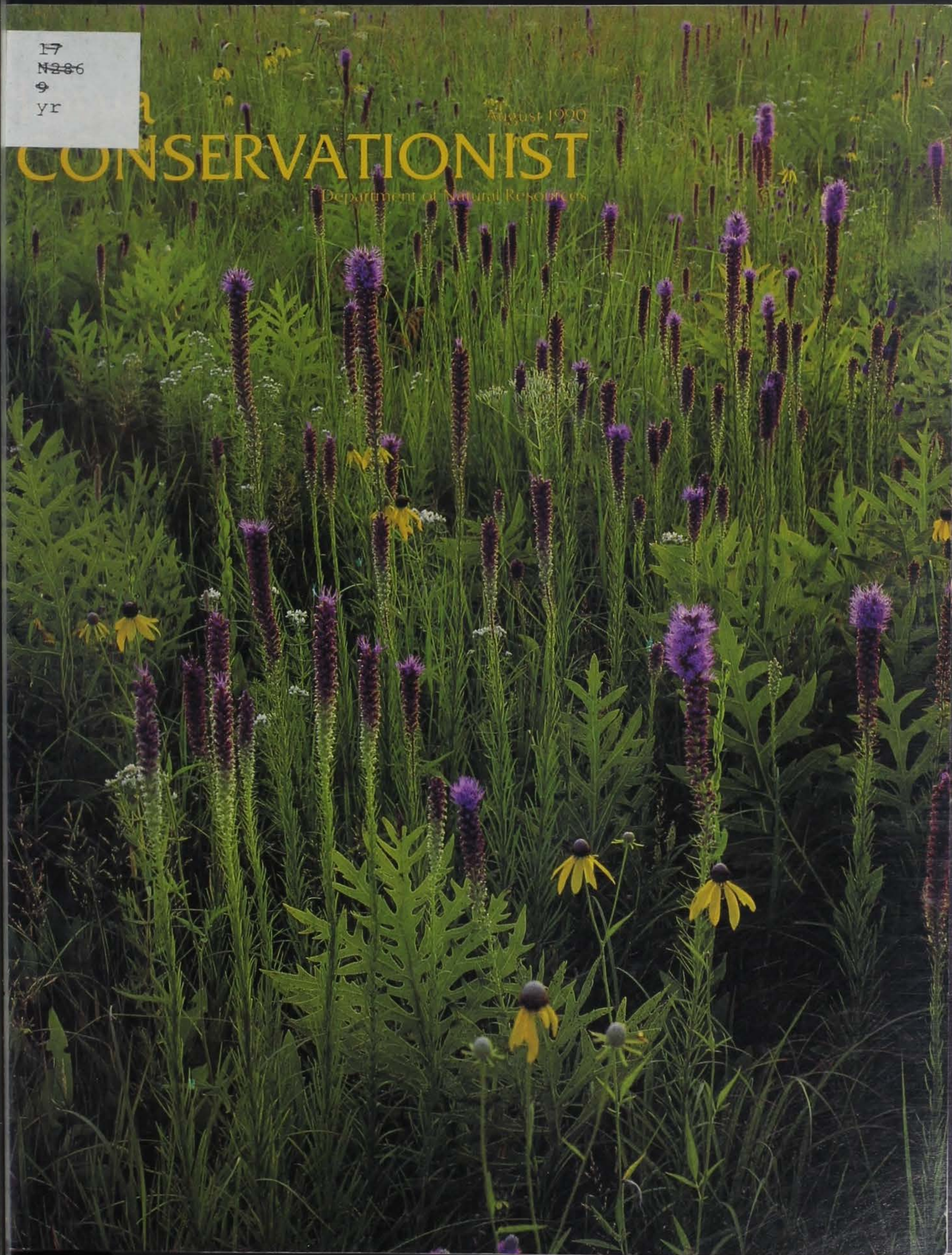


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COVERS: Front -- Iowa's tallgrass prairie -- celebrate it during Prairie Heritage Week, Sept. 9 - 15, 1990. Photo by Roger A. Hill. Back -- Great spangled fritillary butterfly. Photo by Ron Johnson.



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Hayden Prairie: An Iowa Jewel

Article by Mark J. Leoschke and Kay Klier

Photos by Mark J. Leoschke

Ada Hayden was a woman with a mission and \$100. The long-time botany professor from Iowa State University had watched the disappearance of the tall grass prairie in Iowa and had crusaded for years to buy good examples of prairie before it all went under the plow. Then, in 1944, the Iowa Academy of Science gave her a \$100 grant to locate the finest remaining examples of virgin prairie in the state.

A black-soil prairie about five miles west of the town of Lime Springs in Howard County ranked high on her list of prairie remnants she had visited. She recorded it as "an impressive sweep of rolling prairie . . . a colorful panorama of flowering plants occurs throughout the growing season."

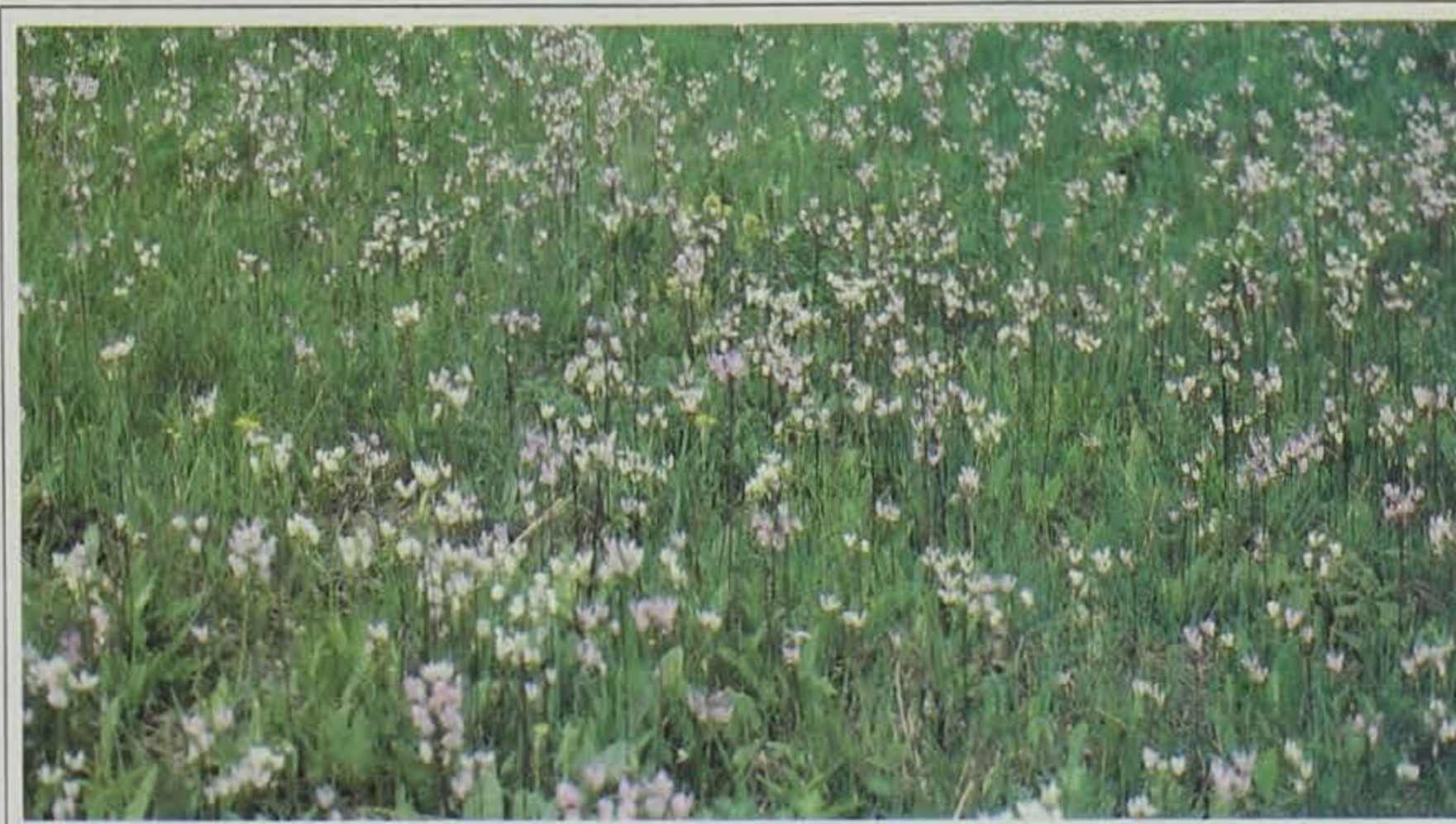
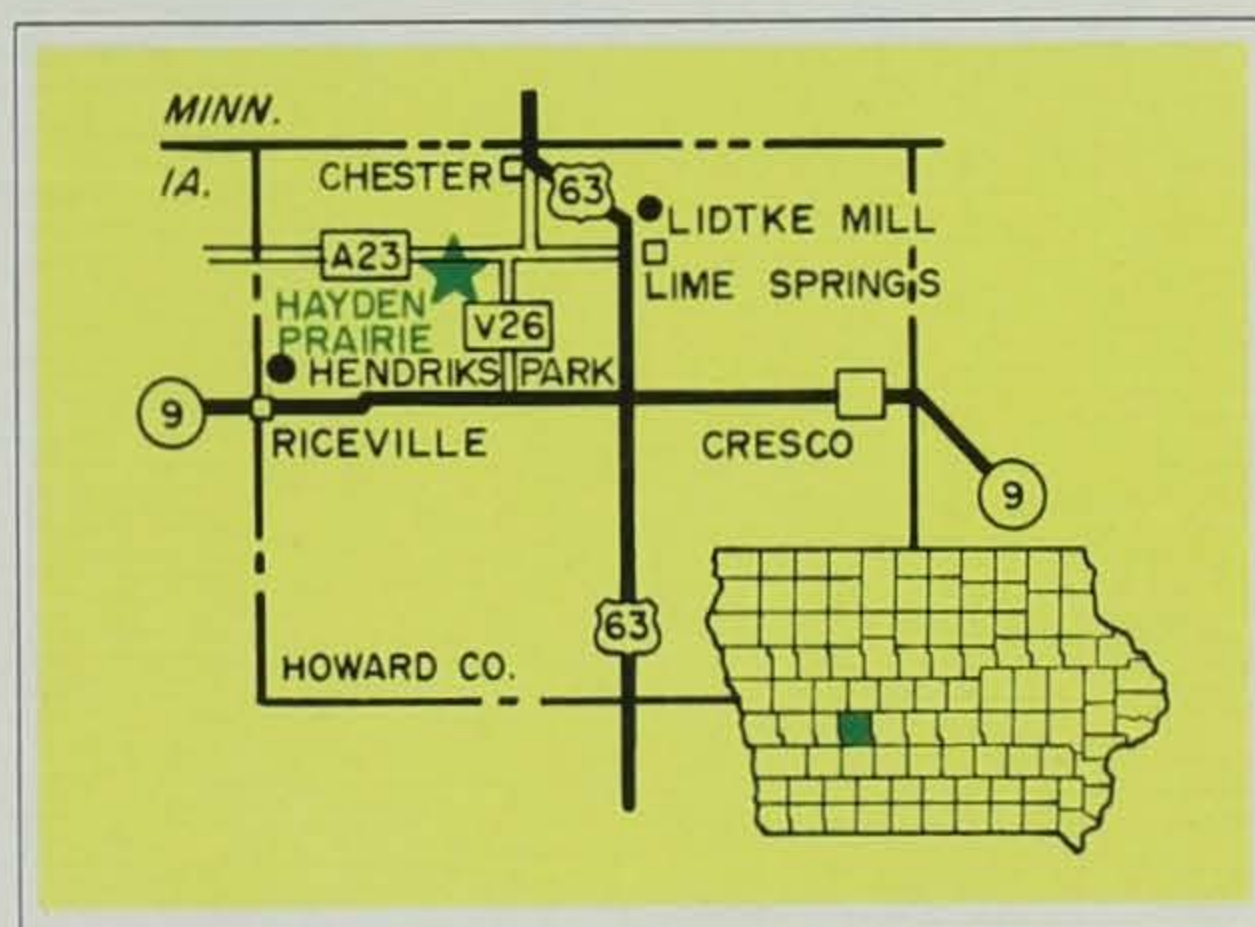
The 240-acre Lime Springs tract was purchased as a state wildlife area in 1945, and named in Dr. Hayden's honor after her death in 1950. It was the first large tract of prairie purchased by the state, and until the initiation of acquisition of the Loess Hills Wildlife Area in 1974, was the largest state-owned prairie. Hayden Prairie became a National Natural Landmark in 1966 and a state preserve in 1968.

Bordered on three sides by roads and surrounded by farm field, Hayden Prairie's many charms are easy to miss if one only drives by in a car. But if you are willing to pull off and walk out into the tall grass, you are sure to be regarded with glimpses of another Iowa, now nearly vanished and unrecoverable.

Watch the sedge wrens perched on last year's stems of big bluestem, bouncing in the breeze like kids on an amusement park ride. Search the long grass for the green twayblade, a small green orchid. Watch the northern harriers wheel endlessly over the prairie, hunting for a tasty lunch of vole or garter snake for their nestlings.

Hayden prairie is perhaps at its most spectacular in late May, when shooting stars and prairie smoke cast a

pink haze over the entire prairie. The cyclamen-like shooting star has clusters of large pink or white flowers borne on a 12-inch stalk, while the plumey, pink-tinged hairs of prairie smoke give it its common name. Redish-



Twayblade (top) and Hayden Prairie in late May (above).

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The prairie cup lily (bottom) may be found hidden beneath the big bluestem grass (above) in July.



purple flowers of prairie phlox, unfurling shepherds' crooks of yellow hoary puccoon flowers, white flowers of wild strawberry and the young stalks of wild indigo, which look remarkably like giant asparagus spears, help complete the scene.

If you wander into wetter portions of the prairie, you might find blue-flag iris or cottongrass, a sedge that looks like someone glued a cottonball to the tip of a grass stem. Look closely though, and you will see the "cotton" is actually fine hairs attached to the sedge's fruit, and like most sedges, the stem of the plant is triangular in cross-section, not round like a grass.

Throughout the spring walk on the prairie, you are likely to hear the incessant twitter of bobolinks, or the "witchity witchity witch" of the northern yellowthroat, a masked warbler that darts from shrub to shrub.

