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WISCONSIN

NATURAL RESOURCES

August 1994 \$3.00



Loons at night
Talking turkey

The magic box for fly fishing
Are we putting the pinch on panfish?

LOON CALLS

Understanding the sound that punctuates the Northwoods night.

Lauren Wentz

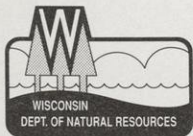
Thanks to modern techniques of sound recording, loons can now be heard in the strangest places. The recent television miniseries “Lonesome Dove” is set in a dusty town in south Texas, near the Rio Grande. On the last night of the miniseries, I was startled to hear loon tremolos apparently issuing from the depths of the desert. For someone like me, who has spent years listening to loons, this was a bit like spotting an armadillo trundling around a pine-shrouded northern Wis-

consin lake. The call of the loon is a north-country sound.

Common loons (*Gavia immer*) have four distinctive calls, together with miscellaneous peeps, mews and moans — a small repertoire by songbird standards. The hoot is short and to the point. Loons typically hoot when they are distressed or before mating. The wail and the tremolo are contact calls the birds use to stay in touch. The yodel is the male loon’s territorial call.

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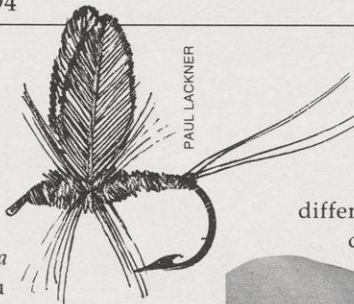
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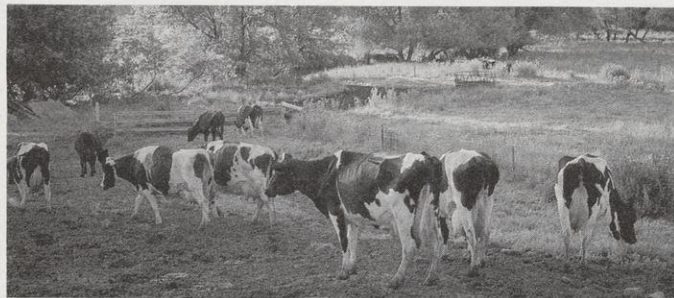


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These days the liquid waste from cheesemaking is dried,
molded and sprayed into a variety of foods and medicines.

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To become a

fly fisher



*"See some folks out on the river,
cool, scientific and clean.*

*They look like everything just kind of stuck to them
the last time they walked through old L.L. Bean."*

— Greg Brown, "Fishing With Bill"

R. Chris Halla

I must have been nine or 10 years old when my father decided it was time for me to give fly fishing a try. We were on a typical, narrow, overgrown Wisconsin trout stream. Dad told me what to do. Then he showed me

how to do it. With my first cast, I snatched the hat from his head and dropped it in the cold, swift current of the unnamed spring creek. My second—and last—cast became a tangled nest in the tree branches above our heads.

Over the next 30-some years, I occasionally talked about learning to fly fish for trout. Sometimes I envisioned myself at mid-stream, making long, graceful casts with a whip-like rod

to trout waiting just below the water's surface. When my wife and children gave me a fly fishing outfit and casting lessons for my 42nd birthday, I was ready to give fly fishing another try.

By the end of my first season, I had fished with a fly all over Wisconsin. Rivers and creeks in virtually all quarters of the state had been party to my formative thrashings. The Wolf, Mekan, Prairie, Plover, Tomorrow and Waupaca rivers, Nine Mile Creek, Black Earth and Mount Vernon creeks, Timber Coulee, Bohemian Valley and others hosted my freshman education. My flies now decorate out-of-reach trees, brush and underwater structure on more Badger State water than many have seen. And I caught some fish.

I learned that you can become a fly fisher, capable of catching trout, in one season. That isn't to say that you will learn all there is to know in one season. Fly fishing is a lifetime activity; it's a complex sport that you can spend a lifetime learning. But if you want to become a fly fisher, you can get a good start in one season.

Start simple

There are some things you will need to know: What constitutes a basic fly fishing outfit and how to choose

what to buy; where to fish; which fly to use in which situation; how to cast; line control; how to land a fish; how to release a fish.

Keep your beginnings simple. Don't try to learn everything at once before you go out. Learn enough to get started, then continue your education on the water.

There are numerous books, magazines and videos geared to every aspect of fly fishing for the rank novice, the lifelong enthusiast and everyone in between. These publications and videos will be found in your local library, outdoor sport shops and even some hardware stores. Several magazines cater specifically to fly fishers.

Even more important than information in print and on tape — find a mentor. Someone who has been fly fishing for years will be well-versed and able to help you get on the stream much faster than if you are self-taught. A good mentor can help you select equipment and learn essential skills. Make a habit of visiting fly shops, sport shops, bait shops and, yes, hardware stores where there are fly fishers on staff. I haven't met one yet who isn't willing to share everything he or she knows (except, of course, that favorite fishing spot).

Also, in your quest for knowledge, take advantage of your nearest Trout Unlimited chapter. TU is a wellspring of free advice, in addition to being a leading protector of cold water resources (where trout live) and one of the most active of all hands-on conservation groups. (Trout Unlimited, 1500 Wilson Boulevard, Arlington, VA 22209 or the Wisconsin Trout Unlimited Council, Jim Hlaban, Membership Chairman, 1420 Silverwood, Neenah, WI 54956.) There are 21 TU chapters in Wisconsin, covering every part of the state. Non-members are generally welcome to attend meetings.

While the enthusiasm of your mentor(s) will provide you with a great deal of practical information, it can also be the source of some confusion. Everyone who has been fishing for a while will have his or her favorite places, methods and a very personal idea of what constitutes correct and necessary equipment. You must master objective listening.

The equipment you need to fly fish is limited: A rod; a reel; backing (it helps fill the reel spool and, when an aggressive fish hooks up, takes over where the line ends); line; leader and tippet (the almost invisible line that the fly attaches to); and, finally, the fly.

Your rod and reel need not be high-buck equipment, but they should be a balanced combination. The easiest way to assure you have a balanced system is to buy one of the many pre-assembled outfits available. Such outfits also usually provide substantial financial savings. Better assembled package deals often include backing, line matched to the rod and reel combination, and a tapered leader.

Whether you buy these items independently or as a package, it's a good idea to purchase additional tippet material to tie onto the remaining leader as it gets trimmed back from changing flies. The most successful presentation will always be one in which the fish can't see your tippet or leader behind the fly.

When it comes time to purchase a beginner's selection of flies, get some idea of what will work in the area you're going to fish before getting out your wallet. It's easy to go overboard and buy a lot of great looking flies that may not be right for your immediate needs. Many fly fishers stop at a fly shop in the area they're going to fish and simply ask the locals what's working. This is an excellent method, but it's always good to have a basic, well-rounded selection along.

When you're standing in the water or next to the stream, trying to figure out which fly to fish, your guiding rule should be to come as close as possible to duplicating what the trout are eating. Some simple tips will help

you to make the right choice: Choose your fly based on size, shape and color, in that order. If you're unsure of size, go to the small side. If color is questionable, choose the darker one.

Tools of the troutng trade

Of the many tools and gadgets available, only a couple are essential. To begin with: a snipper, for trimming line; a forceps, for removing hooks from the fish's mouth; and a good, all-purpose jack-knife. Over time you'll find other tools and gadgets that are nice to have for special purposes.

Waders make fishing in cold streams more comfortable. A vest is a combination tackle/tool/rain gear/lunch box that can make you wonder how you ever got along without one. Polarized sunglasses allow you to see into the water and spot fish. A practical hat will keep the sun out of your eyes and errant flies out of your ears.

Before putting out any cash, best to seek out advice and study the full range of what's available. Some outfitters, such as L.L. Bean and Orvis, are famous for the goods they sell and are generally happy to provide free, usable advice. It pays to take advantage of the 800 numbers of these mail-order giants. Scanning one or two of the many periodicals geared to fly fishing will introduce you to hundreds of suppliers ready to fulfill your every fly fishing desire for a price.

If at all possible, spend some time talking to fly shop owners near the areas where you live and fish. These



ROBERT QUEEN

(above) A patient mentor is more important to the budding fly fisher than fancy equipment or natural talent. Groups like Trout Unlimited are dedicated to improving fish habitat and sharing skills with novices. They welcome new members.

(right) Line control is key. Most fish are caught 15–35 feet from the rod tip.

are all people who sincerely want you to have a good experience. They may sometimes be overenthusiastic, but they're seldom dishonest.

A casting class can serve multiple purposes. First and foremost, you can learn to cast effectively much faster through personal instruction than from a book or video. Second, casting classes will allow you the opportunity to try out several different rods before making a decision about what to purchase. Most businesses that sell rods and reels will also take you outside to try them and provide tips on casting.

For me, learning "line control" was more difficult than learning to cast. The key is simply to make sure that you haven't laid out so much line that

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The magic box

A dozen good bets for catching Wisconsin trout.

