (1961) to 109,306 (1971) fish. Years of low water decreased spawning and nursery areas for yellow perch, accounting for some of the variation in harvests. Walleye, bluegill and bullhead also show population fluctuations from year to year in Iowa's natural lakes.

Jim Bruce

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Studies of water levels have provided fisheries managers with information on how to economically reduce fish overpopulation. Drawdowns simulating drought conditions can increase predation and decrease reproduction.

What we have learned through observations of natural phenomenons such as floods and droughts is put to use in managing Iowa's fishing lakes. Summer drawdowns to simulate drought conditions are used by fisheries managers as an economical way to reduce overpopulated bluegill populations. Meadow Lake, a 38-acre state-owned lake in Adair County, was used to study the effects of an "artificial drought." At the time, the fish population was dominated by bluegill less than six inches long as a result of overcrowding. The water level was purposely reduced by five feet from July to September in 1978. The increase in predation and decrease in reproductive success resulted in a 50 percent reduction in the bluegill population and a corresponding growth of the remaining bluegill.

Conversely, a water level rise of four feet, either by nature or planned, during April through early June would have a predicted benefit -- increasing the crappie harvest by 100,000 fish during the next four years at Rathbun Lake.

Water levels, high or low, impact Iowa's fish populations. Knowledge of this can be used to our advantage in managing our fisheries resources. So, thinking back on that day at the congested, flooded boat ramps in 1982, all that frustration had its benefits.

Larry Mitzner is a fisheries research biologist for the department at Chariton, specializing in large reservoir investigations.

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