Just as pink and white are the predominant colors of spring prairie flowers, yellow and orange are the colors of summer and early fall. On a brilliantly clear July afternoon, the bluestem is shoulder high. The prairie may have been freshly washed by a previous night's storm, and as the grasses blow in the breeze, a shimmer of yellow and orange may be seen under the celadon blue of the grass. These yellow rays of the coneflower, and the orange and yellow butterfly milkweed are common. You may be fortunate to find the brilliant orange and black prairie cup lily, as well.

Later in the fall, you will see several species of goldenrod (falsely accused of being a hayfever plant), sneezeweed and sunflowers, all with brilliant yellow flowers, and low

among the prairie grasses, the intensely blue prairie gentian. In all, nearly 200 species of native plants are known from Hayden Prairie.

Like most Iowa prairies, Hayden was a hay meadow for about 80 years prior to the time of its purchase by the state. Haying a prairie keeps woody species like aspen and dogwood from growing to any size, and also produces excellent fodder — many early settlers swore by the nutritional value of prairie hay for draft horses in the winter. However, the breaks in the tight prairie sod that often occur when machinery is moved on a prairie can allow weed seeds from adjacent fields to grow and flourish. These weeds are considered a management problem. Like all management techniques, haying can change the relative proportions of species on a prairie as well. A plant that sets seed about the time that a prairie is usually hayed may become less abundant, because the seed never has a chance to ripen, while another species that sets seed before haying may become more abundant.

In 1971, after a study by Dr. Paul Christiansen of Cornell College, spring fire became the management technique of choice for Hayden Prairie. Fire, set by

lightning or Indians, was a natural component of the original prairie community. Fire topkills aspen and other woody invaders. It also reduces introduced plants from Europe and Asia, as they tend to appear earlier in the spring than most prairie species and so are more vulnerable to fire. A spring fire removes accumulated plant debris, allowing the exposed soil to warm up faster in the spring. As a result, many prairie plants flower earlier and produce more flowers than on adjacent unburned areas. This response is especially true for the major grasses on the prairie like big bluestem, Indian grass and northern dropseed.

In the last decade, Hayden Prairie has been home to two species of nesting raptors — the northern harrier and the less frequently seen short-eared owl. This ground-nesting owl exhibits some rather un-owl like behavior — it hunts during the day.

Hayden Prairie is also home to several species of reptiles and amphibians. One of the most interesting is the smooth green snake. Its olive-green skin blends well with the prairie vegetation while it hunts for soft-bodied insects and slugs. It is a fairly docile snake, rarely biting when held.

The preserve is home to more than 18 species of butterflies. Many more species will probably be found with further inventory work. One of the most interesting butterflies is the state-threatened silvery blue. The males are small and have iridescent blue wings, while the females are darker blue. The larvae produce a sugary secretion from special glands on their bodies. Ants relish this secretion and will sometimes "farm" the larvae, defending them from predators and moving the larvae underground at night.

Hayden Prairie is too small to support large mammals, so we will never again see a herd of flower-fed buffalo, although you may see an occasional deer. The prairie is home to pocket gophers, voles and an occasional jackrabbit. Hayden Prairie is a state wildlife area, so hunting is allowed in the fall, and the introduced ring-necked pheasant and Hungarian partridge are commonly pursued.

Many visitors to this prairie do not realize it is divided into two separate parcels. The 200-acre unit is the portion of the prairie most people enjoy. However, there is also a 40-acre unit of the prairie southwest of the larger tract; they are separated by a gravel road. This 40-acre unit has many of the same species of plants and animals.

Hayden Prairie is a day-use public area. There are no camping or picnicking areas, nor are there water fountains or rest rooms. Chester and Lime Springs are the closest towns. Lidtke Mill County Park northwest of Lime Springs and Lake Hendriks County Park north of Riceville provide camping facilities.

Ada Hayden had the pleasure of seeing "Howard County No. 1," as she called it, purchased for protection of its vanishing ecosystem. She did not live long enough to see it named after her, to become a state preserve, nor to attend the rededication of Hayden Prairie in 1988. Ada Hayden should be thanked for her devotion to saving the very best -- the jewel of Iowa's prairies.



Shooting star (top) and prairie smoke (above) create the pink haze over Hayden Prairie in late May.

Mark J. Leoschke is a botanist with the DNR's preserves and ecological services bureau.

Dr. Kay Klier is a professor of biology at the University of Northern Iowa in Cedar Falls.

Solar Appliances Embark on Consumer Markets

Article by Kristen Andrews and Ed Woolsey
Photos by Ron Johnson

After 20 years of anticipation, the promise of solar technology is becoming a reality in conventional consumer markets. Solar devices that convert the sun's rays into electricity are not limited to the huge panels seen on innovative residences anymore.

Consumers accustomed to plugging equipment into electrical outlets or constantly putting batteries into appliances will welcome the money-saving solar applications. Shoppers may find the solar equivalents for such everyday items as yard lights, calculators and security lights as nearby as the local hardware store.

Not only are solar products becoming price competitive with their electric and battery-powered counterparts, solar devices are often easier to install than electrical devices. The solar security light, for example, can be installed in remote areas without the hassles of wiring, extension cords or constant battery changes.

Convenience and energy savings are not the only benefits of solar-powered -- photovoltaic -- devices. Disposable batteries corrode and contaminate landfills by leaching heavy metals into the ground and eventually into the water. Even more environmentally hazardous are the toxins emitted by battery incinerators.

Solar products use recharge-



Solar products can save money and conserve energy. This solar-powered battery charger reduces the number of throw-away batteries and can cut battery costs from nine cents per hour to one-tenth of a cent per hour.

able batteries that last for years. Infrequent replacement drastically cuts the number of spent batteries sent to landfills, incinerators and recycling operations.

How do solar-powered products work? Most photovoltaics work on a similar premise. Solar cells are exposed to the sun and capture its rays. These rays are converted into electricity and stored in a battery. The electricity is then utilized either on demand or, in the case of some lights, is activated at dusk by an automatic on/off switch called a photosensor.

Listed below are a few solar products available in local retail stores.

Solar-powered yard lights

These are the energy-efficient alternatives to electric yard lighting. The lights require no wiring and are easy to install -- simply push the stake into the ground and let the sun do the work. Most solar yard lights burn for about five hours a night. Light bulbs need to be changed about once a year and batteries need to

be changed about once every five years. Most brands offer the photosensor feature which automatically turns the lights on at dusk. Solar yard lights range in price from \$30 to \$80 at discount and department stores.

Solar-powered security light

The solar security light is similar to the yard light, only larger in scale with more illumination. Most of the lamps provide from four to six hours of light per night and some come with the photosensor feature. Many solar security devices today are equipped with motion detectors that automatically turn the light on when moving objects come within 40 feet. Solar security lights range in price from \$30 to \$400 at farm supply stores and discount stores.

Solar-powered battery charger

Solar battery chargers reduce the number of throw-away batteries and



Some solar products available for purchase include yard lights (left), calculator (below) and fence charger (bottom).



save energy. The chargers use rechargeable nickel-cadmium -- *nicad* -- batteries and can cut battery costs from nine cents per hour to one-tenth of a cent per hour. Most solar chargers charge batteries from AA to D and some chargers are made especially for button batteries used in hearing aids, cameras, calculators and watches. The solar chargers range in price from \$15 to \$30 at hardware stores.

Solar-powered fence charger

The solar fence charger's principal feature is the absence of complicated wiring. A photovoltaic panel and a rechargeable battery allow the chargers to operate for 15 to 21 days without sun and most carry a charge for 10 to 25 miles. Solar chargers range in price from \$145 to \$185 at farm supply stores.



Solar-powered calculators

The major reason to choose solar-powered calculators over the regular battery-powered ones is the landfill problem. Solar-powered calculators with memory -- those that do not need direct light to operate -- utilize rechargeable batteries. Solar calculators without memory do not need a battery at all and can be used in normal work-room lighting conditions. The calculators range in price from \$4 to \$40 at discount stores.

Where to purchase solar products . . .

In addition to the stores mentioned, several companies sell solar products through specialty catalogs. These catalogs are available to consumers upon request.

Real Goods
966 Mazzoni St.
Ukiah, CA 95482

Seventh Generation
10 Farrell St.
S. Burlington, VT 05403

Backwoods Solar Systems
8530 Rapid Lighting Creek Rd.
Sandpoint, ID 83864



PV Made in Iowa

Consumers may have the opportunity to buy solar products made in Iowa in the not so distant future. Researchers at the Iowa State University Microelectronics Research Center, in a joint effort with 3M Corporation, have developed flexible solar cells on lightweight plastic film.

This innovative technology will provide a more versatile and inexpensive means of utilizing solar rays than solar cells covered with glass plating. The film is unique in that the solar cells do not break. They can be rolled, folded, wrapped or shot full of holes and still perform.

The continuous rolls of thin film (up to 14 inches wide) are flexible enough to wrap around curved surfaces and can be cut to fit a variety of applications requiring portable electric power.

One proposal for thin film technology is to use panels covered with the film to provide backup power for utility companies during the peak summer usage periods. The panels could be installed on hillsides to capture the sun's rays and meet air conditioning demands on hot summer days.

Researchers and 3M hope pilot manufacturing for the material will be in operation within two years. A clean alternative to declining fossil fuel resources, solar film has the potential to power anything from portable radios to space vehicles.

Compact solar panels

Homes equipped with solar power panels are becoming a familiar sight but what many consumers don't know is that there are also compact portable solar panels available. These photovoltaic panels have the capability

to charge cars, boats, power radios, small televisions and computers. They are 3/8- to 1/4-inch thick, are lightweight and easy to stow. The car and boat panels range in price from \$65 to \$345 and the small appliance panels range from \$60 to \$200 in specialty catalogs.

Solar experiments

There are several experiment kits on the market now to heighten understanding of sun power. Fun for both kids and adults, the experiments range from sun engine turbine kits to solar burglar alarms. Kits are priced from \$5 to \$40 at stores that feature educational toys.

Solar For Fun

Solar cap with built-in fan

The panel on the top of this cap (right) actually uses the sun's rays to keep the wearer cool. The miniature fan on the bill blows a breeze onto the forehead as the day heats up. And if the wearer is caught sweating in the shade, they can turn on the AA battery pack -- the fan can be activated by an on-off switch. The cap is available for about \$29 in specialty catalogs.

Solar bait bucket

Solar panels built into the lid of this unique bait bucket will keep the aerator pumping for as long as the sun keeps shining. The solar panels will also maintain the D battery for cloudy days and moonlight fishing. The bucket sells for about \$50 in specialty catalogs.

Future of solar products

Presently most solar distributors remain at the grassroots level and target a small market of individuals. These small-scale businesses hope to have a trickle-up effect on corporate utilization of solar power, but need conscientious consumers' dollars to remain viable. Solar experts forecast that as the manufactured number of the photovoltaics grow, the price will come down, and as the price comes down, the range of uses for solar products will grow.

Experts at the Solar Energy



Solar-powered cap

Research Institution (SERI) in Golden, Colorado, predict the cost of photovoltaic electricity will go down in the future and will be comparatively lower than conventional electricity in the late 1990s. Currently Americans are paying between 25-30 cents per kilowatt-hour (Kwh) for large-scale photovoltaic electricity and nine cents per Kwh for conventional electricity. SERI forecasts that by the year 2000 the cost of large-scale photovoltaic power will be six cents per Kwh.

Solar applications consumers can expect to see in the future include laptop computers, automobile interior cooling systems, cellular telephones, portable radios, CD players and household power tools. Solar cell panels will be installed on the outside walls of buildings and connect to inside sockets for appliance charge ups.

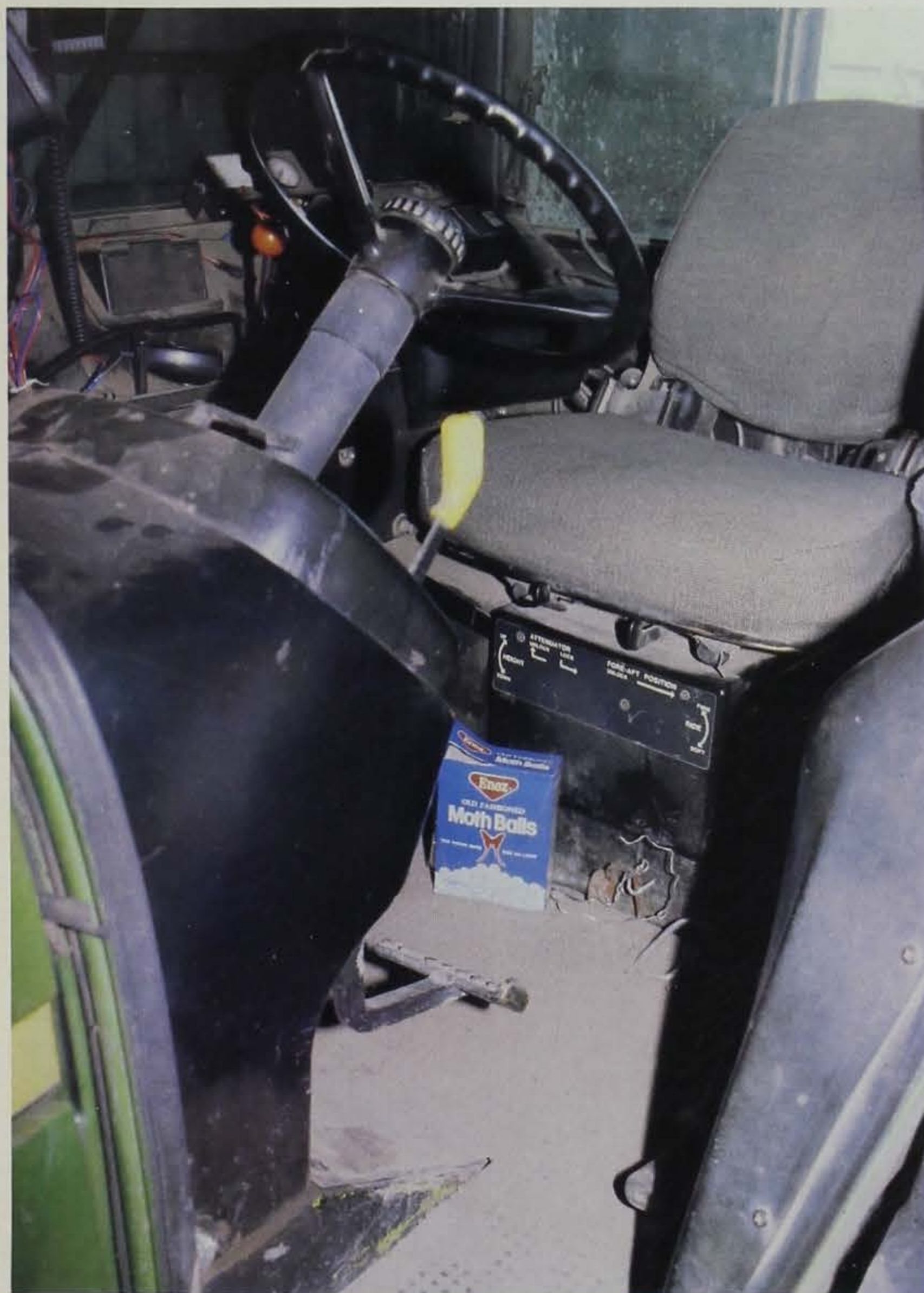
The sun's energy is free, inexhaustable and easy to tap. It does not contribute to smog, acid rain or the greenhouse effect, and does not produce radioactive waste.