Darrell Toliver

Photos by Robert Queen

A look into a fly box is a look into the fly fisher's heart and soul. Inside are the secret fish-catching patterns; the ones that catch fish when nothing else works, just like magic. There are three basic styles of fly patterns, and we'll cover each briefly. To assist the beginner in compiling an assortment of fish-catching flies for his or her own fly box, we're recommending a basic set.

The dry fly version of fly fishing is the most popular and most visually exciting, because dry flies float on the

water's surface. Any attempt a fish makes to "take" a dry fly will cause surface commotion of varying degrees. Sometimes a small dimple ring may be your only clue that fish are feeding on top. Or you may see a trout leap entirely out of the water to catch an escaping flying insect.

The insects most fly fishers think of as dry flies are mayflies, mosquitoes, caddis flies and moths. Terrestrial insects that trout eat include grasshoppers, beetles, ants and crickets. In some areas of the state, certain

patterns will be more effective because these insects are abundant. Grasshoppers are a perfect example: a good choice for anglers in the southern half of Wisconsin, but not as successful in the Northwoods. This is where your observation skills are born and honed. Being more attentive to the insect life on and around the stream will make you a better angler. It will also save you money, because you won't buy flies that look nice, but don't catch fish.

My first choice for our dry fly selection is a Black Gnat, size 10–14. This fly is all black in color including tail, body, wings and hackle (feathers wound around the hook shank).

The ever popular Mosquito, although a pain in our necks, accounts for a lot of girth on a lot of Wisconsin trout. This dry fly is



tied with grizzly (black/white) feather tips for a tail, a black and white body made from moose mane, and grizzly wings and hackle.

Sizes should be 10–16.

Another very good dry fly is a Henryville Caddis. It's a different looking dry



fly, with a mallard quill wing, chocolate-colored fur or a wool body and dark ginger hackle. Sizes should be 14–20.

The Olive Caddis is the next dry fly to go into our box. It's tied similar to the Henryville, with a style of dun blue mallard quill. This fly has an olive-dubbed body and olive hackle. Sizes should be 12–18.



Our final dry fly selection is the Light Cahill, in sizes 10–18. This very versatile fly is tied with a light ginger tail, cream-dubbed body to wood duck flank wings, and finished off with light ginger hackle. With these five dry flies (in assorted sizes) and good casting skills, an angler should be able to go anywhere in Wisconsin and catch trout when they are feeding on the surface.



Now focus your attention on fish feeding *below* the surface (which, by the way, is 80–90 percent of the time). Unfortunately, this form of fly fishing takes more patience and concentration. But it does catch fish! The sub-surface patterns consist mainly of nymphs, wet flies and streamers.

Nymphs and wet flies imitate immature stages of insect life found in different parts and at different depths in each particular stream.

Take a good look at the stream you will be fishing. What does the stream bottom look like: rocky, sandy, weedy or silty? Every form of insect life has a desired environment. For instance, the brown drake nymph is found in silty-bottomed streams. Turn over rocks, look at the underside of submerged logs, even scoop up a small sample of soft bottom and sort out the native aquatic life. Novices should note the size, shape and color of the insects you see. Later on you'll get interested in the genus and species of each insect.

For nymph imitations, I recommend the famous Gold Ribbed Hare's Ear. It's a buggy pattern tied with wood duck flank fibers for the tail, a dubbed body of brown and black hair from the base of an English hare's ear with a strip of tinsel wrapped sparsely around the body and capped off with a wood duck flank or turkey wingcase. Hook sizes should run 8-18.



Next, I recommend a nymph pattern called a March Brown: a larger fly than the hare's ear, tied with ring-necked pheasant tail as the tail, and wingcase material on a body of dubbed fur from a red fox. Recommended sizes are 10-12.



The Prince Nymph should also be included in our box. It has a different silhouette than other nymphs and uses dark green peacock herl as body material with flat gold ribbing tied over the body. It's most noticeable characteristics are the pointed horns and tails attached by using goose quill fibers: brown in color for the tail, white for the horns. There is also a light hackle beneath the horns for a livelier effect. Sizes should run 8-12.



Our last nymph pattern is also the most varied in size. The Black Stone pattern can be tied in sizes 4-18 to imitate anything from a leech to a species of stonefly. This fly is tied with a black-dubbed body wrapped with small copper wire. It has black hackle fibers for the tail and dyed black goose quills for a segmented wingcase.



Streamer patterns, the other sub-surface group, are generally designed to imitate minnows. Use streamers in areas where you have seen minnows, or below those areas where a wounded minnow might be swept by the current. Three particular streamer patterns account for a lot of trout caught.

The first and most common is the Black Nose Dace. It's a very sleek pattern sporting a red wool tail with a silver tinsel body on an extra long shank hook topped with a wing consisting of brown over black over white bucktail tips extending just past the bend of the hook. Sizes should run from 6-14.



The Mickey Finn has a profile similar to the Dace and is tied on the same style hook. No tail on this pattern, but the body remains silver tinsel and the bucktail colors go from yellow to red to yellow. Hook sizes should be from 6-10.



The last fly in our box is classified as a streamer, but has been used floating, neutral or sinking. The Muddler Minnow is a versatile pattern, definitely sought after by larger trout. This pattern consists of a turkey quill tail, gold tinsel body, turkey quill and squirrel wing and a spun deer hair head. The Muddler Minnow is tied on anything from a 1/0 to a size 14 hook.



Now our fly box is ready to be customized by the attentive angler. It offers 12 basic patterns which should allow the beginning fly fisher to enter the stream with a bit more confidence. There is a pattern in this "magic box" that should catch fish.

The fly fishing vest serves as a combination tool chest, life vest and lunch bucket.



ROBERT QUEEN

Outdoorsman Darrell J. Toliver hunts, fishes and sells sporting goods in Appleton, Wis.



ROBERT QUEEN

(above) Part of the joy of fly fishing is the combination of gentle technique and quiet surroundings as the fish flash, jump and battle.

(below) Handling fish carefully and quickly can improve the odds that released fish survive. Fly fishers led the pack in encouraging catch-and-release fishing.

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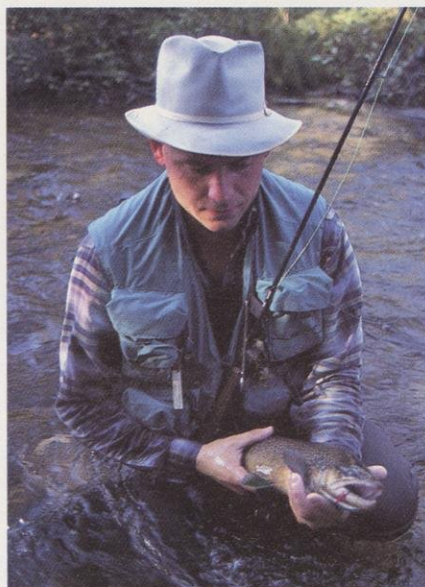
you can't set the hook when a fish takes. Don't overestimate the amount of line you need out. You will quickly learn that most Wisconsin trout will be caught 15-35 feet from your rod tip. Then there's fly control. The important thing is to avoid drag on your fly by any means possible. Other fly fishers, books, magazines and videos can all provide good advice. Experience, however, will be your best teacher.

Playing and handling fish

When you finally hook your first fish on a fly, the next challenge is to land it. Trout have soft mouths. You don't need to set the hook hard, just lift your rod tip with a firm pressure. Play and land the fish as fast as possible, but when a fish runs, let him have his head at first while maintaining light tension on the line. As often as not, you will bring in the fish by hand-stripping line rather than using the reel.

Whether or not you use a net to land a fish, never grab a fish with your hands dry. This will destroy the protective slime on the fish's body and limit its chances of survival if you release it.

Many fly fishers practice catch and



ROBERT QUEEN

release exclusively. Others keep a few fish staying strictly within size limits, taking fewer fish than legal limits allow and only keeping fish from waters where they are most plentiful.

When you do release fish, do it properly. In addition to playing a fish fast and never grabbing or holding one with dry hands, try to observe the following: Use a net, if possible; grasp the fish across back and head; turn the fish belly up while removing your fly; don't remove swallowed hooks — if you can't see the whole hook, cut the line. Don't keep fish out

of water for more than 10 or 15 seconds. Hold fish in the water, facing them upstream to revive them before letting them go. Never *throw* a fish back.

Following these guidelines could help save some of the two million trout that will be hooked and released throughout Wisconsin this year. The Wisconsin Council of Trout Unlimited has put together an excellent brochure on how to release a fish. Copies are available from the address given earlier.

By now, you may wonder how one goes about finding a place to fish. The news is good. No place in Wisconsin is more than an hour away from a river or stream that holds trout. And the single best guide to Wisconsin trout waters I've found is free from the Department of Natural Resources in the form of the "Wisconsin Trout Fishing Regulations and Guide." Coupled with a state highway map and a handful of Department of Transportation county maps from the areas you want to fish, this is enough to get you started. Most county and area tourism offices can also provide excellent maps along with the occasionally good tip. There are a number of maps and other trout stream resources available commercially.