Kristen Andrews is an information intern for the department's energy bureau in Des Moines.

Ed Woolsey is an environmental specialist with the department's energy bureau in Des Moines.

Heed the Warnings

Are we, as consumers, becoming oblivious to the warnings placed on household hazardous products? Maybe we need to take a closer look at these labels. What exactly are household hazardous materials and what precautions should we take with them?



A farmer planting his field and working long hours every day for two weeks felt nauseous and had a headache the entire time. He decided he had a virus or a "touch of the flu." He attended a toxic cleanup day event in his county, and noticed mothballs in the hazardous waste pile. He visited with a Department of Natural Resources staff person and found that mothballs are poisonous. He then realized what had been causing his health problems. He had put mothballs in the cab of his tractor to ward off mice. He was breathing poisonous fumes from the mothballs during the long stretches he was in his tractor cab. He decided he needed to look at alternative choices for dealing with mice in his cab -- possibly mousetraps or nontoxic glue traps.

• • •

Article by
Marilyn Krogulski
Photos by Ron Johnson

COMMON EXAMPLES OF HOUSEHOLD HAZARDOUS WASTE

Paint and Solvents

Oil-based paints, aerosol paints, paint thinners, paint strippers, boat bottom paints, varnishes, furniture refinishing products, furniture polishes, metal polishes.

Auto Care Products

Engine cleaner, motor oil, tar remover, antifreeze, gasoline, lead-acid batteries, gasoline additives, transmission fluid, engine lubricants, car waxes, windshield wiper solution.

Cleaners

Degreasers, spot removers, rug cleaners, disinfectants, toilet cleaners, oven cleaners, drain cleaners, septic tank cleaners, floor waxes, spray dust cleaners.

Pesticides

Pest strips, insect repellants, flea and tick products, ant and roach powder, rat poison, slug bait, moth balls, yard and garden sprays, herbicides, fungicides.

Miscellaneous Items

Lighter fluids, pool chemicals, photo chemicals, chemistry sets, old fire extinguishers, old medicines, fertilizers, wood preservatives, batteries, shoe polishes, most glues and adhesives, self-lighting charcoal, charcoal lighter, butane lighters, all aerosols (except personal care products).



A child recieved a precious gift of a puppy one birthday morning. Two days later the puppy was dead. What happened? Did the puppy have some defect? Was it diseased? Sad to say, the reason the puppy died was because it discovered a puddle of antifreeze in the driveway. Antifreeze is sweet-tasting and poisonous. A minute amount is fatal. Small children, pets and wildlife find it attractive. It was not until one of the family members picked up a Home Sweet Hazards brochure and read about antifreeze that the mystery was solved.

• • •

A voluteer cook at a fund-raising pancake breakfast kept liberally spraying cooking oil on his grill in between batches of pancakes. This produced a generous cloud of fumes in his cooking area. He soon collapsed and was taken to the hospital and given the care he needed. The fumes from aerosol cooking sprays can be fatal. The can states this information on the label. However, the tendency is to make an assumption of safety and not read the label -- especially with a food product.

• • •

If we pluck it off the shelf at our local store, it surely can not be dangerous. If it is a household product, we can skip the step of reading the information on the label. It is easy to fall into this mode of thinking.

Recognizing household hazardous materials and reading labels is important. Many tragic incidents could be prevented with an informed approach to household products.

Any product which has a "signal" work such as *danger*, *warning* or *caution* on the label is considered to be a hazardous material. We need to read and heed these messages.

Signal words for pesticides are designated by the Environmental Protection Agency. They include the words *caution*, *warning* and *danger* and refer to the toxicity and/or eye or skin irritation potential of the product. These pesticide signal words can be interpreted in the following ways:

Danger (poison) -- a few drops to one teaspoon will kill an average person.

Warning -- one teaspoon to one ounce will kill the average person.

Caution -- it will take more than one ounce to kill the average person.

Any pesticide product with one of these signal words is required to have a first aid statement. Many times a company telephone number will appear on the label to use in an emergency or for more information.

Nonpesticide products contain similar signal words and they generally refer to the toxicity, flammability or corrosiveness of the product.

Nontoxic is a term intended to indicate the product will not have any harmful effects on humans. However, caution is still advised. A product labeled nontoxic would probably be a better environmental choice but, as with all products, check the label carefully prior to purchase.

Household hazardous materials should never be poured in the sink, flushed down the toilet, dumped in a storm drain, put in the septic tank or thrown in the trash. Most labels will contain information concerning correct use, storage and disposal.

The Household Hazardous Materials Program of the Department of Natural Resources was developed to help consumers become aware of toxic household products which can cause problems due to improper use, storage or disposal. Improper use of these products can endanger the health and safety of people, pets and wildlife. And improper disposal can pollute groundwater -- the major source of Iowa's drinking water -- as well as our lakes, rivers and streams.

State law mandates Household Hazardous Materials stickers be displayed on shelves under products which contain toxic substances, and HHM consumer awareness posters are to be displayed in areas selling large numbers of household hazardous materials. *Home Sweet Hazards*

brochures are available from retailers to inform consumers about these substances.

In addition, the DNR has available, for \$1.25, a *Household Hazardous Waste Wheel*, a convenient reference to hazardous material information and safe alternatives.

The Household Hazardous Materials Program also coordinates toxic cleanup days, each year, around the state. Individuals are asked to properly store hazardous materials until a local toxic cleanup day when they can bring them in for proper disposal.

Take time to read labels on products. You are in control of safeguarding the health of your family and you can help protect our environment. Call the Ground Water Protection Hotline -- 1-800-532-1114 -- if you have questions regarding a household hazardous material.



Watch for bright yellow stickers, with this image, on retail shelves containing household hazardous materials.

Marilyn Krogulski is a planner for the department's household hazardous materials program in Des Moines.

EIGHT SIMPLE STEPS CAN HELP MAKE A DIFFERENCE

1. Choose a safer alternative whenever possible. For example, use cedar chips instead of mothballs when storing clothing.
2. Buy only the amount needed and use what you buy.
3. Read labels carefully and follow instructions for use and disposal.
4. Reuse. For example, let used paint thinner particles settle out, pour off the liquid and use the thinner again. Dry out the solid particles and dispose of them in the trash.
5. Share usable leftovers with others.
6. Safely store unused products in the original containers in an area away from children and pets.
7. Properly dispose of hazardous waste. Attend a toxic cleanup day in your area.
8. Let manufacturers and retailers know you want products which are environmentally safe. Make sure they comply with Iowa's law requiring them to display the HHM stickers and posters.

Iowa Aquifers

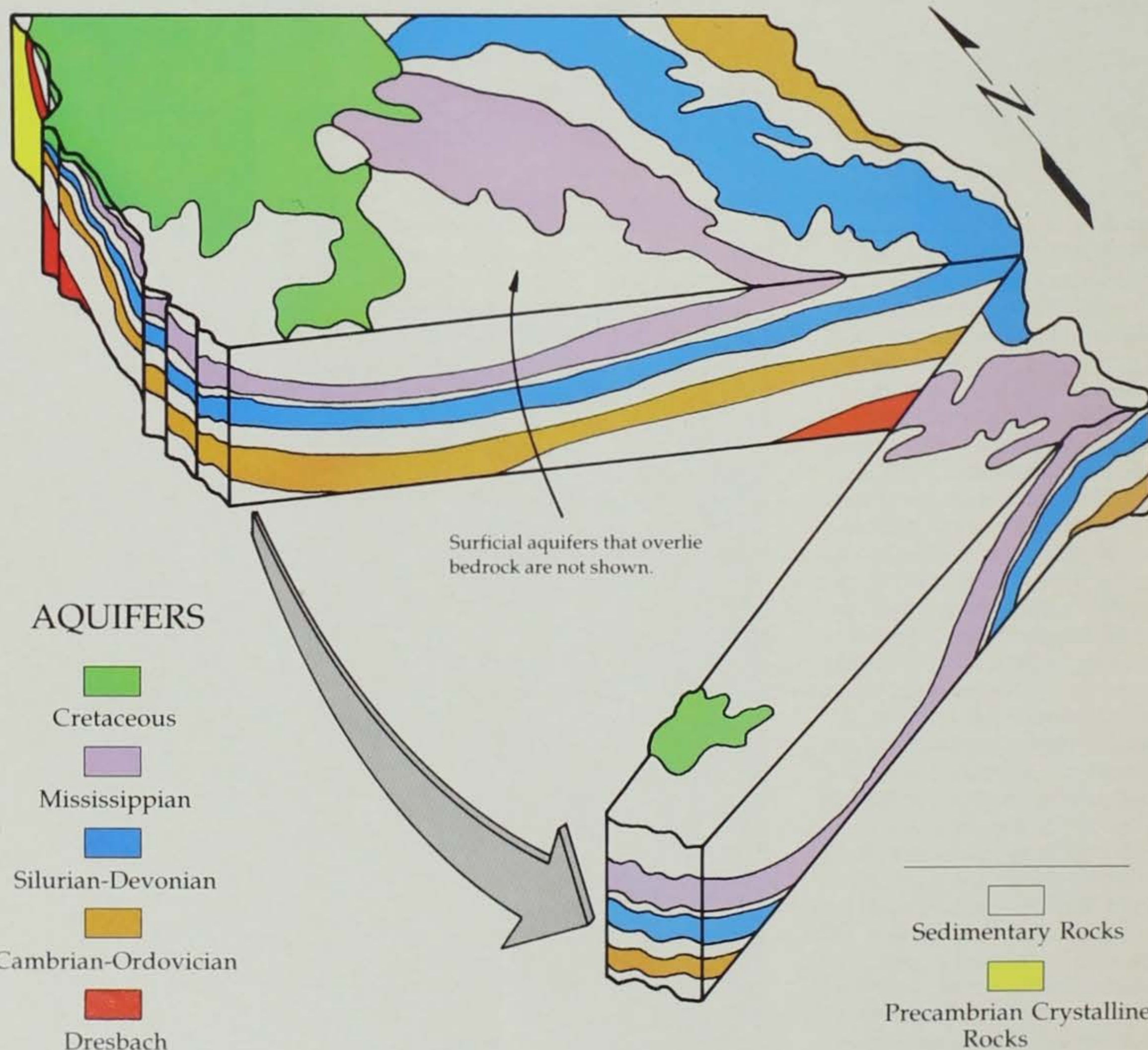
THE LAST WATER SUPPLY

by Joe Wilkinson

Rich farmland, rolling landscapes, river bluffs and varied lakes and streams. They all help define the topography of Iowa . . . now. Through hundreds of millions of years past, though, the region that would someday be called Iowa has worn many geologic cloaks; shallow tropical seas, continental ice sheets up to two miles thick, coastal swamps, cold tundras. Each of these prehistoric episodes played a role in depositing the varied layers of rock -- limestone, sandstone, shale, coal and the unconsolidated soil materials such as clay, silt, sand and gravel which support Iowa's landscape. The materials also function as containers for ground-water -- aquifers.

Simply put, our aquifers are layers of water-bearing rock and glacial deposits which lie between the land surface and the pre-Cambrian age 'basement' rock which is dated at nearly two billion years of age. In earlier times, underground water was pictured by most

Consolidated Aquifers



people as vast subterranean lakes, underground rivers or "veins." Today, through study of rock cores from wells and other geologic evidence, we see that these underground reservoirs are vast layers of sandstone, limestone and dolostone. Others are ancient, buried-bedrock valleys filled with sand and gravel or deposits (alluvium) associated with modern-day streams. These rock formations contain trillions of gallons of water in their pores, fractures, joints and cavities. When tapped by wells, they yield water for our consumption, cleansing, recreation, industry, irrigation and other demands.

In Iowa, about 18 percent of the total water used comes from underground sources. This amounts to about 277 billion gallons per year. Approximately 80

percent of us rely on groundwater for our drinking water. As with most other resources, water is taken for granted by many of us until drought, contamination or some other crisis shakes us. It is at this point that we, perhaps, find ourselves now. Even with a spring and summer of heavy rainfall, we keenly remember two years of drought in Iowa. We want answers about where our water originates, the quality of that water, the availability of it and the cost to obtain it in the years to come.

Iowa's aquifers fall into two broad categories -- *local aquifers* which generally have areas comprising a few counties or less and *regional aquifers*, which underlie large portions of the state and which are associated with major bedrock layers.

Unconsolidated aquifers, lying close to the surface, are large beds of gravel, sand and silt deposited over the last two million years. Beneath these sediments are bedrock -- layers of limestone, dolostone, sandstone, shale and others. The major bedrock, or *consolidated aquifers*, of the state are named according to the geologic age of the rocks which form them. The most significant are the Cretaceous (also referred to as the Dakota), the Mississippian, the Silurian-Devonian, the Cambro-Ordovician and the Dresbach.

As shown in the diagram at left, the bedrock aquifers are generally inclined from the southwest to the northeast across Iowa. This incline and the banding



pattern that appear have developed over geologic time through down-warping, erosion and glacial activity. This explains how Cambro-Ordovician rocks, for instance, are exposed at the surface in the bluffs of the Mississippi River in northeast Iowa, yet are buried more than 3,000 feet below the land surface in southwest Iowa.

Unconsolidated Aquifers

Relative newcomers in the groundwater picture, *alluvial*, *drift* and *buried-channel aquifers*, lie close to the surface.