While my own first efforts with a fly rod concentrated on trout, I learned very quickly that virtually any fish can be taken on a fly. Small and largemouth bass are capable of taking your breath away when they double your rod from out of the depths of nowhere. A crappie will nail your fly from an undercut with the attitude of *Tyrannosaurus rex*. A northern...well...when that prehistoric weedbed cruiser confronts the fly, the experience can only be described as assault. A musky — I'm told — will stop your heart.

There can be much mystery and mysticism to fly fishing, but basically it's a simple act. And that's an act, I'm happy to report, that anyone can take part in. □

Writer, poet and avid angler R. Chris Halla lives in Appleton, Wis.



Talking turkey

After six years of study, we know a lot more about wild turkeys and the people who hunt them.

O John Kubisiak, Neal Paisley
and Bob Wright

One day last spring two of us went turkey hunting in Vernon County in southwestern Wisconsin. Just any bird wasn't good enough. We were after hen 150.200, named for the radio frequency of her backpack transmitter. And we didn't want to bag her, we wanted to count her poults.

Sneaking up on a turkey isn't easy. They have sharp vision, keen hearing, and they spook easily. We conduct brood counts by stalking the hen, then rushing her, so she and her poults will flush and we can count them. If she's deep in the woods, we won't get close enough. Even if we catch her in the open, she may hear us and ditch her poults instead of flushing.

Today we were lucky. We caught up with hen 150.200 in a newly mowed hayfield. Her brood was feasting on insects. We got as close as we could, flushed her toward the nearby woods, and four strong poults rose behind her. She had done well this year; half her poults were still alive.

STEPHEN J. LANG

Turkey restoration

This count was part of an extensive wild turkey study DNR researchers conducted between 1987 and 1993. Wild turkeys are native to Wisconsin, but were extirpated by 1881. In the late 1950s some game farm birds, the offspring of wild toms and captive hens, were released on the Meadow Valley Wildlife Area in central Wisconsin, but failed to thrive.

In 1976 we tried restoring turkeys again. Wisconsin is at the northern end of the turkey's range, and Missouri is at the southern end of the ruffed grouse's range. We had lost our turkeys, and Missouri had lost its grouse, so we established a trade. Between 1976–1985, 334 wild turkeys from Missouri were released across southern Wisconsin.

This time the turkeys did well. We were soon stocking other parts of the state with offspring from these successful releases. By 1983, there were enough birds to warrant a spring hunt; by 1989, we were able to hold a fall hunt.

Permits for those first hunting seasons were conservative to avoid overharvesting. Hunters enjoyed the experience so much that they soon had their buddies champing at the bit. Their growing enthusiasm was generating pressure to provide more hunting opportunities. At the same time, farmers who sometimes saw flocks of 50 or 60 birds in their fields were worried the turkeys were eating up their livelihood.

Could we hunt the birds harder? To make good management decisions, we had a lot of questions to answer: If we increased the number of hunters, could we sustain turkey populations? Would more hunters interfere with one another? Could we document whether feeding turkeys were harming agricultural crops? Would landowners tolerate more hunters in their neighborhoods?

To provide answers, we set up an experimental management zone in western Vernon County and roughly doubled the number of hunting permits in that area. We began by using



NEAL PAISLEY

(above) Newborn turkey poults drying at the nest.

(below) A young flock. Turkeys have to beat sizeable odds to reach adult size. Research shows 80 percent of Wisconsin hens attempt to nest but only 20 percent successfully hatch a brood. Half of the young poults die or are preyed upon during their first two weeks. Wildlife biologists estimate at least a third of the adult hens need to produce a brood to sustain the population.



HERBERT LANGE

rocket-fired nets to capture hens and gobblers in the experimental zone and fit them with backpack radios. Between 1988 and 1993, we wired 238 hens and 121 toms.

Life and death in Vernon County

The longest lived wild turkey on record reached the respectable age of 14. Most of our radio-tagged birds

are not nearly so lucky.

Their first obstacle is making it out of the egg. During spring over 80 percent of the hens attempt to nest, but only 20 percent hatch a brood. Predators such as coyotes, foxes, raccoons and skunks cause most nest losses, although some nests are disrupted by farming or logging.

After hatching, turkey life is extremely precarious for several weeks. The average clutch had 11 eggs, of



NEAL PAISLEY

Keep in touch. Radio transmitters are an important tool for tracking turkey whereabouts. Radio signals can be heard two to three miles from tagged birds for almost two years before batteries die. Each bird's movements are tracked daily during the hunting and nesting seasons and about once every three days the remainder of the year.

which nine or 10 usually hatch. Only half of the poults survive the first two weeks. By fall, about 1.5 poults survive for every hen in the population.

The adults don't do much better than the poults. About half the adult birds die each year. Spring is the most dangerous time of year for both sexes for different reasons. Most of the hens that die are killed by predators. Legal hunting in the spring harvests about a third of the gobblers. For the most part, toms are too big for predators, although coyotes take a few during the strutting and breeding season.

Few birds die during the summer and fall when they are no longer preoccupied with breeding and their predators choose from a larger menu. Less than 10 percent of the wild turkeys are harvested during the fall hunt.

Surprisingly, winter survival was

high during our study. The reason is that agriculture had helped "winter-proof" the turkeys, at least in southern Wisconsin. Turkeys do best where dairy farms are interspersed in oak woodlands. During a mild winter, the turkeys spend much of their time in the woods scratching around for acorns, but when weather gets tough, they come out, scratch the corn stubble and pick through spread manure for leftovers.

A severe winter will still take its toll. During the winter of 1990-1991 we had 49 consecutive days of deep fluffy snow that made it difficult for the birds to move from one area to another, and there was severe, persistent cold. A flock of eight radio-equipped hens trapped in an area where there were no active dairy farms starved to death. Fortunately, severe conditions ended by early Feb-

ruary and overall survival was good.

What did the radio-tagged birds tell us about the dynamics of turkey populations? The spring and fall hunts do not put undue pressure on the birds. Although roughly a third of the toms were killed in the spring hunt, one gobbler can service many hens. The small number of birds harvested in the fall either-sex hunt is below the level that would threaten the population.

More troubling was the poor nesting success. This "recruitment" is the engine that drives turkey populations, and it was lower than expected during our study. Wildlife biologists believe about a third of the hens must produce a brood to sustain the turkey population; only 20 percent of our radio-tagged hens raised broods.

Discussion with our colleagues confirm that poor recruitment is a

problem throughout the wild turkey's midwestern range. High predator populations appear to be the primary factor affecting recruitment. Long periods of cool, wet weather can also greatly reduce poult survival.

Counting turkeys

Our work tracking a few radio-tagged birds couldn't really tell us whether turkey numbers in Vernon County were up, down or holding steady. To figure that out, we needed a better method of counting large numbers of birds across a large landscape.

Like most wildlife, turkeys are hard to count. We had been estimating the population by surveying hunters, conducting mail surveys and interviewing landowners to track turkey trends. We were concerned that these numbers were too soft to be useful. So we tried something new. Helicopter surveys had provided reliable estimates of deer populations in hardwood stands during winter. Perhaps this technique would work for turkeys, too.

It turned out that turkeys are easier to count from helicopters than deer. When observers spot a bird, the helicopter circles back to reconnoiter. This usually flushes all the birds in the flock, which can then be counted on the wing. Turkeys in dense stands of conifers were still easy to miss as we cruised by at 35–40 miles an hour. Deer, on the other hand, often stand still when a 'copter flies over.

We tested the accuracy of aerial surveys against our ground counts of radio-tagged birds in the experimental zone. The helicopter observers were spotting about 80 percent of the turkeys counted by ground crews, a respectable percentage.

Between 1990–93, turkey numbers dropped from 28 to 20 birds per square mile of woods in the experimental zone. Poor recruitment was obviously decreasing the population. Fortunately, aerial surveys this past winter suggest the population is stabilizing. We think there are roughly 130,000 wild turkeys in the state,

probably more birds than before European settlement. Farming has also extended the turkey's range northward.

Surveys also confirm that turkey are not spread evenly across the state — fewer than 10 turkeys per square mile of woods in Buffalo County near the bird's northern limit; more than 50 turkeys per square mile in Iowa County in ideal habitat.

Socially acceptable hunting

One of our goals is to maintain a high-quality hunting experience, which we define as providing a good chance for people to hear or see birds, reasonable hunting success and minimal interference from other hunters. Determining how many hunters feel comfortable hunting the same area is as important as understanding turkey ecology.

We particularly want to protect the quality of the spring hunting experience. During spring, only turkeys with beards can be legally hunted (the toms and about four percent of the hens grow beards). A hunter typically scouts an area; finds a roosting, strutting or breeding area; sets up nearby, and imitates a hen's call. To make sure spring hunters have elbow room, they are spread out among hunting zones and one of six time slots. Hunting is closed on Mondays and Tuesdays to encourage hunters to safely scout their hunting areas. During the fall hunt both hens and toms are legal. Hunters spend much of their time stalking and ambushing birds instead of calling them in.

We also want to ensure the hunting experience does not come at the expense of landowners' good will. Throughout the restoration project we had made good landowner relations a priority. So we surveyed hunters

and landowners in the experimental zone and adjacent areas after the spring and fall hunts. Their responses suggest that the higher densities of hunters in the experimental area are close to the limit of what hunters and landowners will accept in the spring.



HERBERT LANGE

(above) Wisconsin is home to approximately 130,000 wild turkeys mainly in the southern two-thirds of the state.

(left) Hunting permits are regulated to protect turkey populations and to protect the quality of the hunt. Research also examined when landowners felt their property was getting too crowded to provide safe, enjoyable hunting conditions.

Curiously, higher numbers of hunters during the fall hunt did not bother other hunters. Why the difference?

Most hunters consider spring season a trophy hunt. Since all other hunting seasons are closed, they view other hunters as competitors. By contrast, the fall turkey hunt is one of many. So seeing another hunter in the woods does not necessarily draw ire.

Surveys show 90 percent of landowners allowed turkey hunters on their property until they felt their land was getting crowded. About half the landowners were favorably impressed by turkey hunters. Another 30 percent were unhappy to spot people hunting their property without permission.

Who ate the corn?

As noted, turkeys are very dependent on farming for winter survival. Farmers who complained of marauding turkeys were concerned about





BOB WRIGHT

Do turkeys damage corn crops? Not much. It appears turkeys eat more insects and waste corn in farm fields than standing crops.

crop damage during the growing season, not about scavenging for waste corn in winter stubble.

We researched how much time turkeys spend in crop fields during the growing season and what they are doing there. We also examined if turkeys were responsible when crops were damaged.

We found that hens spend most of their time in woodlands or near the forest/field edge. Hens with poults

use crop fields more than gobblers or hens without poults. They seem to prefer mowed hayfields and weedy pastures.

To find out what the turkeys were eating, we examined the crops of about 400 wild birds. Since the crop holds food before it's ground in the gizzard, we could readily identify foods and even distinguish whether corn was waste, seed or had been unharvested based on its appearance.

Though agricultural crops are an important part of a turkey's diet, the birds do little damage to standing crops during the growing season. Half the food the birds eat is agricultural, but three-quarters of that is waste corn. Brood flocks in crop fields during the summer are usually eating insects, mostly grasshoppers, rather than crops.

Investigations of 28 complaints of crop damage by wild turkeys supported these findings. Each species leaves its own telltale signs, and in most cases it was evident that deer, raccoon or other animals were responsible for the damage. Only one case showed significant crop damage caused by turkeys.

The upshot

Our research has provided solid information on current populations and trends specific to Wisconsin birds. We also have a benchmark for determining how many birds can be harvested and how many hunters can comfortably hunt in an area. So the number of permits we issue should be based on sound footing.

It appears we could hunt more turkeys in areas like Iowa County that are flush with birds, but we ought to be more conservative in areas like Vernon County with more moderate populations. Research suggests greater numbers of hunters can be accommodated in the fall than in the spring. Beginning this year, fall hunters will be free to hunt throughout October, instead of being limited to an assigned time slot.

This spring, we issued about 70,000 permits and hunters took home about 12,000 birds. This fall we will issue about 17,650 permits — fewer than in previous years, but not bad for a state that's only been back in the turkey business for 20 years. □

John Kubisiak leads DNR's biological research team studying turkeys, deer and ruffed grouse in central and southern Wisconsin. Neal Paisley and Bob Wright are DNR wild turkey biologists conducting research in Vernon County.

ARE WE PUTTING the PINCH on PANFISH?

Consider some strategies and options to ensure plenty of panfish.

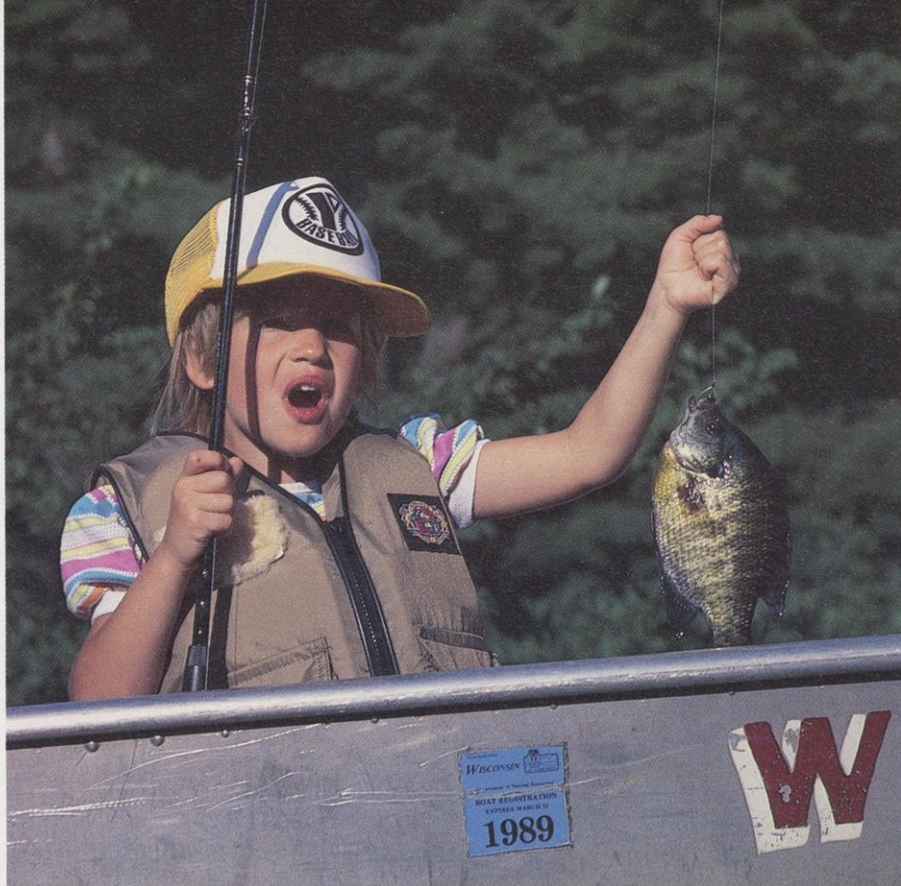
Martin J. Jennings and T. Douglas Beard

Bluegill are not exactly an endangered species. Indeed, bluegills and other panfish are so plentiful that it seems impossible to overharvest them. Consequently, they are liberally managed. In Wisconsin, panfishing is open year-round, the bag limit for each species is 50 fish a day, and there are no size limits. Lately, however, fish managers are listening as more anglers complain of stunted panfish populations, fished-out lakes and overbagging by panfish "hogs."

What is going on? To find out, Bureau of Fisheries managers analyzed data from angler surveys, fyke net collections and creel surveys. Many anglers believe they've been catching smaller panfish in the past few years.