Though they do not cover the area of most bedrock aquifers, these 'Quaternary' aquifers are easier to tap for their groundwater. They played a vital role in yielding needed water supplies before advances in drilling allowed us to tap into

deep bedrock aquifers. Many communities, especially those along major Iowa rivers, rely on them for all or part of their needs. *Alluvial aquifers* consist of the sands and gravels that have accumulated in the beds of rivers throughout the state. Because of their size, the Mississippi and Missouri rivers' aquifers can yield more than 500 gallons a minute. Significant stretches of the Iowa, Des Moines, Little Sioux and Floyd rivers yield from 100 to 500 gallons per minute. Most other areas fall below that. Water quality from these alluvial aquifers is generally very good, although human activity and resulting contamination can sometimes foul these close-to-the-surface supplies. The "human factor" has been noted over the last 10 to 20 years, as chemicals and nitrates have been monitored more readily, especially in shallower wells.

Water availability is affected, too, by the precipitation falling near stream beds. Those variables affect glacial *drift aquifers*, also. Wells drilled in drift areas are shallower, and cheaper, but more readily impacted by surface contamination and dry conditions. It was many of these wells which "went dry" over the last two summers as a lack of rainfall and runoff failed to recharge the area with water.

Beneath glacial drift in some areas of Iowa, especially in the eastern section, are *buried-channel aquifers*. These ancient stream beds have filled with sand, silt and gravel of more recent geological events, such as

glacier movements. Water yields from these sources vary. Localized yields of 500 to 600 gallons per minute have been seen. More often, though, yields range between 50 and 300 gallons each minute. Because they are deeper than alluvial and drift aquifers, these buried channels are not so susceptible to surface contamination. On the other hand, undesirable elements such as dissolved solids and iron concentrations can be high.

Consolidated Aquifers

Iowa's bedrock tells a tale of prehistoric seas covering its land, often for tens of millions of years at a time. As the seas receded, they left sediment deposits -- evidence of marine life which crawled on the sea bottoms or swam in the waters above. Different geologic ages left behind distinct layers. Over time, they evolved into the sandstones, carbonate rocks, shales, gypsum and chert which we find today. Why isn't there just one giant bedrock aquifer? The placement of water-resistant formations such as shales created a blocking effect between the more permeable layers of sandstones, limestones and dolostones. These blocking layers, called aquitards or aquicludes, helped establish the relatively distinct aquifer boundaries we can identify.

Cretaceous -- Commonly called the Dakota aquifer, this unit primarily covers northwest Iowa. It is also the youngest of the bedrock units in Iowa. These sedimentary formations range from 85 to 100 million years in age. The Dakota is considered fairly shallow, with the top of the aquifer lying from 100 to 1,000 feet below the surface. Water quality varies, with dissolved solids levels considered good or acceptable through most of the aquifer. Still, one-third of the water has unacceptable levels of more than 1,500 milligrams per liter (mg/l) of solids. Water quality for other bedrock aquifers in northwest Iowa is generally considered unacceptable. Most areas rely on alluvial and drift aquifers, where water quality is considered good to fair.

Mississippian -- From about 320 to 360 million years ago, seas once again covered the land mass which would be Iowa. As these seas receded, they left deposits over an area stretching from the southeast up to the north-central region of Iowa and then west and south through the rest of the state. These formed rock units, generally 100 to 300 feet thick, but up to 600 feet in places. Water from this aquifer, named the Mississippian, is important to communities in north-central Iowa. Approximately 70 percent of the Mississippian aquifer water withdrawn in Iowa is used in communities such as Marshalltown, Iowa Falls and Eagle Grove. Municipal wells yield up to 50 gallons per minute. Generally, it is not considered a high-volume supplier. Water quality outside this north-central range is not considered very good, overall. Although acceptable in some other areas, high concentrations of dissolved solids ranging from 1,500 mg/l to 5,000 mg/l place it off limits for consumption by people or livestock. In comparison, the EPA considers water with dissolved solid levels above 500 mg/l unacceptable. It is no coincidence that many of the communities in Iowa which

"went dry" during parts of 1988 and 1989 sit atop the lower quality region of the Mississippian aquifer. Because of the undesirable water in the aquifers, wells in these areas tap the shallower alluvial and drift aquifers for their supply. Dry conditions pushed down the water tables, often below the bottoms of these wells.

Silurian-Devonian -- Continuing back through geological time, about 360 million to 420 million years ago, are aquifers created during the Devonian and Silurian periods. These water-bearing formations underlie about 90 percent of Iowa -- all but the northeast and northwest tips of the state. This band of rocks is up to 700 feet thick in southwest Iowa, but narrows to 200 to 400 feet in thickness in northern and eastern counties. In some areas, too, it is much less, due to erosion and other climatic factors. The most productive areas of the Silurian-Devonian aquifer are in the eastern and northern outcrop areas of the rock. About 80 percent of the water yielded by this aquifer comes from the regions. Overall, close to 200 municipal water systems in Iowa rely entirely or in part on the Silurian-Devonian. In this outcrop area, water quality is good, with dissolved solids usually well below the 500 mg/l standard set by the EPA. As the aquifer becomes more deeply buried in western and southern Iowa, the quality goes down with it. Dissolved solids in the range of 2,000 to 5,000 mg/l are found. Sulfate and sodium are problems. Before water is determined fit for consumption, treatment for other undesirables is common.

Cambro-Ordovician -- This aquifer was formed between 420 and 500 million years ago. It is often referred to by the specific rock unit which is tapped. For this reason, Jordan wells and St. Peter wells are common phrases, when referring to Cambro-Ordovician drillings. All but the dozen or so counties in the northwest corner of Iowa lie over the Cambro-Ordovician aquifer. Fair to high yields of water are consistent throughout. Thickness of the rock units vary, though the Jordan unit -- the major water-producing area -- runs from more than 100 feet thick in extreme northeast Iowa to a ribbon of thickness only 30 feet in the southwestern corner. Large-capacity water users depend heavily on the Jordan aquifer, with its yields ranging from 500 to 1,000 gallons per minute over much of its area. Yields of more than 2,000 gallons per minute have been recorded on occasion. Water quality is considered best, again, in the northeast range of the aquifer. As water migrates slowly to the south and west through the bedrock, mineralization which accompanies that movement gradually increases the dissolved solid levels to unacceptable levels. In the southwest quarter of Iowa, water from the Cambro-Ordovician aquifer is generally considered 100 percent unacceptable for consumption. A variety of minerals -- calcium, magnesium, sodium and sulfates -- team up to impart a bitter taste and laxative effect on any water which is pumped to the surface. Radium and iron are also present in objectionable amounts, unless removed through treatment.

Dresbach -- The "bottom layer" of aquifers in Iowa is a series of sandstone bands which comprise the Dresbach unit. In keeping with the downwarping of

Iowa bedrock, the Dresbach emerges in a couple of extreme northeast Iowa locations. By the time it gets to Page County in the southwest corner of the state, the top of this aquifer lies more than 3,500 feet below the surface. Yields of water from the Dresbach vary widely. Production is high in several eastern counties. A major portion of Dubuque's water comes from a well capable of providing 2,400 gallons per minute. In Clinton, an industrial well pumps up to 2,500 gallons per minute. A variety of other industrial and municipal wells supply water in the 700- to 1,600-gallon-per-minute range. Elsewhere, away from eastern Iowa, attempts to draw Dresbach water have failed. Low yields and high mineral content are among the shortcomings. Water quality varies from east to west, as well. High potassium, sodium, chloride and radium levels make Dresbach water undesirable in many locations.

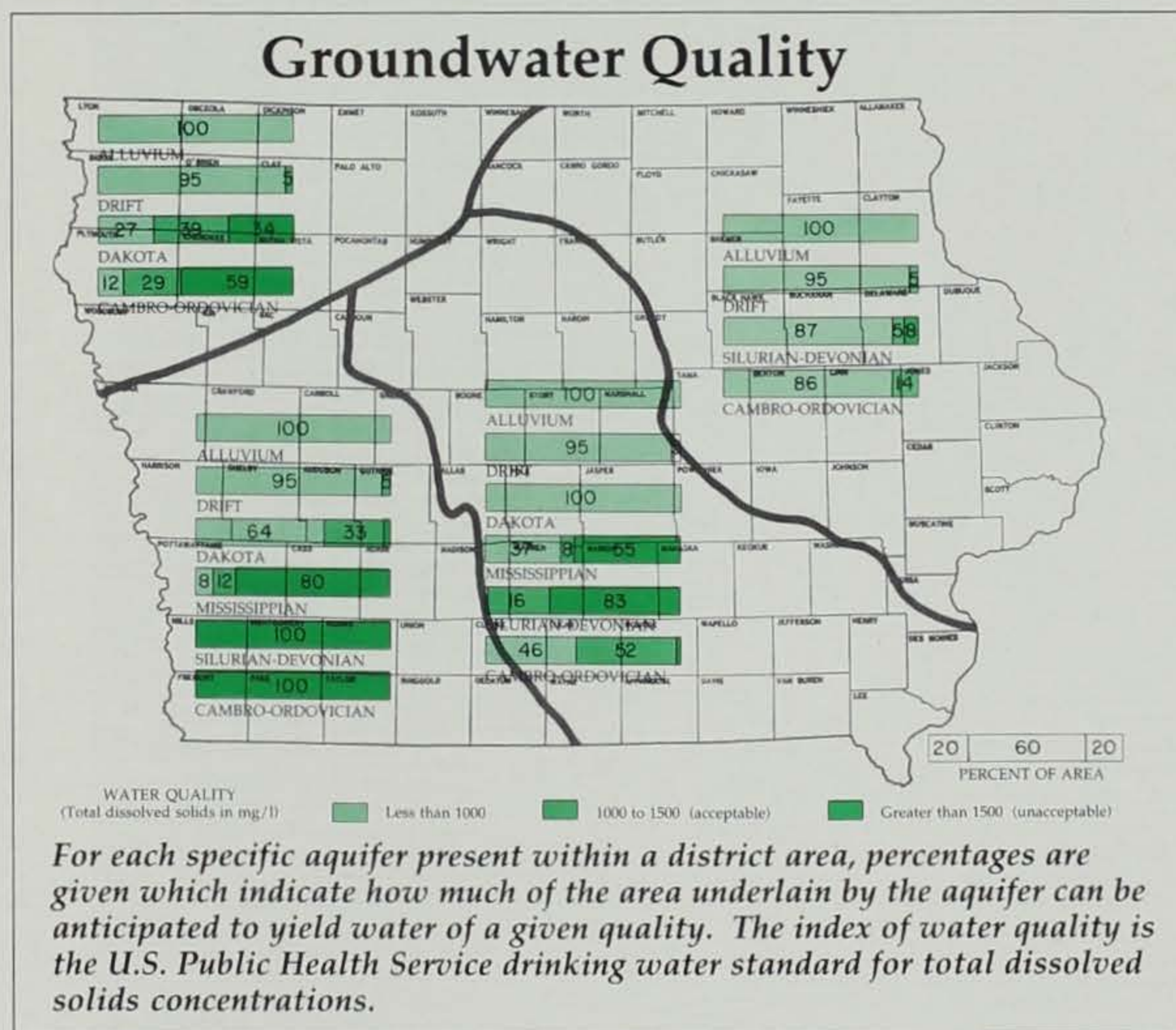
How Much Is Down There?

With drought fears in our very recent past and sure to rise again in Iowa, *quantity* does not pose a real problem when considering Iowa groundwater. Estimates set the groundwater reserve beneath Iowa at more than 100 million acre-feet. Availability, though, must be balanced with the quality of the water, the depth, cost to reach it and the location of the reservoirs.

Generally, northeast and east-central Iowa have good supplies of relatively easy-to-reach groundwater. In contrast, northwest and southwest Iowa sit atop relatively small pools of low quality, hard-to-reach bedrock groundwater supplies -- recall the down-warping which pushes these rock layers so deep beneath southern and western Iowa. Water slowly percolates through the soils, the aquifers and with some difficulty, the aquitards. The longer it takes to move, the longer it is exposed to mineralization. High levels of dissolved solids and the extreme depths in these regions make it impractical for individuals and communities to tap the aquifers for potable water. Water quality and economics put the water out of reach.

The recharging of aquifers beneath Iowa has captured the attention of geologists and other water experts in recent years. With political disputes over diversion of the Missouri River water supply and challenges to massive irrigation policies, the availability of water is becoming a key question to be answered. Problems are also being noted as increasing numbers of

wells draw down the static level of aquifers. As water is pumped from a well to the surface, it creates a drawdown of water in the vicinity. If this drawdown continues long enough, it interferes with other wells. A private well, for instance, which has functioned adequately for decades might suddenly "go dry" when newer, surrounding wells begin drawing water, too. Withdrawal of water over the rate at which an aquifer



is recharged is called *groundwater mining*. While not critical in 1990, it is an issue which will need to be addressed soon.

A late entry in the groundwater debate is human-induced contamination. For hundreds of millions of years these aquifers were untouched by human activity. Now, in the past one to two decades -- the blink of an eye in geological time -- we have begun finding nitrates, pesticides and other surface contaminants in our groundwater picture. They have been recognized and we are responding to the problem through action such as the 1987 Iowa Groundwater Protection Act. However, until these problems are eliminated, they are still another factor on the negative side of the groundwater ledger.

Where does your water originate? With a clearer picture of "what's down there," we will be able to separate the issues and perhaps influence the decisions about how to deal with our water supplies in the years to come.

Joe Wilkinson is an information specialist for the department in Iowa City.



How'd It Go?

IOWA'S FIRST YEAR OF NONRESIDENT DEER AND TURKEY LICENSES

I think we should!

Well, I think we shouldn't!

These two turkey hunters' views are obviously polarized. What topic could result in such disagreement? As it turns out, they are discussing the issue of nonresident turkey licenses. The reasoning and purpose of issuing nonresident turkey licenses has been discussed thoroughly (*Iowa Conservationist*, November 1987) and the DNR has already issued both fall 1989 and spring 1990 nonresident licenses, so the point of *why* is moot. Instead, we need to examine the development and impact, if any, of the new nonresident deer and turkey licenses.

Turkeys

The 1989 Iowa legislative session had significant ramifications for turkey hunters, both residents and nonresidents. The legislature passed the original version of the bill that called for the issuance of 500 nonresident turkey licenses in fall 1989. Nonresident turkey hunting zones were also set by the Legislature and required the nonresident zones to match resident deer zones, not resident turkey zones. However, the DNR apportioned the licenses among these hunting zones with regard to

Article by
DeWaine Jackson
and Willie Suchy
Photos by Roger A. Hill

anticipated demand, current resident hunter numbers and turkey densities. These 500 licenses were in addition to the quota of licenses already established for residents, thus no resident was deprived of a license because a nonresident received a license.