DAVID MARSHALL

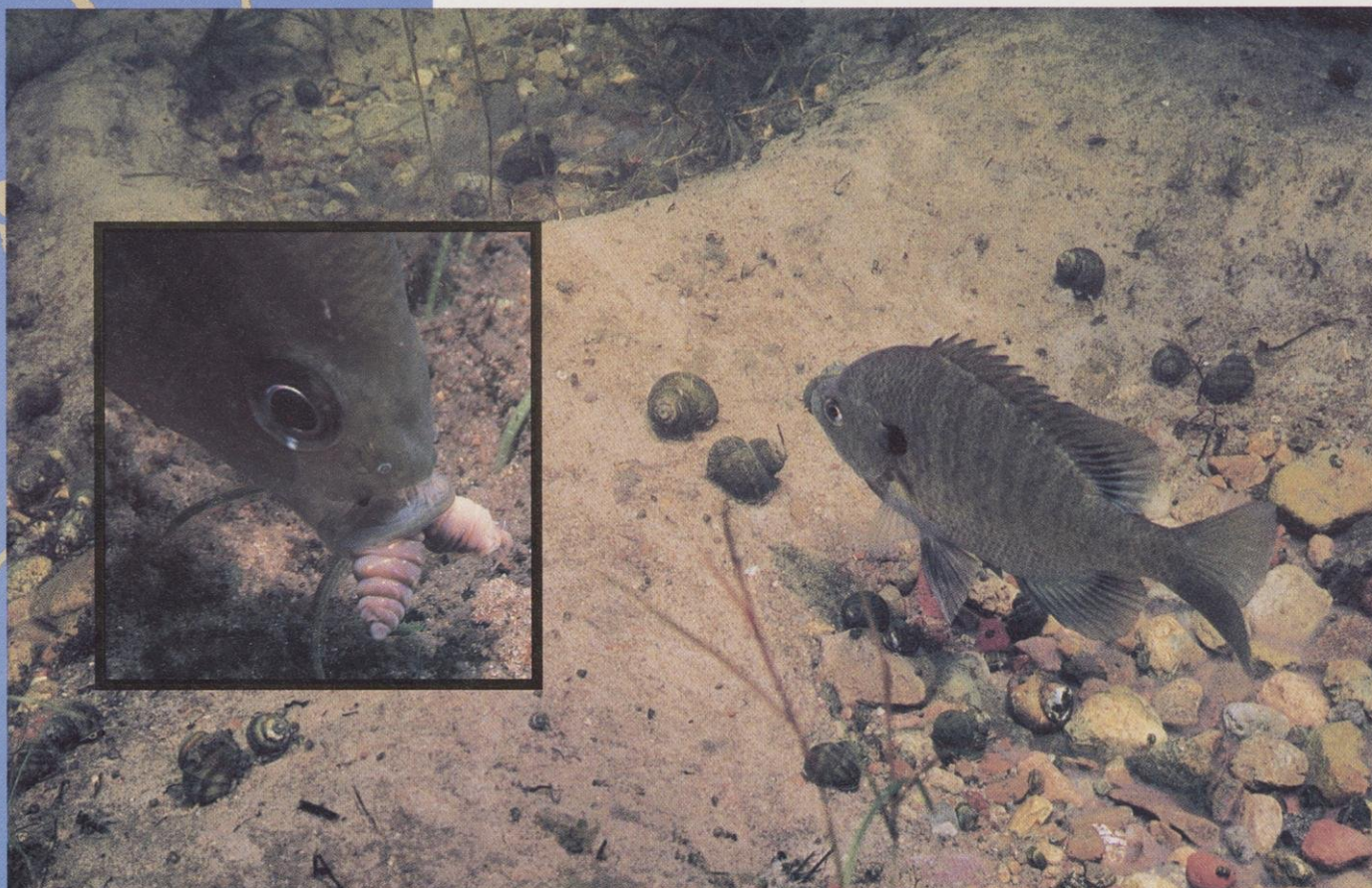


STEPHEN J. LANG

(above) Bluegill fishing is tops for anglers. Male bluegills bite baits readily in the spring when they aggressively defend their territories.

(inset photo) Bluegills are not fussy eaters, but different waters produce different foods. Clear lakes provide more zooplankton, shallow and weedy waters provide more aquatic insects like midges and mayflies.

(bottom) On guard! Male bluegills fiercely defend their spawning areas and nests during the breeding season. They won't even leave the territory to find food.



PHOTOS BY DAVID MARSHALL

Six out of 10 anglers rated recent panfishing experiences as "fair or poor."

Anglers' perceptions are borne out by fyke net surveys on selected lakes. Since 1967, the mean length of bluegill and yellow perch has decreased by about 10 percent. There are also proportionately fewer large fish than there used to be. In short, although panfish populations are in no danger of collapsing, the quality of panfishing does appear to be declining.

If it's time to try some new panfish management techniques, what are the best strategies?

For our purposes, we might just as well refer to panfish anglers as bluegill anglers since they catch so many of this species. In that way, our discussion of bluegill "problems" can serve as a kind of shorthand for improving panfish populations statewide.

Bluegill biology is significantly different from other sport fish biology. Some sport fish reproduce at low rates, so protecting spawning females is a critical management objective. Populations of some other fish are so sparse that low bag limits are needed to maintain their numbers. That's rarely the case for bluegills — reproduction is almost never a limiting factor, and even the heaviest fishing pressure does not put populations at risk.

The more likely problem is that many bluegill populations are stunted; the fish grow slowly and there are few old, large fish. The objective in managing bluegills is to promote populations that contain different sized fish and plenty of larger fish rather than protecting the whole population.

Manipulating size distributions is a subtle business, and one in which common sense is not always a reliable guide. Strategies that work for other sport fish, such as lower bag limits, might actually make the situation worse. A strategy for bluegills must be based on understanding how they grow in different situations. And that biology is a bit fancier than one might expect for such a modest fish.

Eating and being eaten

Mammals and birds stop growing when they become adults but fish grow throughout their lives. Biologists call this indeterminate growth, because there is no limit on the size an individual fish can reach. How big a fish gets depends on both how fast it grows and how long it lives. Therefore fish managers could potentially increase the number of big bluegills in a body of water by increasing either growth rates or life expectancy.

How fast a bluegill grows depends on the water temperature, the food supply and competition from other fish. Fish in the temperate zone, including the northern United States and Canada, generally get their growth spurt during the summer months. In Wisconsin, the growing season is fairly short, particularly in the north.

Growing fish, like growing children, need sufficient groceries. Bluegills are not fussy eaters, but they feed on different foods in different waters — zooplankton in deep, clear lakes as compared to a mix of aquatic insects, midges, dragonflies, beetles and mayflies in shallower weedy lakes.

Do bluegills do better where the weedbeds are sparse or dense in a lake? Many insects cling to the stems and leaves of aquatic plants, so insects are more abundant where plants are thick. On the other hand, insects can hide better in dense plant beds. Recent research indicates that these factors tend to cancel each other out. Bluegills grow at roughly the same rate in lakes of varying weediness.

Another factor is the competition a fish faces in the search for food. Bluegills are prolific spawners and often produce large "year classes," or cohorts of fish that hatch during spring and summer of a single year. Crowding can result in fierce competition for food and slow the fishes' growth. An overcrowded lake provides poor angling; although there are plenty of fish, they remain small.

In theory, another way to grow bigger fish is to grow fewer of them. Managers could remove bluegills

from the lake or they could encourage populations of bluegill predators like northern pike. Predators can be stocked or they can be protected by restricting their harvest. But would either strategy work in practice? To find out, the Department of Natural Resources is now testing various combinations of the two strategies in some small lakes in northern Wisconsin.

Limiting the catch of walleyes and northerns would be an unpopular means of building up bluegill populations. A second alternative could include stocking non-game predators, such as gar or bowfin. A third alternative would concentrate on changing the fish's habitat in ways that favor predators. Just as aquatic plants allow insects to hide from bluegill, they allow bluegills to hide from predators. Cutting channels in dense plant beds might tip the balance in favor of predators.

Time out for love

Eating fuels growth, but breeding retards it. This is even more true for bluegills than for most game fish. Most Wisconsin sport fish are broadcast spawners. During the spawning season they congregate in shallow water, scatter eggs and milt promiscuously, then depart, leaving their hapless offspring to hatch and mature on their own. By contrast bluegills, like other sunfish, have elaborate reproductive and parenting behaviors that require much more energy.

Bluegills spawn in the spring or early summer, when the water reaches about 68°–72° F. Male bluegills build nests by sweeping depressions in the lake or stream bottom with their tail fins. The nests, or beds, are grouped in clusters called colonies. Females visit the colonies only to spawn. The males then guard the colonies until the offspring hatch and are large enough to swim away.

This means a male bluegill often stays on the nest for 10 or more days, attacking all predators that venture near. He won't even leave to find food. A study of a related sunfish spe-

cies showed that parental males lost as much of 20 percent of their body weight during the spawning season.

Researchers have found that female bluegills prefer to spawn with bigger males. By selecting a big male, who is better able to drive predators away from the nest, a female increases the probability that her offspring will survive. This means that the bigger the male, the better his chances of reproducing.

How can a male bluegill bulk up? One way is to delay maturing until he is relatively old. Sexual maturation absorbs energy that would otherwise help the bluegill grow more quickly. So fish that remain sexually immature grow more quickly than fish that mature earlier. There's a trade-off in this strategy, however. Fish that prolong adolescence stand a greater chance of being eaten before they have a chance to spawn. On the other hand, because they are bigger sooner, smaller predators tend to leave them alone.

Figuring out the best time to mature is no easy trick, and nature has

when they are very small but do not build nests. Instead they wait near nests until females enter to spawn. As the females release their eggs, the small males sneak into the nests and release sperm, usually managing to fertilize some of the eggs. Other small males imitate female coloring and behavior to gain access to nests during the spawning season.

What do these "sneakers" and female mimics have to do with fish management? The growth rate of a sneaker male, like that of a nesting male, declines once it reaches sexual maturity. In fact most sneakers never grow big enough to become nest builders. From a biological point of view, there is nothing wrong with these fish, but for anglers, the small "sneakers" make a less desirable catch.

What controls the proportions of sneakers and nesters in the population? Research suggests genetics, but the environment plays a role, too.

The sneaker strategy will more likely succeed in weedy lakes, where it is easier for these fish to lurk un-

gies to discourage slow-growing sneakers and encourage fast-growing parentals.

A more promising fulcrum for jacking up the size structure of bluegill populations, however, is delaying the age when parental males mature. The later a bluegill matures, the bigger it's likely to be. In experimental ponds, when the biggest fish were removed, the remaining males matured and began building nests. Since these fish then grew more slowly, removing the big fish tended to hold down the size distribution of the entire population. Whether angling pressure has a similar effect on lakes is unknown. Researchers in several midwestern states are currently trying to answer this question.

What about female bluegill? Female reproductive behavior offers comparatively little leverage to the fish manager. The females' sole strategy: to mature and lay eggs. Like males, females grow more slowly once they are sexually mature. Indeed, mature females grow even slower than mature males, though they can still get pretty chunky. Manipulating when females mature is also more difficult. Females mature when food is abundant and they all mature in the same lake at about the same age and size.

A super predator

At first blush, "predation" by weekend anglers might seem indistinguishable from consumption by walleyes. In fact, anglers have quite different effects on sizes of bluegill populations than predatory fish.