The bill was passed late in the legislative session and the license bureau issued licenses first come-first served.

Insufficient interest in fall turkey hunting and the late announcement of a nonresident season resulted in minimal requests for nonresident licenses. Only 157 licenses (of the 500 available) were issued to individuals from 13 states. Sixty-nine percent of those licenses were issued to residents of Minnesota and Wisconsin. A majority of the licenses issued were in nonresident Zone 9b (the northeast corner) — a not-so-surprising fact considering the preponderance of Minnesota and Wisconsin hunters.

Resident fall turkey hunters have had, at least the last few years, outstanding harvest success rates. Nearly one-half of the shotgun hunters who actually hunt have been harvesting a turkey for their Thanksgiving table. How did the nonresidents do in comparison to residents? Well, a higher percentage of nonresidents actually used their license than did residents (89 percent versus 75 percent, respectively) yet nonresidents were no more successful in harvesting a fall turkey. Last fall, nearly one-half of the resident hunters (49 percent) and nonresident hunters (48 percent) harvested a fall turkey, for a grand total of only 67 turkeys taken by nonresident hunters. The population impact of removing 67 turkeys distributed over nearly the entire state is not observable.

Ok, but what about spring hunting and nonresidents? Well, a similar nonresident season took place this spring. Due to technical provisions of the original bill that legally prohibited the DNR from issuing nonresident permits beyond fall 1989, the bill had to be amended. Because of delays in receiving the amended bill, the DNR had to wait before announcing the availability of licenses. Although the demand was expected to be much greater, only 231 nonresi-



dent licenses were issued (450 were available). These licenses were in addition to the resident quota already established, and no resident was denied a license because of a license issued to a nonresident. As in the fall season, a majority of the nonresident licenses were issued for zones in the northeast and south-central portions of Iowa. Although information is not yet available on spring turkey harvest, nonresidents probably harvested no more than 125 gobblers this spring. When compared to the annual harvest of more than 6,500 gobblers by resident hunters, 125 turkeys shot by nonresidents has essentially no impact on turkey populations or on resident hunter success.

The amended bill allows the DNR freedom to establish and regulate the issuance of nonresident licenses in accordance with population levels. Specifically, a total of 600 turkey licenses, including both spring and fall seasons, are to be available to nonresidents. License issuance is reciprocal to residents of states that allow Iowa residents to hunt turkeys, cost is fixed at \$50 (plus a \$5 habitat stamp) and the DNR

may establish the hunting zone boundaries and license quotas per zone. Considering the positive economic impacts of nonresident hunters to our small rural communities, the opportunities for our relatives to return and hunt with us, and the very minimal impact to the turkey population, we can resolve the argument of the two hunters at the beginning of the article by saying *I'm sure glad we finally allowed nonresident turkey hunting.*

Deer

Last season was also a significant one for a small number of nonresident deer hunters in Iowa. Like the turkey hunters described at the beginning of the article, some of Iowa's deer hunters also feared that nonresidents would overrun the state. Although understandable, that fear was probably not too rational. Even in states such as Missouri, nonresidents only make up about two percent of the total number of hunters. The bills passed by the Legislature strictly limited the number of nonresident hunters. In 1989 the numbers were 1,000 for deer, and in the future this

number will be increased to 1,200.

What impact did these hunters have on resident hunters and deer? Well, this question was posed to several groups of hunters, and most did not notice any nonresident deer hunters last fall. The few that did mentioned no major problems.

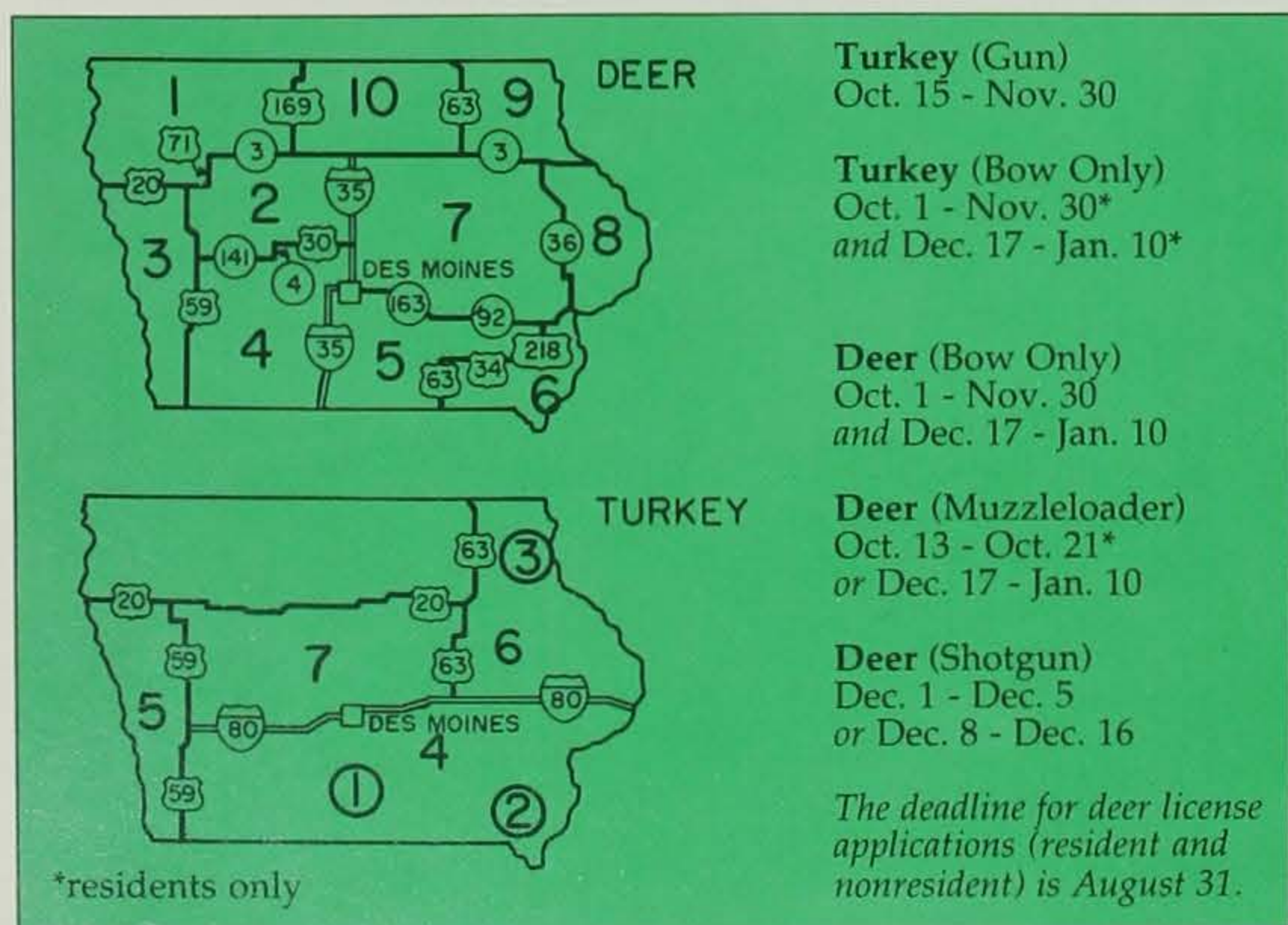
If we look at the results of the deer harvest survey, we see 70 percent of the nonresidents hunted with a resident Iowan — one reason why hunters did not notice the nonresident hunters. Results from the harvest survey also indicate these hunters were about as successful as resident hunters. The 701 nonresidents who hunted with a gun (either during the shotgun season or late muzzleloader season) harvested 397 deer for a 60 percent success rate. Of the 218 nonresidents who hunted with a bow, 58 reported bagging a deer. This translates to a 25 percent success rate.

What do nonresident deer hunters have to look forward to this year? The maximum number of licenses that can be issued is 1,200 divided between 10 management zones, with more licenses available for zones with more deer. Nonresidents will have to apply for a license by the August 31 deadline. Hunters can choose to hunt in the bow season, either shotgun season or the late muzzleloader season. Nonresidents will get licenses of the same type issued to residents (any-sex where residents get any-sex, buck-only where residents get buck-only). Nonresident archers and muzzleloader hunters are restricted to hunting in only the zone for which their license is purchased. No nonresident licenses are issued for the early muzzleloader season because this is a limited-quota hunt and residents normally use all of the available licenses.

DeWaine Jackson is a forest wildlife research biologist for the department in Boone.

Willie Suchy is a forest wildlife research biologist for the department in Chariton.

Deer and Turkey Zones and Seasons



WARDEN'S DIARY

You Make the Call by Chuck Humeston

"Come on man, can't you give me a break?"

"You're not going to write me a ticket are you?"

"Oh man, you're a @#%!"

It's called "officer discretion." Coming across a violation you have to make the decision. Do I file charges or do I give a warning? Many times it seems like the persons we deal with view officer discretion as, "You get the other guy if he breaks the law, but you give me a break."

Hunting and fishing are sports. The only person with a striped shirt to blow the whistle and call, "Foul!" is the conservation officer. While attending a basketball game and watching the referee take abuse, I thought, "Sir, I know how you feel. No decision you make is right, and it seems if you do give a break, many times your good deed does not go unpunished." But then I recalled a TV commercial I saw during a pro football game where a play is shown and then the action is stopped. The viewer, put in the place of the referee, is told, "You make the call." Penalty or no penalty?

I'd like to put you in our place now. You are going to be placed in actual situations. You make the decision. Violation or no violation? It makes no difference who the officers were or the action they took. It will now be up to you. The only help I can give you is to remind you that you have placed your left hand on the Bible, raised your right hand and vowed to uphold the laws of the State of Iowa, the United States and the constitution of both, without fear or favor. You will be required to have the patience of Job and the wisdom of Solomon. Good luck.

Opening day of goose season. You watch as a man near a road ditch shoots a goose before shooting hours. The ditch is lined with hunters. The man goes into a field to retrieve the goose leaving a young boy unattended. Another goose flies over. The young boy, age 12, hunter education graduate, raises his gun and fires, hitting the goose. As it tumbles out of the sky, he runs toward the goose yelling, "Daddy, Daddy, I got my first goose!" It is 10 minutes before opening. All eyes of the hunters are upon you. You make the call!

On a day off, you see a person of high-school age pulling a water skier without a required third person to observe. A dangerous situation. You stop him. The next day you arrive at his home to issue a citation. The young man is extremely cooperative. You hand him the citation to get a required signature. All of a sudden, his father explodes, "No, take him to jail. He's a dangerous criminal!" You explain the violation is a simple misdemeanor and ask for cooperation. "No, he won't sign it, I want you to take him to jail." You explain you wouldn't want your own son to go to jail if you were in his place. A disparaging remark is made about your own son. Do you arrest or walk away? You make the call!

You come upon an elderly man fishing at a gravel pit. You ask for a fishing license. The man tells you they took it away and he has to pass a driver's test to get it back. You say, "Not your driver's license,

your fishing license." He replies, "The D.O.T. took it away." You take out your own fishing license and explain the difference. He repeats, "I have to take a test to get it." You make the call!

You come home at night to find a man of Laotian nationality sitting in your driveway. He tells you, "Please do not arrest me, I do a terrible thing." His English is very poor. He was a colonel in the Laotian Army and was forced to flee his country. You know he has been trying hard to learn our laws, ways and culture. He takes you to a location where he had been pheasant hunting in season. In front of a group of pine trees he saw a pheasant fly into the trees. He shows you where, hearing a sound, he spun around and shot into the trees, thinking it was the pheasant. You look and see a deer lying dead from the shotgun pellets. The man is almost beside himself from his actions. You make the call!

A crestfallen hunter seeks you out at the marsh. He hands you a juvenile swan he has shot. Swans are protected. His license and stamps are all in order. There are several witnesses. He is apologetic, saying, "I know better. I've got it coming. I just looked up, thought 'goose' and bam!" You make the call!

I could go on. It's not always easy to make a decision that falls squarely on your shoulders only. You make the best decision you know how. Sometimes you go home still wrestling with it. You try to be firm but fair and to treat everyone equally as much as humanly possible. but you soon find . . . you can't please everyone.

CONSERVATION UPDATE

Pilot Polystyrene Recycling Program Slated For Central Iowa In August

by Kathryn Stangl, information specialist

A pilot polystyrene plastic recycling program is planned for Des Moines in mid-August. The project, sponsored by AMOCO Foam Products, will be a cooperative venture between city, state and private businesses.



The materials reclaimed by polystyrene recycling can be reused in making a wide variety of plastic products -- from flower pots and video cassette cases to children's toys and egg cartons.

"The program is slated to begin Aug. 15 with collection of polystyrene plastic materials from the capitol complex, two McDonalds, two Hardees, two Kentucky Fried Chickens, one Des Moines public school and a local recycler," said Jack Felmlee, issues management coordinator for AMOCO Foam Products, Chippewa Fall, Wisconsin. "AMOCO will supply equipment that can wash, dry and grind polystyrene material and

blow it into a container for shipping to an end user. We will also help the recycler market the material," he said.

The equipment being supplied by the company can process about 25 pounds of polystyrene plates, cups, food service clamshells and fast food containers in each batch. The machine, about the size of a soft drink machine, takes about an hour to complete a cycle. The amount of material it can process is equivalent to the amount of polystyrene material used in a busy fast-food restaurant in a day.

Participants in the program will have their patrons clean food materials from trays, empty ice and beverages from cups and deposit the materials into special trash receptacles. The city will transport the collected material from the participating location to Best Recycling in Des Moines where the processing will take place. Best Recycling will process the material and sell the recycled polystyrene material to a plastic manufacturer who will be able to use the material in manufacturing new products.

The pilot program is scheduled to continue until the spring of 1991. The recycler will have the option of expanding the amount of material that is collected and processed after the pilot is underway.

Already, many groups have expressed an interest in participating in the program by collecting

polystyrene material and bringing it to Best for recycling.

Polystyrene has come under attack from environmental groups. While there may be numerous claims against it, the primary problem with polystyrene is that it is a highly visible, non-deteriorating waste that occurs far too frequently as litter.

The Des Moines project is an attempt to demonstrate the benefits the material has when recycled. This is one of several projects in the Midwest to demonstrate the material can be economically recycled and made into usable products.

By Iowa law polystyrene in packaging and food service must be recycled. If 50 percent of this material is not recycled by 1994, the manufacture, use or sale of any polystyrene in Iowa will be prohibited.

Although recycling is one method of reducing solid waste, officials of the Department of Natural Resources prefer volume reduction at the source to recycling.