Bass, northern pike, walleye and other predatory fish consume prey smaller than the size of their gaping maw. As a general rule, these fish prey most heavily on younger, smaller bluegill. In many lakes the big fish are simply too big to be eaten. So without anglers, the survival rate of the fish in a year class

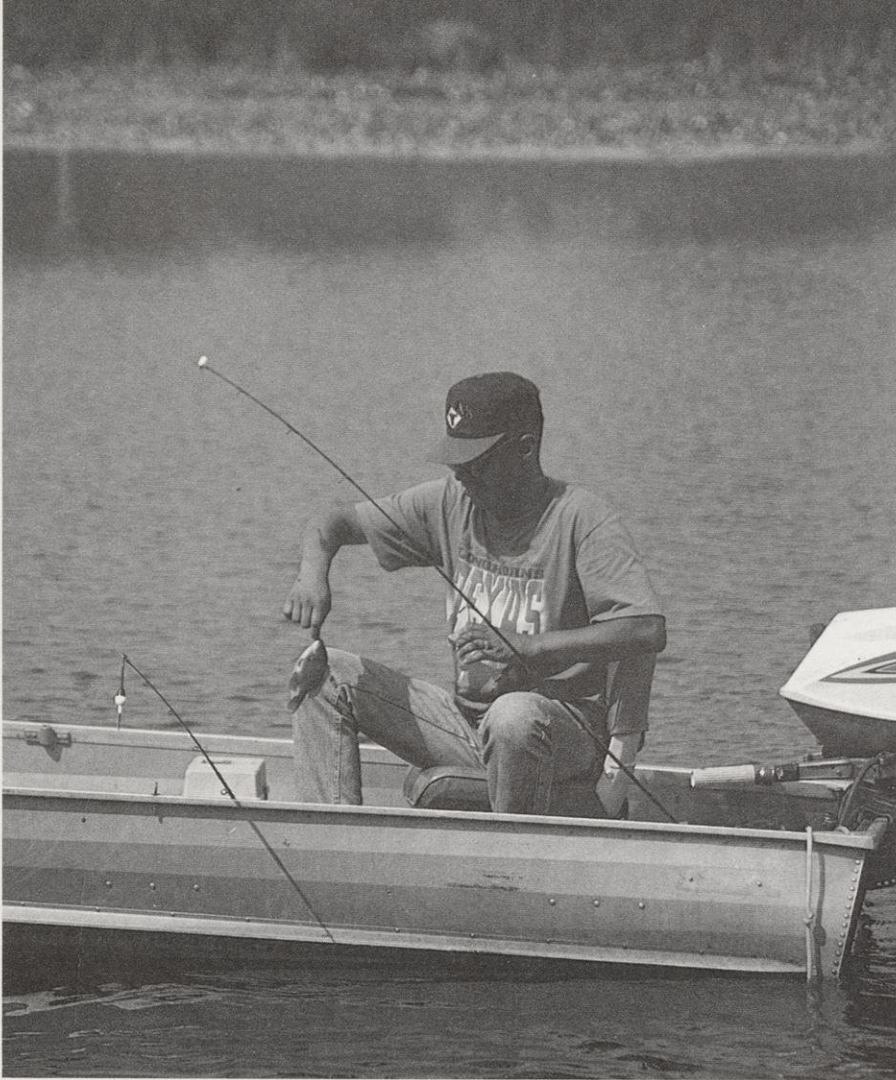


Do weedy lakes produce more or fewer panfish? The answer isn't clear. Weeds provide hiding places from predators, but dense weeds inhibit the search for food. Insects are more abundant in weedy waters, but thick weeds give water bugs more places to hide.

left the calculation to evolution. So each fish's genetic program influences its growth rate.

Here we encounter an interesting complication: male bluegills have more than one reproductive strategy. Some males become sexually mature

seen near nests. Large predators may have the opposite effect. The small sneakers are more vulnerable to predators than the large parental types. If the factors that affect male development were better understood, it might be possible to devise strate-



ROBERT QUEEN

By keeping larger fish, anglers can change the age structure and slow the growth of panfish populations. Differing lake conditions warrant a variety of strategies to enhance fishing.

improves as they grow older.

Anglers, by contrast, prefer to keep the largest panfish. Creel surveys verify that anglers sort their catch and take home 20 to 30 percent more large fish than are found in the natural panfish populations. Since large fish are scarcest, anglers can effectively and selectively clean out the large panfish even though they come nowhere close to cleaning out the lake.

Anglers also change the size structure of a bluegill population in another, more subtle way. By searching for the biggest fish, they often target nesting males. In spring, these big fish are aggressive, easy picking. The nests are easy to see in shallow water, the males stay on the nest and they will attack nearly any bait thrown into their territory. By removing the nesting male bluegills, anglers may contribute to stunting and decrease the overall fish population since the unprotected small fry are easier targets for predators.

Bluegills that knock your socks off

Managers have to experiment with several options in their search to increase the number of large bluegills in Wisconsin lakes. For example, fish managers might remove small bluegills or boost predator populations. In some situations, thinning out the small fish might increase the number of big fish, but taking steps to beef up the bigger fish would be preferable to trimming the population. Since the major strain on big panfish is angling pressure, the most effective management strategy might be new panfish regulations.

Most anglers would support lower bag limits on panfish; very few people catch a limit of 50 fish anyway. To effectively reduce the number of fish that are actually taken, the bag limit would have to be lowered significantly. And, as we've noted here on some lakes, reducing the bag limit could contribute to stunting rather

than encouraging larger fish.

Another possibility would be starting a size limit for panfish. For example, an aggregate bag limit might be limited to 50 panfish, of which no more than five bluegills could be more than seven inches long. In lakes where bluegill grow quickly but are caught before they can become big, a size limit could be a very effective means of raising larger fish. In other lakes, where bluegills grow slowly due to sexual stunting, a size limit might allow the larger parental males to emerge and uncap the population's size structure.

Size limits for panfish would be more controversial than bag limits. As one angler put it, the whole spirit of panfishing is to catch for fun and for food. "We can go onto the lake and we don't have to worry if the fish are six or nine inches long — we're going to eat them all anyway."

Other anglers might not mind being limited to a fewer larger fish if there were more large fish to catch. As another angler put it, "It would sure be nice to test size limits on a lake. I think if it was done right, you could show anglers statewide the value of letting big panfish go. If it was the right lake and the right conditions, you could grow panfish that would knock your socks off."

Bluegills will remain Wisconsin's most popular fish — the ones most frequently sought and caught. Many anglers are satisfied with the quality of panfishing, but to keep it that way, managers are anticipating that the same factors pressuring the chunkier game fish will put the squeeze on the littler brethren. The better we understand bluegill biology, the more effective we'll be. □

Martin J. Jennings leads DNR's Northern Lakes Fisheries Research Group from his Spooner office. T. Douglas Beard is a data analyst with DNR's Bureau of Fisheries Management in Madison.

PASTURES *of*

PLENTY



Ed Brick

Sometimes, you have to keep your eyes open pretty wide to envision the vastness of opportunity. Watching cattle lazily eat grass, swish their tails and slowly plod across a pasture isn't exactly a vision of revolution. But it could be. Innovative farmers and public land managers are improving on centuries-old techniques to capture animal power and restore the rural landscape. It's working on farms and it could work on public lands as well.

The technique is called intensive rotational grazing. To use it well, you mix a little high-tech fencing, a little botany, some animal husbandry and a bit of advice from land managers who passed away more than a hundred years ago.

When Europeans first settled Wisconsin, their earliest descriptions of the landscape included much prairie and savanna in the southwest, forests and "barrens" (sand prairies) in the north. These open landscapes were the result of the way Indians managed the land with fire and animals. Indians used animals' natural willingness to browse woody vegetation, graze grasses and eat forbs. Native Americans maintained the grasslands and the brushy forest edges to support abundant game animals that were so important to their survival.

The U.S. government land surveys from 1832 to 1866 described these vegetation patterns in great detail. By the time the government surveys were finished, the lands had already changed considerably as the countryside was usurped by settlers and European plowing and cropping techniques spread across the land. Nevertheless, these surveys provide our best blueprints for restoring hab-

Controlled grazing on public and private property should be an important option in the land manager's toolbox.



Land managers can carefully use grazing cattle to control weedy and woody plants, stimulate new growth, seed different ground cover and fertilize the new crop.

itats on which game and other forms of wildlife can prosper.

The return to grass

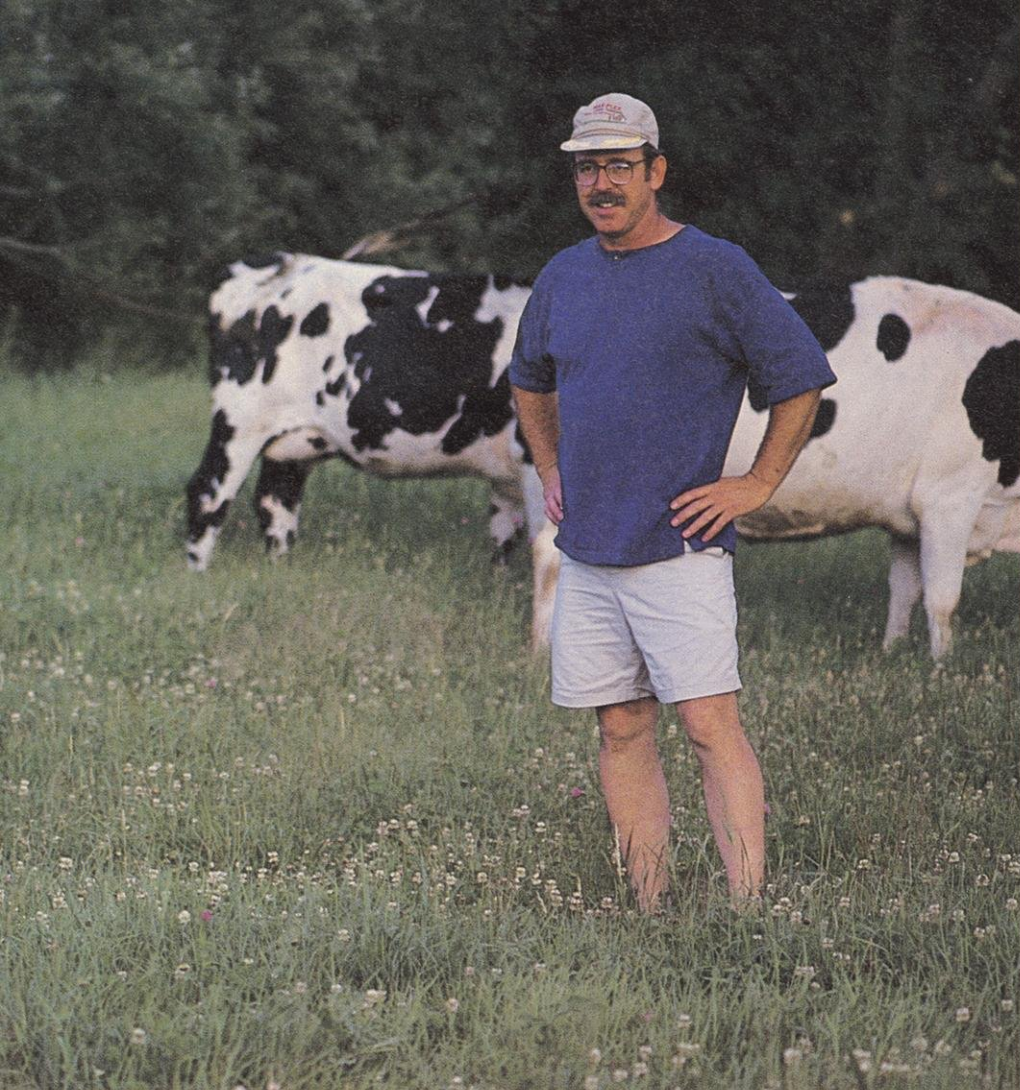
Grazing as a formula for natural abundance includes controlling when, how long and how often animals feed

on plants. The animals fertilize the plants in return. The practice is different from typical and historical grazing practices.

On many U.S. farms, cattle, sheep and pigs don't freely graze. They are permanently fenced in a pasture and eat every blade of grass until the

ground is so bare and compacted than the land sheds water like a tin roof, eroding gullies and quickly washing the soil into streams.

Changing farming practices since World War II have begun restoring the topsoil and vegetation throughout Wisconsin, but we have more op-



ROBERT QUEEN

Dan Patenaude, one of a growing number of farmers developing an "eye for grass" to carefully provide forage for cattle while improving land quality.

portunity than progress.

The new grazing techniques have been perfected by New Zealand sheep farmers. Sheep, with their sharp hooves and teeth, graze grass very close to the ground in a hurry. They would quickly eat their steep-sloped pastures down to bare soil without careful tending. So the New Zealand shepherders have to develop a keen "eye for grass."

Moreover, they use some modern technology to control the herd. Lightweight electric fencing on stakes can be quickly moved. A single strand of smooth steel or poly-wire in combination with modern electric chargers can keep the animals where managers want them. Whereas Indians used fire to control the grazing area, modern electronics, "put the fire in the fence," says Dan Patenaude, one of Wisconsin's grazing leaders. The electric fencing is easy to build and provides tremendous flexibility to move animals through paddocks as vegeta-

tive conditions warrant.

In general, animals graze and browse on a paddock for one to three days in each rotation, perhaps up to six rotations during Wisconsin's six-month grazing season, then they are moved onto a new area.

By keeping the grazing periods brief and the resting periods long, good things can happen to pastures. Grazing reduces the buildup of dead plants that can shade and cool the ground. Warm ground produces more grass during the summer season just as mowing a lawn a few inches high stimulates new growth.

By controlling when animals are moved onto specific parcels, farmers can slowly switch the kinds of plants growing in the pasture, if that's desirable. For instance, cool weather plants that are repeatedly grazed before they can set seed will gradually cause those species to disappear.

Moreover, the animals themselves can be used to introduce new plants



ROBERT QUEEN

Portable, lightweight electric fencing can keep grazing animals exactly where you want them for the right period of time.

into the pasture. Studies by the Missouri Department of Natural Resources show that the insect populations most important to birds were red clover fields and native grasses rather than the cool season grasses typically used for ground cover. Legumes, like the clovers, have hard-coated seeds. Feeding these seeds to animals in their mineral rations scratches up the hard seed coat. It passes through the animal and is deposited in manure, ready to germinate. Or grass seeds could be broadcast on the paddocks before the animals graze. Their hooves would trample the seeds into the ground and effectively sow them. Again, the herd manager need to judge how much grazing the grass can handle and when it's time to move animals on.

It sounds tricky, but many farmers in Wisconsin practicing sustainable agriculture are gaining that sharp eye for grass. They are reducing their costs tremendously, improving their soil and keeping their animals where they want them, when they want them there.

Management on the public side of the fence

Fine you say. Thanks for the farming lesson, but what does this have to do with recreation and public lands? Plenty. First, some of these same grazing techniques might be usable on

public lands to remove brush and re-establish more desirable vegetation. Second, we may be able to save some money if animal grazing can supplement lawn mowers and controlled burns to maintain wildlife cover in some areas. Third, we just might create a win-win situation for DNR properties and their farming neighbors if grazing on public lands was carefully controlled to meet land management goals, compensate state coffers and provide a cheap source of forage for farmers.

Jim Keir, wildlife biologist of DNR's Buena Vista Marsh in Portage County, and Tom Becker, wildlife supervisor of the Bong Recreation Area in Kenosha County, are already using cattle to control brush. The two managers work with farmers to stock young cattle on controlled paddocks to browse back areas overgrown with young willow, aspen and box elder. Larger brush and trees must still be cut back, but careful rotations of cattle can keep new shoots in check.

Wildlife managers are careful to limit grazing through May and June when songbirds and grassland birds are nesting. They can afford to wait until early July when warm weather pastures provide food without endangering wildlife.

As we move ahead to manage public lands even more deliberately, we will decide how the public portion of the landscape should look. Controlled grazing may be an important tool to sustain a wide variety of plants and animals while using fewer chemicals, less energy and less funding to maintain public lands.

The appearance of dairy or beef cattle on public lands might startle or offend some observers. But results from proper management of animals on the land could lead to startling improvements in vegetation type, variety, vitality and wildlife productivity. On public lands, grazing timing and frequency must reflect the needs of nesting birds, wildlife habitat and goals to restore a variety of vegetation. These benefits will gradually appear as vegetation types shift toward native species.

Greening the public's grasslands

Given all the controversy and questions about private grazing on public lands in the West, you might think that this is all a pipedream. It isn't. Step back and take a look at the landscape. The Nature Conservancy, for one, is using rotational grazing management to maintain parcels at several locations from Nebraska through Kansas into Oklahoma. Both

erty near Muscoda.

Land management using intensive rotational grazing gives us a tool to maintain a vital, dynamic community of plants and animals that sustain each other's life cycles. Native Americans understood this web before European settlers started a coast-to-coast movement to tame a wilderness. We should attempt to emulate the Indians' practices, with appropriate adjustments like electric fences to reflect modern circumstances like private



Fort Niagara, Nebraska where grazing cattle are maintaining desired types of grasses on rangelands. Private land conservation groups, the U.S. Fish and Wildlife Service and Wisconsin DNR property managers are experimenting with these techniques to supplement or replace mowing, cutting, herbicide application and burning.

European-type cattle and native bison and elk are being used on Conservancy land. The U.S. Fish and Wildlife Service plans to use buffalo and elk in the same manner on the Walnut Creek Wildlife Refuge near Prairie City, Iowa. Even closer to home, The Nature Conservancy plans to use grazing animals to maintain the Nachusa Grasslands near Dixon, Ill. In Wisconsin, discussions have been held to consider using young dairy cattle from a neighboring farm to help restore the Thompson Prairie south of Blue Mounds. The Winnebago Tribe is also proposing to introduce a herd of buffalo to maintain portions of the tribe's 600-acre prop-

erty and speeding cars. We can show respect for their knowledge, which led to the wide diversity of plants and game Europeans marveled at when they first arrived.