"Instead of recycling, it is preferable to use a durable item that can be reused over and over again so no waste is generated," said Teresa Hay, administrator of the DNR's Waste Management Authority Division. "It would be better to use cups, plates and glasses that get washed and reused rather than a disposable

item of any kind. Just because a material can technically be recycled, does not mean it is economically feasible or even desirable."

Common disposable items made from polystyrene are cups, plates, utensils and food containers. Most disposable replacements for these items are listed as "paper." However, most of these paper materials use virgin paper and encase the material in plastic. Encasing the material in plastic makes it impossible to recycle and means it must be landfilled. The materials reclaimed by polystyrene recycling can be reused in making a wide variety of plastic items from flower pots and video cassette cases to children's toys and egg cartons.

Food-grade polystyrene production causes very little damage to the earth's atmosphere. Molded products such as folding dinner trays and fast-food clamshells are manufactured with gases that have some effect on the ozone layer, but the materials called halogenated chlorofluorocarbons (HCFC) are 95 percent safer for the ozone layer than the chlorofluorocarbons (CFC) that had been used in the past. These CFCs are still heavily used in the electronics industry to clean delicate circuit boards.

The polystyrene industry is looking for an alternative gas to use in the production of these molded products and the

use of HCFCs is a temporary measure that should be phased out within the next five years.

The Des Moines project will help demonstrate that recycling works and that additional materials may be recycled in the future.

Tree Topping -- A Poor Substitute For Tree Pruning

The sight of topped trees is all too common in the yards and along the streets of Iowa communities. Tree topping is the severe cutting back or removal of almost all branches off maturing trees to allow them to sprout back or to control tree size. "Topping is the absolute worst action you can take for the health of your tree," said John Walkowiak, forestry projects coordinator with the Iowa Department of Natural Resources.

Trees are often topped because they interfere with utility wires, or simply grow so large they worry the landowner that they may fall on their home. In Des Moines and other communities hit by the ice storm in March, the topping of private homeowner trees is often considered a quick fix-up of a problem. Some people even believe that topped trees are nice to look at. However, research has proven that topping trees should be the last resort to correct problems, in fact tree



One of the best alternatives to tree topping is to use a long-standing practice known as drop crotch pruning. A qualified arborist can carefully prune a tree's branches away from powerlines or from hanging over someone's home.

removal is often more cost-effective. Topping of trees is only a temporary solution that creates large wounds that never seal over, thereby exposing internal wood to decay. The resulting sprouts after trees have been topped are weak and often unsightly.

Utility companies have been faced with the problem of trees growing into their powerlines for many years. Topping was considered the most economic alternative for most tree problems until recently, when it was discovered that topped trees require repeated treatment every three to five years to keep utility wires clear. In addition, vocal concern from homeowners against topping is influencing utility company officials to seek alternative pruning methods. One of the best alternatives to tree topping is to use several modifications of a long-standing utility trimming practice known as drop crotch pruning. A qualified arborist can

carefully prune a tree's branches away from powerlines or from hanging over someone's home. Today, more and more tree services who complete powerline maintenance contracts consider topping the last resort to correct a utility wire-tree problem.

The other best alternative that utility companies are actively pursuing to minimize tree topping, is long-term homeowner education on tree planting or tree species selection. Information is being made available by utility companies and others on how to properly plant trees away from utility wires or to plant trees whose mature height will be less than 25 to 30 feet tall.

If you have questions concerning proper tree selection and pruning, contact the Forests and Forestry Division, Iowa Department of Natural Resources, Wallace State Office Building, Des Moines, Iowa 50319-0034.

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:

- Sept. 6, Missouri Valley
- Oct. 3-4, Spencer
- Nov. 1, McGregor

Environmental Protection Commission:

- Aug. 20-21, Sioux City
- Sept. 17-18, Des Moines
- Oct. 15-16, Des Moines

State Preserves Advisory Board:

- Sept. 11, Des Moines

Weed Control Vital for New Tree Plantings

The abundant moisture and ideal temperatures Iowa has received this spring are not only good for trees, but also for plants that compete with trees such as weeds and grasses. Weeds compete with trees for moisture, nutrients, light and space. To have a successful tree planting in Iowa, weeds and other plant competition must be controlled, according to John Walkowiak, forestry projects coordinator with the Department of Natural Resources.

"Controlling weeds basically means keeping them from growing in a two- to four-foot zone around trees. This gives trees room to get properly established and to grow at their optimum rates," said Walkowiak. "Weed control in tree plantings can involve mechanical cultivation, herbicides, cover crops, mulching, mowing or a combination of these. What method you use to control weeds will depend upon the time of year, weeds present, type of trees or woody shrubs planted and the type of equipment you possess. Weed control will be necessary for the first three to five years."

For tree plantings with weed problems now, the best advice, according to Walkowiak, is to stake out tree rows and perform diligent mechanical cultivation or mowing between rows.

"The ideal time to control weeds is before planting your trees," said Walkowiak. "Several cultural, economic and environmentally safe techniques are now available to minimize weed problems in future tree plantings."

For more information on weed control, contact the Forests and

Tree Owners Should Be Aware of Potential for Oak Wilt

Oak wilt, a disease of red and white oaks, may pose a threat to landscape and woodland oaks in Iowa. However, according to officials with the Department of Natural Resources, tree owners should be aware that the disease can be handled through proper management.

"Oak wilt is a problem that can be handled through common sense management, whether pruning your oak in your front yard or cutting oak firewood from your woodlot," said John Walkowiak,

special projects forester for the DNR.

Oak wilt is caused by a fungus that invades the water-conducting tissues of oaks. First identified in Iowa during the 1950s, oak wilt spreads very slowly to neighboring oaks by either natural root grafts or by insects carrying the fungus to a new tree wound. Red oaks are more susceptible to oak wilt than white oaks.

The symptoms of oak wilt appear in late spring or early summer in Iowa. The leaves of infected trees turn a dull, bronze brown at the tips and leave a very sharp line of contrast between brown and green colors on the same leaf. The damage from anthracnose, a common disease of oaks and sycamores, is often confused with oak wilt. Trees with anthracnose show symptoms at the lower branches and will releaf by mid-summer. Oaks with oak wilt will never releaf, though white and bur oaks do successfully survive on their own, according to Walkowiak.

Although there is no cure for oak wilt, forest pathologists have proven that control strategies should be aimed at preventing the spread of oak wilt. The best and most economic methods that tree and woodlot owners

should do are to 1) avoid tree injury from pruning, grazing or logging during April 1 through July 1 and 2) remove infected trees.

"If tree owners are cautious and work around their oaks during minimal oak wilt potential, July 1 to March 30, the chances of spreading oak wilt will be minimal," said Walkowiak.

More information on oak wilt is available from county extension offices or from the Forests and Forestry Division, Iowa Department of Natural Resources, Wallace State Office Building, Des Moines, Iowa 50319-0034.

Club Mounts Hunters-Against- Hunger Campaign

The Safari Club International is asking 20 million U.S. hunters to share their game meat with the hungry and homeless by having it ground into two-pound packages of hamburger (at the hunter's expense) and donating it to local Salvation Army outlets.

According to representatives with the club, more than 50 tons of elk, deer, antelope, bison and other game has been donated to the program.

For more information on the campaign, contact the Safari Club International Headquarters, 4800 W. Gates Pass Rd., Tucson, AZ 85745.



Turkey Hunting Conference, Aug. 16-18

A conference entitled "Wild Turkeys, Hunters and Landowners in the Upper Midwest" will be held at the Radisson Hotel in LaCrosse, Wisconsin, Aug. 16-18.

The conference, designed for both professionals and the public, will provide a "state of the art" description of both human and biological aspects of turkey management. Conference organizers hope to define and clarify issues and stimulate communication among the diverse groups attending.

"A major aim of the conference is to develop and improve relationships and good will between landowners and turkey hunters," said University of Wisconsin-LaCrosse psychology professor Bob Jackson, conference coordinator. Another aim is to identify significant problems

and then develop solutions for them. The conference will provide extensive small group interaction in all sessions.

For more information on the conference, contact Regional and Environmental Studies, Robert M. Jackson, coordinator, University of Wisconsin-LaCrosse, 1725 State St., LaCrosse, WI 54601, (608)785-8625.

Climbing Accident at Maquoketa Caves Re-Created For Television Series

A rock climbing accident that occurred at Maquoketa Caves State Park in August 1988 will be featured this fall on the CBS television series "Rescue 911."

Val Svetich of Davenport was rock climbing with Kevin Poltzin when the limestone gave way, causing her to fall 23 feet onto a trail below.

Svetich lost her left leg as a result of the accident.

The climbing incident was recreated last month for "Rescue 911," a weekly docudrama series in which real-life rescues are recreated, using many of the actual people involved.

Only Japan and the Netherlands collect more than half their aluminum, paper and glass for recycling. In effect, these two countries require no raw materials for making paper and glass one year out of two.

New Paper Stock For Conservationist

Effective with this issue, the *Iowa Conservationist* is being printed on Pentair recycled paper stock from Niagra Paper Corporation, Niagra, Wisconsin.

For the past year, we had been using another brand of recycled paper, Save-A-Source, produced by Watervliet Paper, a mill in Watervliet, Michigan. In June, the company that owns Watervliet Paper, Kapaco Group, Inc., filed for federal Chapter 11, bankruptcy, and consequently closed the mill.

Pentair paper meets the Department of Natural Resources' definition of recycled paper by using at least 10 percent post-consumer wastepaper.

COUNTY CONSERVATION BOARD FEATURE

Littlefield Discovered by Chuck Corell

"Daddy, I'm hungry. When are we going to eat lunch?" It seemed like Dave's six-year-old stomach was never satisfied.

His sister Tracy had seen a sign pointing out a county park for the next exit off Interstate 80. "How about eating our sandwiches in a park, Mom? There's one at this exit." Ever since their first family camping trip last summer, Tracy couldn't get enough of the outdoors. She especially enjoyed seeing deer, pheasants and other wildlife.

"Sounds great."

Dad pulled the station wagon off the westbound lane and stopped. He pointed to a brown sign with an arrowhead along the road -- Littlefield Recreation Area, Audubon County Conservation Board. "It's only six miles off the interstate. Why don't we check it out?"

Hearing no arguments, Dad turned the car around and headed toward Littlefield. The county highway took them through the hills pushed up by the southern-most edge of the last glacier. Thousands of years of erosion hadn't whittled away at the hills very much, but time had cut the valleys and draws deeper. This seemed to lift the hills even higher.

On the ridge tops, the family could look out over the fields of corn and soybeans, green pastures and patches of oak and hickory forests. In the swales, they could trace the grassy draws down to small, willow-lined streams, occasionally widened into patches of marsh grass or cattails.

This was once prairie country. Grass as tall as a person once dominated the landscape. Massive herds of bison, elk, and pronghorn antelope wandered the plains. A huge bison wallow just to the north attracted thousands of animals to the area. It had long since disappeared, drained and disguised by years of agriculture.



ILLUSTRATION BY NEWTON BURCH

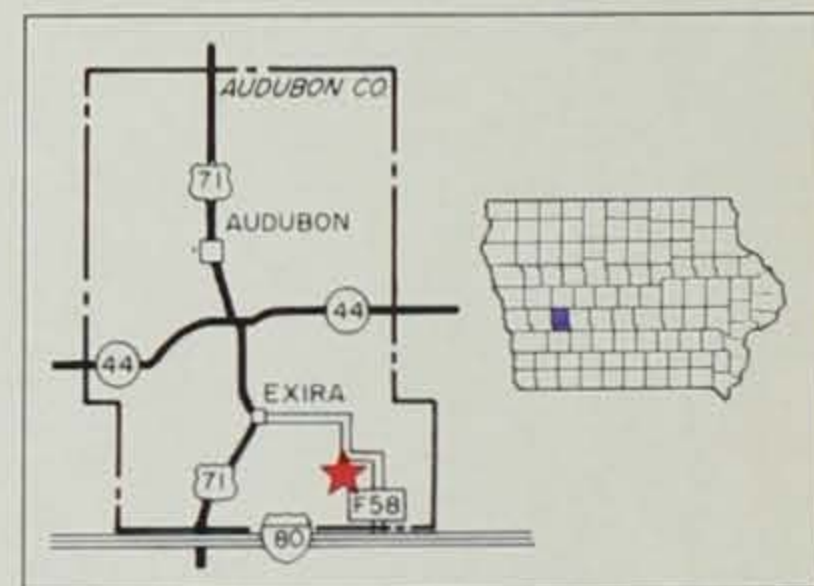
"Look, kids. There's a lake over there." The excitement in Dad's voice was contagious as the 70-acre Littlefield Lake came into full view.

Dad pulled the car into the fishing access on top of the hill overlooking the north side of the lake. Looking across the water, they could see two modern campgrounds, picnic shelters, swimming beach, shower building, concession stand and boat ramp. A hiking trail meandered across the hillside.

To the north, a large field of switchgrass covered almost half the hillside below them. A path from the parking lot where they sat went in both directions along the shore with fishing jetties on one end and a dam on the other. Below the dam was a wooded area with a much larger, denser forest beyond that. Mom broke the silence. "Let's find a picnic table and have lunch."

They continued down the county highway towards the main entrance. "Look at those big cows," Dave pointed through the scattered walnut trees.

"Those are bison, Dave," explained Tracy. "There used to be



millions of them living on the prairie."

They passed another campground nestled among huge oak, walnut and ash trees. They turned into the main entrance, past a picnic area with picnic shelter, playground, volleyball court and softball diamond. On their right was the Littlefield Nature Study Area, 40 acres of native hardwood forest that had escaped bulldozers and timber saws. A self-guided nature trail eased its way between the majestic oaks, giving access to the wonders of nature.

They followed the road into the newer sections of the Littlefield Recreation Area. Tracy recognized the

tall green grass bending ever-so-slightly in the breeze. "That must be a prairie plot. My biology teacher said more than three-fourths of Iowa looked like that before it was settled."

The road wound past the dam and the beach before Dad turned into the first campground. "I've got an idea," he said. "Why don't we set up the tent and spend the night here?" No one needed persuading, and it wasn't long before the car was parked under a shade tree and lunch was spread out on the picnic table.

After lunch, Mom and the kids decided to go for a swim and a hike. Dad grabbed his fishing pole and headed toward the lake "to catch a big one." Mom, Tracy and Dave spent most of the afternoon lying in the sun, splashing in the water and building sand castles.

Tracy wanted to hike the trail and see the view from the top of the hill. All three enjoyed the hike, especially when they spied a white-tailed doe and her twin fawns resting in the shade of an autumn olive tree. It was late afternoon when they walked back to camp. They saw Dad lying in the grass by the lake shore with his hat over his eyes, sound asleep. Dave wondered if Dad had bothered to bait the hook this time.

Later, after a restful snooze, Dad wandered back to camp. "Catch any fish, dear?" Mom grinned.

"Nope. Just not biting today, I guess."

During supper they swapped stories of the day's adventures. When evening came, they roasted marshmallows over the fire, planning the next day's activities. Tracy promised to show Dave the prairie and the grass that was taller than he was. They all wanted to hike the self-guided nature trail through the forest and, of course, get a closer look at the bison.

Settled around the fire, the family reflected on the busy day. "We're going to notice those brown signs with the arrowhead from now on," Mom said. The family agreed.

Chuck Corell is the director of the Audubon County Conservation Board.

CALENDAR

AUGUST 10-12

Lakeside Laboratory Nature Weekend. A three-day course on the geology and history of the Great Lakes Region, Dickinson County. This event includes tours and photographic sessions. Cost is \$90 per person and includes meals and lodging. For more information, contact Bruce Menzel, Department of Animal Ecology, Iowa State University, Ames, Iowa 50011, (515)294-7419; George Knaphus, Department of Botany, 113 Bessey Hall, Iowa State University, Ames, Iowa 50011-1020, (515)294-2351; or Lois Tiffany, Department of Botany, 353 Bessey Hall, Iowa State University, Ames, Iowa 50011-1020, (515)294-3522.

AUGUST 11

Whaletown Triathlon. Swimming, running and biking event at Lake Anita State Park. For more information, contact Lake Anita State Park, Rte. 1, Anita, Iowa 50020, (712)762-3564.

AUGUST 11-12

Chichaqua Free Skinkers Rendezvous. Crafts, nature hikes, canoe rental and displays at the Chichaqua Wildlife Area, five miles east of Elkhart. For more information, contact the Chichaqua Wildlife Area at (515)967-2596 or the Polk County Conservation Board, Jester Park, Granger, Iowa 50109, (515)999-2557.

AUGUST 25

Big Creek Triathlon. Swimming, running and biking event at Big Creek State Park. For more information, contact Des Moines YMCA, 1000 Porter, Des Moines, Iowa 50315, (515)285-0444.

AUGUST 25

Iowa Bluebird Conference. Delaware County Community Center at the Delaware County Fairgrounds, Manchester, is the location for a conference on bluebirds and other nongame wildlife. For more information, contact Iowa Department of Natural Resources, 1203 North Shore Drive, Clear Lake, Iowa 50428, (515)357-3517.

SEPTEMBER 9-12

National Trails Symposium. The Collins Plaza Hotel in Cedar Rapids is the location for this symposium designed for trail planners, managers and users of trails and greenways. Topics to be addressed include the economics of trail use, the marketing of trails, statewide trail planning and the 1990 Rails-to-Trails U.S. Supreme Court decision. Cost of the symposium is \$75 for American Trails, Inc., members and \$95 for non-members. For more information, contact The Trails Symposium, Box 75, Center Point, Iowa 52213.

SEPTEMBER 22-23

Prairie Harvest Festival. Smith Lake Park in Algona is the location for this festival featuring square dancers, folk music, bluegrass band and craft demonstrations. For more information, contact Kosuth County Conservation Board, Rte. 2, Box 216A, Algona, Iowa 50511, (515)295-2138.

SEPTEMBER 29

Fort Atkinson Rendezvous. Buckskinners, period costumes, food and craft, military drills and theatrical production within the historic fort walls. For more information, contact Volga River State Recreation Area, Rte. 1, Box 72, Fayette, Iowa 52142, (319)425-4161.



Visual implant tag

RON JOHNSON

The Mark of Management

Keeping tabs on Iowa's fish, by marking or tagging, assists fisheries managers and biologists in determining the survival and growth rates of the species.

by Leo Schlunz

Last June, while doing an angler survey at Rathbun, I ran into an old friend of mine -- a nine-pound walleye. An elderly, sun-baked woman was showing off my walleye friend to several other anglers. She gave me a doubting look when I mentioned I had seen her trophy every spring since 1984. She admonished me for not wearing a cap while out in the sun. I proceeded to point out the collection of trimmed fins adorning the old timer she was showing so proudly. By looking at these markings, it was easy to see it had been in the Rathbun Hatchery every spring spawning season since 1984.

"Why did you cut the fins off?" she inquired as I pointed out the clipped fins.

"So we can recognize the fish when we see it again," I answered.

"Why do you want to recognize it?"

I explained that the ability to recognize or identify a fish belonging to a group is important to fisheries managers and research biologists for several reasons. One of these is for estimating the number of fish in the lake. Typically, a number of fish in a lake are marked and released. After several days the fish in the lake are sampled again and the ratio of marked to unmarked fish gives a good estimate of the number of fish in the lake. Also, by marking fish in consecutive years, a manager can determine the number of fish that die each year and the number of small fish that survive and grow to contribute to the population.

The most commonly used method of group marking fish is *fin clipping*. It is also the most economical and simplest to apply, requiring only a pair of sharp scissors, strong hands and nimble fingers. Almost any part of any fin may be used except for the bottom of the caudal or tail fins, which are often damaged during spawning and other activities. The main problems with fin-clips is the limited number of different clips and the natural regeneration of fins

which makes it difficult for even the trained eye to distinguish previous clips.

Probably the marking method anglers are most familiar with is the *dart* or *spaghetti tag*. These small plastic tags are commonly used by fish tournament organizers, rewarding an angler for catching a particular fish. These tags are imprinted with numbers and look like a dart or piece of spaghetti with a 't' at one end. A tagging gun is used to insert the 't' end of the tag between the bones in the back of the fish, permanently marking it so it may be recognized later.

While being able to identify an individual fish may enable tournament organizers to award prizes, it gives the fisheries manager a tool for collecting important biological data about individual fish. By catching, marking, releasing and recapturing identifiable individuals, known age, growth rates, movement and other biological statistics may be determined. This information is essential to sound fisheries management.

Another type of tag is the *radio tag*. Due to cost, they are normally limited to only a few fish in a population. These tags are surgically implanted in the belly of the fish. They have great scientific value because, with the radio tag acting as a transmitter, biologists using receivers can locate and follow an individual fish at almost any time. Important movement and habitat usage can be determined. A study presently going on with largemouth bass in the Mississippi River relies on radios which have revealed that bass use different habitat during the summer than in the winter. An individual's summer location may be limited to a few feet around a particular stump or brush pile, while its winter location may be several miles away in a backwater near a flowing channel.

A tag which is relatively new is the *binary-coded wire tag*. These tags are implanted in the nose of fingerling fish prior to stocking.



JERRY LEONARD

The marking method anglers are most familiar with is a dart or spaghetti tag. These small tags are commonly used by fish tournament organizers in awarding prizes for catching a particular fish. By catching identifiable fish, essential information on age, growth rates, movement and biological data can be determined.

This permits them to be identified at harvest as belonging to a particular stocking. These microscopic tags are magnetized and require a special reading machine to identify their presence. In Iowa they have been used on a limited basis on walleye at Lake Rathbun, the Iowa Great Lakes and several rivers in the northeast part of the state. But, in the West, along the Pacific Coast, millions of salmon fingerlings have been marked this way.

Even with these types of marking methods, there is still need for new and better methods of marking fish. One that is still under development is called the *visual implant tag*. These tags are small pieces of mylar which are individually coded. When implanted just under unpigmented skin, they can be read without special equipment. Iowa has been experimenting with them on walleye, but other states have used them on largemouth bass and salmon.

As you can see, there are a

number of ways to mark fish for a number of reasons. The various marks or tags help fisheries workers determine how well a fish population is doing and what might be done to improve a poor population or maintain good fishing.

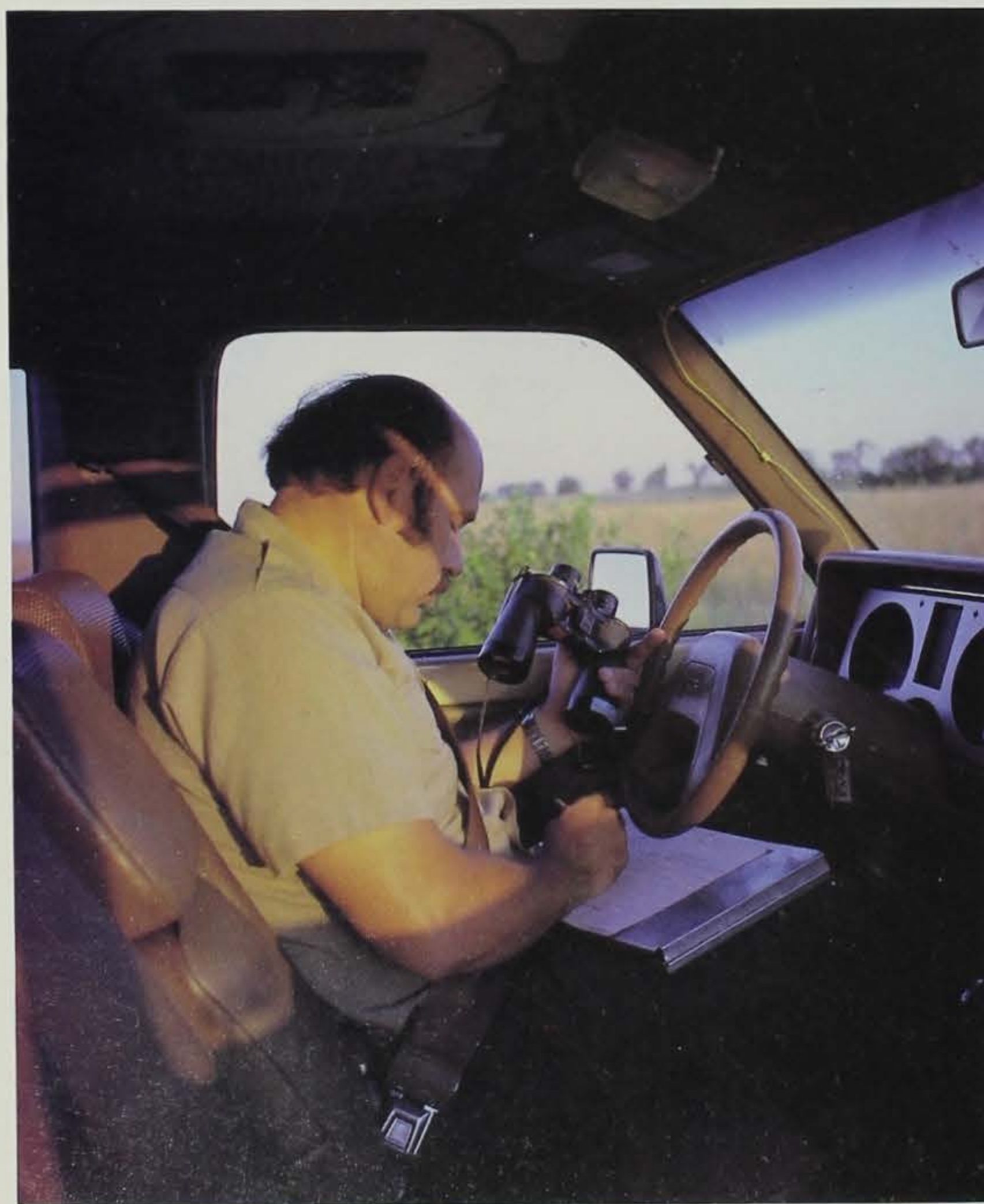
The last I saw of my old walleye friend, it was being carefully packed in ice for shipment to a taxidermist. And for the lucky woman who caught it, she was telling anybody who would listen how she hooked one of the oldest walleyes in the lake. She would point at the tattered fins and tell everybody how she could tell it had gone to the hatchery every spring to spawn since 1984.

In an excited voice, she would exclaim, "And that makes it an old timer!"

Leo Schlunz is a fisheries biologist for the department at Chariton.

*"45 pheasants, 16 quail, 24 cottontail rabbits,
90 doves and 3 gray partridge"
-- game surveys help make predictions*

Counting On A Good Season



RON JOHNSON

What is the upcoming hunting season going to bring? How many birds are on the land that I hunt? What counties have the highest numbers? Many upland hunters begin speculating about what next season will be like before they even finish the current season.

The Department of Natural Resources also begins speculating early in the year. However, the DNR has a more structured approach to project what the upcoming season might hold. This process includes a winter game sighting survey, monitoring



RON JOHNSON

weather conditions during the winter and nesting/brood-rearing periods, monitoring the progress of farming activities, and finally the August roadside survey. With all of this information, biologists can make a reasonable statement about what can be expected during the hunting season. Once the August survey is completed we can only wait for the hunting season and the hunters to prove us right or wrong. But then we are getting ahead of the story.

Weather conditions are factors over which we have no control but they have a major influence on upland wildlife populations. The most dramatic effects generally are from severe weather, which tends to be localized. Its effects are somewhat masked by adjacent unaffected areas. If the severe weather conditions persist over larger areas the effects can be substantial. Severe winter weather can dramatically affect survival of birds needed for brood-stock. Extremely heavy rainfall during the

by Ronald J. Munkel

peak nesting and incubation period can severely impact potential production. Heavy rains during and immediately after the peak hatching period as we have experienced in some parts of the state this year, can greatly reduce chick survival.

Agricultural practices and activities are another factor that can also have a major influence on potential bird numbers. Tillage of crop residues and annual set-aside cover crops in the fall affect brood-stock survival during the winter. The timing of planting annual set-aside cover crops and oats, the harvest of hay, and weed control on idle acres all influence production and survival of upland game. Agricultural practices and activities tend to have greater impacts in areas of intense monoculture farming.

Although weather and agricultural effects are not easy to measure their influences can be significant. The effects of weather and agriculture are often very subtle and the gradual and cumulative impacts often cannot be readily associated with losses of birds. In most cases, we do not see the physical evidence of these losses. These two factors are monitored throughout the year, but especially during periods which are critical for upland wildlife survival. The best information comes from monitoring upland wildlife populations directly through surveys.

The winter game sighting survey is the first survey conducted each year. The survey starts the day after the pheasant hunting season closes, in early to mid-January, and runs through March 15. The survey is conducted by conservation officers, wildlife biologists and technicians during their normal workday activities. In this survey, complete snow cover is a critical factor — enabling birds to be seen clearly. Because snow cover can vary across the state, and personnel run surveys along with normal work duties, the longer period increases the probability of collecting information under the

Winter game sighting surveys help obtain information on the pheasant sex ratio, distribution and to a lesser degree, abundance. Bobwhite quail, gray partridge, wild turkeys and jackrabbits are surveyed for distribution and abundance at the same time. This winter survey indicates brood-stock availability for the upcoming reproductive season, while the August roadside survey (left) provides the results of production from this brood-stock.



ROGER A. HILL

desired conditions. In some years, with very little snow cover, information is spotty. However, there is generally enough information to obtain a good perspective on a regional and statewide basis. One shortcoming of this survey is that it is not standardized and is strictly observational in nature. Primary pieces of information gained are the pheasant sex ratio, distribution of species, and to a lesser degree, abundance.

For the winter game sighting survey, observers record the number of ring-necked pheasants by sex, as well as the numbers of bobwhite quail, gray partridge, wild turkeys and white-tailed jackrabbits. Pheasants are of primary interest. By keeping count of pheasants by sex, a sex ratio can be calculated, which indicates the portion of the rooster population that was harvested by hunters. Some basic assumptions in this formula are that an even sex ratio exists at the start of the hunting season, and nonhunting mortality during the hunting season is the

same for hens and roosters. Sightings under marginal or no snow cover tend to bias the counts toward roosters. This in turn lowers the sex ratio and indicates a lower harvest than may have occurred. This might be of major concern if we were harvesting an extremely large proportion of the rooster population. However, in most years the harvest is between 60 and 70 percent on a statewide basis. This is somewhat below the 90 percent level that is considered acceptable.

Because we harvest all the other upland species without regard to sex they are tabulated as they are observed regardless of snow cover. Thus, distribution and abundance are directly influenced by conditions and the placement of observers in the state.

In summary, the winter survey provides an indication of brood-stock availability for the upcoming reproductive period. To see the results of production from this brood-stock, we conduct another survey in August.



JERRY LEONARD



RON JOHNSON

Weather conditions play an important role in both the winter game sighting survey and the August roadside survey. Snow cover in the winter and heavy dew in the summer cause pheasants and other wildlife species to become more visible.

The August roadside survey is the most important survey for upland wildlife. The species of concern are ring-necked pheasants, bobwhite quail, gray partridge, mourning doves, cottontail rabbits and white-tailed jackrabbits. This survey provides an indication of production, abundance and distribution which are comparable to the previous year or years. A major advantage of this survey is that it is standardized — the same routes are run each year and each route is 30 miles long on a secondary road. Conservation officers, wildlife biologists and technicians once again conduct the survey under specified weather conditions. The routes are driven at 15 to 20 miles per hour starting at sunrise. Preferred weather conditions are heavy dew, wind speed under seven miles per hour and with the sunny skies. The dew condition is probably the most critical weather factor because it causes the birds to go to open areas to dry off, thus making them more observable.

The counts for each species can be viewed as an index which is comparable from year to year. Over time an upward, downward or stable survey trend may be observed for each species. Although it has never been proven that the counts equal the exact population size or total number of animals along the routes, the counts appear to reflect what has happened on the surveyed areas. In general terms, we can reasonably expect the total population to react in the same way as the surveyed area on a regional and statewide basis. This conflicts with the perception many people have about what the survey means.

One of the most common requests from hunters is for very localized information on bird numbers. Based on our surveys, we do not have the ability to say what is happening on localized areas such as individual farms or even counties. This is due to the fact we only sample about 200 routes for the state, averaging about two routes per county. Thus

we can obtain only regional and statewide trends. We can expect local areas to reflect regional trends unless there have been localized weather or unusual agricultural impacts. Sampling at levels that would allow close monitoring of individual farms is not a reasonable expectation.

The Iowa Agricultural Statistics for 1988 published by the Iowa Department of Agriculture and Land Stewardship indicates that there are about 107,000 farms in Iowa and each of them would have to be surveyed. Even surveying adequately to develop county level trend information would require a considerable increase in the number of survey routes. Increasing survey levels would require asking some very important questions. Do we have the funds and staff to increase sampling? Is the increased level of sampling necessary to make decisions on season lengths and limits? At the current time, both answers are no.

From a hunter's standpoint, very intense sampling would provide some very useful information. It would allow much more local information. The hunter would be able to key in on areas which would provide the greatest probability of success. It would require less prehunt preparation in the field to locate areas with better habitat. But even with more information the successful hunter is going to be the one that can identify good habitat and has a good understanding of the species' life requirements.

But enough with wishing for more. Let us look at what we have and how we can use it to our advantage. We have some 200 routes scattered across the state, with anywhere from one to four routes per county. The 30-mile routes have a wide variety of habitat along them ranging from very intense row crops to almost completely idle grassland. This variation even occurs within individual routes. This habitat mix accounts for the wide variation of bird counts on the routes. Almost

every county has localized areas that can support high or low bird numbers. Hunters should always keep in mind that wildlife is not uniformly distributed across the landscape. The highest densities of each species are associated with areas having well-balanced habitat available to fulfill the species' annual life requirements. The August survey distribution maps can provide focal points to begin the search for these areas.

The distribution maps resulting from the August surveys should not be viewed as a guarantee of high or low bird numbers, but, rather, they should be used as guides. The maps reflect the counts on the surveyed routes, but always remember, the counts are a reflection of available habitat and habitat varies considerably often over short distances. The survey maps can help guide a hunter to areas that had high counts, but then the hunter must do their part. Hunters must search out localized areas that have a good balance of habitat required by the species of interest and obtain permission from the landowner to hunt. A very important factor to consider is that general areas with high counts attract the greatest number of hunters. Often areas labeled as having lower counts can have some excellent hunting opportunities. Fewer people are attracted to these areas so there is less competition. You may have to travel a little further in search of pockets of good habitat, but the payoff can be big in number of harvested birds.

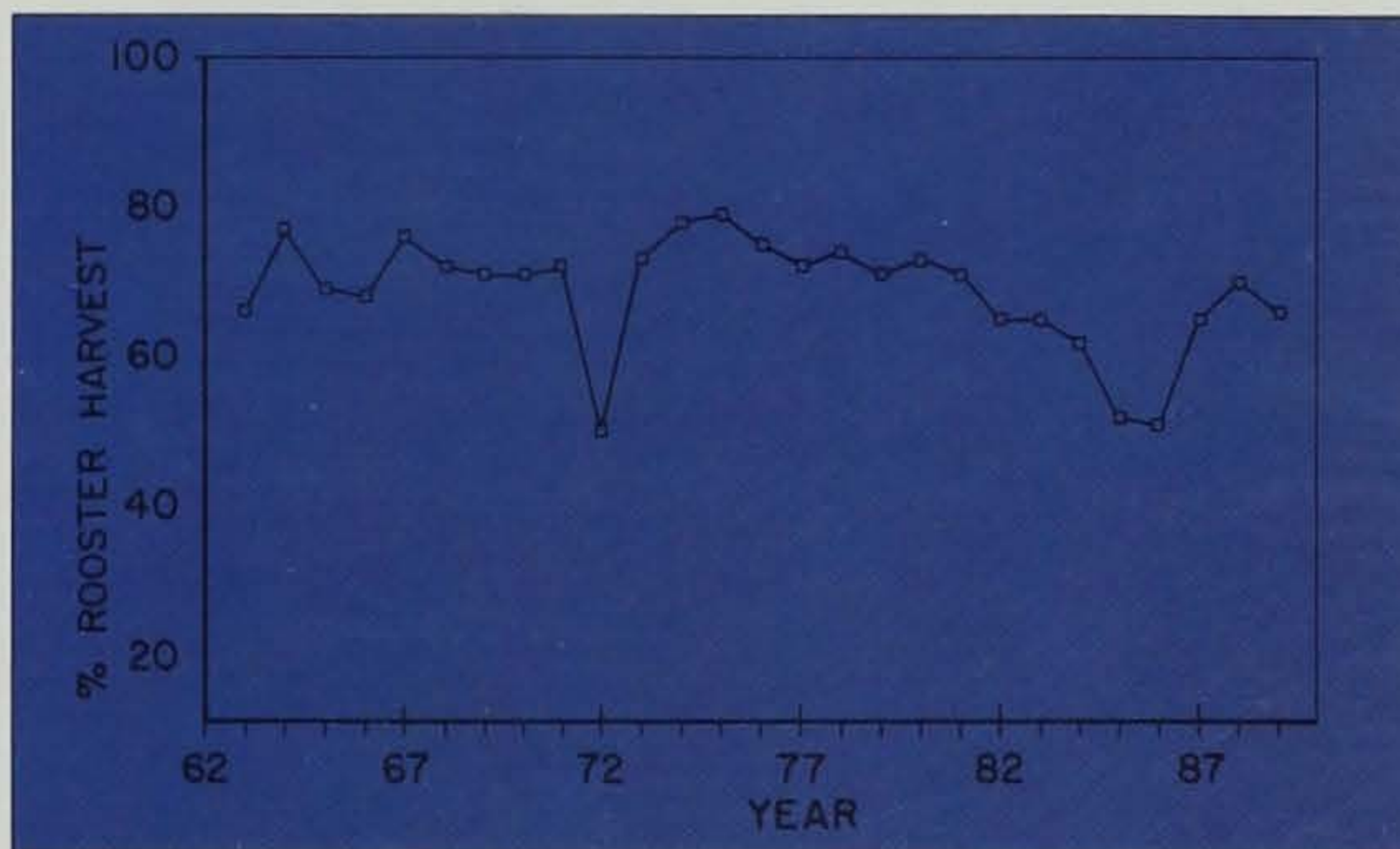
An excellent way for the hunter to improve hunting success would be to conduct their own survey to supplement the DNR's more general surveys. By taking a few early morning drives in late July and August around prospective hunting areas, one can quickly identify the better spots. It will also allow the hunter to make contacts with the landowners to arrange for access during the hunting season. Being well prepared before the season will almost always result in a successful,

fulfilling hunting experience.

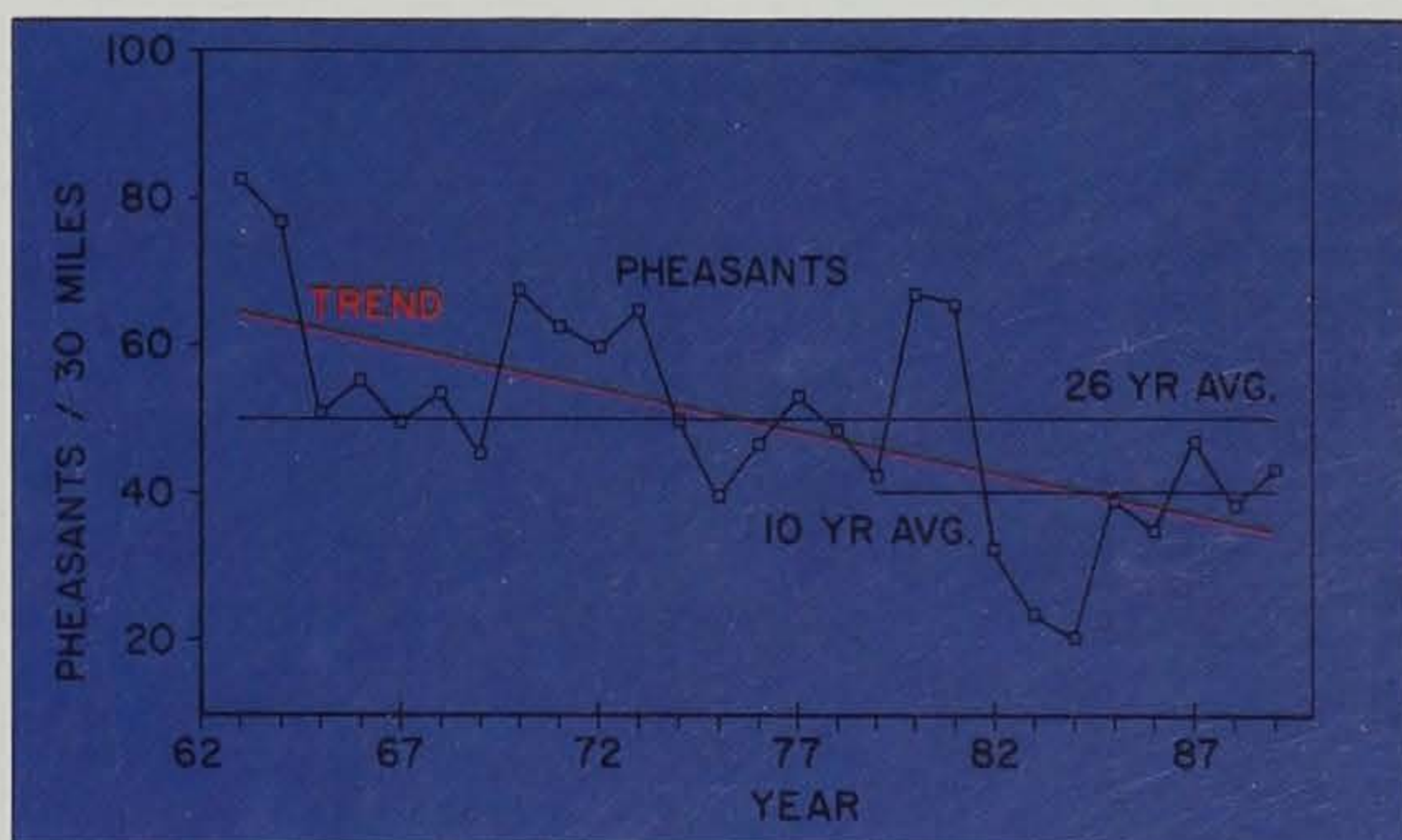
Survey information can be very useful to the hunter if it is combined with knowledge of local conditions and well-developed hunting skills. The hunter should develop knowledge and understanding of all factors affecting the sport. Relying solely on the August survey results to direct one's hunting activities and having misconceptions about what the information means will undoubtedly lead to considerable skepticism about the value of the survey.

The winter and August surveys are funded in part by the Pittman-Robertson Act. The August roadside survey material is compiled by biologists and technicians at the Chariton Research Station, Chariton, Iowa. Final analysis and compilation of the August survey material is generally completed and available for distribution in mid- to late September each year.

Ronald J. Munkel is a wildlife technician for the department in Chariton.



Statewide estimate percent harvest for rooster pheasants based on the winter game sighting survey.



Statewide pheasant trend index developed from the August roadside survey.