Putting grazing animals back in the picture can make both economic and environmental sense if herds are managed to increase both wildlife and diverse plant communities on public and private lands in Wisconsin. □

Ed Brick is a land use historian, consultant and civil engineer who worked for the Department of Natural Resources for 20 years. Mr. Brick is pursuing his historical explorations and raising prairie plants at his rural Oregon, Wis. home.



ROBERT QUEEN

THE NEW WHEY

Once considered a waste, whey is now made into almost as many products as cheese itself.

Tina V. Bryson

The Cheesehead hats and shirts, familiar at sporting events, perpetuate the reputation and good-natured pride in Wisconsin as the Dairy State. But did you realize that if Wisconsin were a nation, it would rank third in world cheese production? More than 90 percent of the state's milk goes into manufactured dairy products — in 1992 alone, 24 billion pounds of milk, two billion pounds of cheese and more than 18 billion pounds of a by-product, whey.

Whey is the liquid that cheese-making alchemy separates from curd. The curd is skillfully mixed, flavored and aged to form creamy Muenster, nutty Swiss and sharp Cheddar. Until the last 10 years or so, cheesemakers hadn't been challenged to turn the whey into a similar variety of products.

Just as cheesemaking lore in Wisconsin stretches back to 1858, whey has an equally long and interesting history. According to Jerry Rodenberg, DNR wastewater specialist in Madison, whey was the cheesemaker's curse — nine pounds of it for every pound of finished cheese.

Rodenberg said that decades ago cheese factories were located very close to two commodities: dairy farms because poor refrigeration limited how far milk could be shipped, and streams, which supplied ample water, cooling, and an outlet for wastewater. Places to take or process whey had to be located nearby too, because it spoiled like milk.

"There was no economic market for whey," he recalled. "It was used to feed the pigs and nearly two-thirds of Wisconsin's whey was spread on the land as fertilizer." In 1976 one of the earliest environmental laws, Natural Resources Code 214, limited the kinds of industrial wastes that could be dumped on land. Whey was

wastewater section chief, spent two years wading through the controversy as the public stink over whey separated rural regions from urban lawmakers.

"Citizen complaints and pollution problems were being attributed to whey mismanagement," Witt remembered.



DNR BUREAU OF WASTEWATER MANAGEMENT

(above) For decades, the protein-rich whey was spread and sprayed on land as a fertilizer. If it drained into surface waters, whey became a potent pollutant that robbed oxygen and promoted plant growth.

(left) Whey is a very valuable product, but it's difficult to market because some people still consider it a waste. — Carl "Chuck" Krohn of Krohn Dairy, Inc, Luxemburg, Wis.

exempt from regulation because it was considered a fertilizer. However, by the late '70s complaints about how whey was handled mounted from different parts of the state. This environmental era would later be dubbed the "Cheese Wars."

Michael Witt, DNR industrial

When dumped into sandy soil or water, whey is a powerful, potent pollutant. It's loaded with bacteria and provides all the sugars bacteria need to thrive. As the bacteria multiply, they use up oxygen in the water and feed nutrients that spur algae and plant growth.

"There were reports of fish kills and in some places the water from private wells would turn black every spring," Witt said. "Where whey was allowed to pond, it killed grasses and caused offensive odors."

Witt and Rodenberg agreed that two particular incidents escalated the debate over whey disposal. One involved a small dairy in Elroy. Its practice was to dig holes and dump load upon load of whey into the pits until liquids ran over onto other people's property and wetlands. The second incident involved a cheesemaker in Dodge County.

"The Dodge County firm would apply whey to the soil all winter. In the spring, drinking water wells in the surrounding area would spew forth polluted water," said Rodenberg. "The company had a spray system that sprayed all the whey in one spot. The whey would percolate through the soil and get into the groundwater."

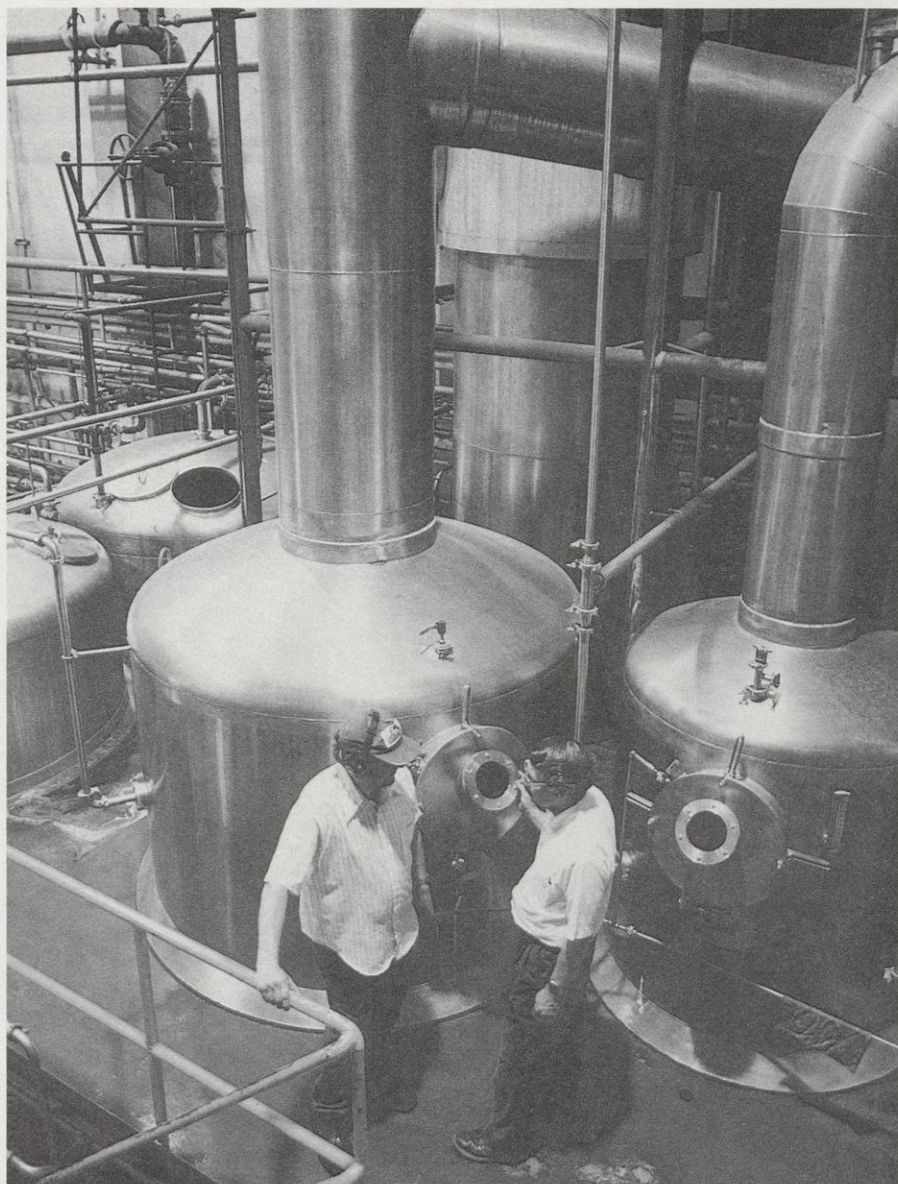
In 1979, neighbors began noticing a brownish scum on the water in the toilet bowls and a brownish tint to their drinking water. Nearby residents took photographs of puddled whey in fields and roadside ditches. They petitioned the Public Intervenor's Office in the Department of Justice to intercede.

Those legal pressures led to specific rules regulating whey disposal.

In 1982, the Dodge County company was implicated in the contamination of 25 rural wells and agreed to pay part of the cost to replace them. Within a few years, whey was classified as a "liquid industrial waste and by-product."

It was not a happy decision for the state dairy industry. Agricultural interests viewed the rules as blurring responsibilities of the state environmental agency and the state agriculture department.

James Tillison, then director of the Wisconsin Cheese Makers' Association, appealed to the Department of Natural Resources to classify whey as a food by-product, fertilizer or soil conditioner. Tillison contended that whey-spreading problems were not



Packerland Whey Inc. in Green Bay is one of several state firms that process whey for use in a variety of foods and feed supplements.

ROBERT QUEEN

rampant and the regulations were an overreaction to a handful of complaints. Furthermore, calling whey a waste ignored 30 years of research by the University of Wisconsin.

Arthur Peterson, a respected UW professor of soil science, was an advocate of using whey as a fertilizer. Moreover, whey is used in foods and pharmaceuticals, he used to remind the crowd by waving candy bars containing whey at hearings. Whey provided a cheap source of fertilizer that would soak into cropland just like rain water. The bigger problem, he said, was quickly moving the perishable whey from plant to field and con-

trolling how much and how often whey was applied to the same parcel. If whey is stored in anaerobic conditions, it stinks in a hurry. However, if a half-inch or less of whey is applied to a field and immediately turned into the soil, odors and problems could be avoided, Peterson said.

The final whey rules incorporated Peterson's common-sense guidelines to protect groundwater while accommodating cheesemakers. Today, whey applications on nitrogen-loving crops like corn are limited to one inch the first year. Repeat applications, made in consecutive years, taper the amount to one-half inch per year.



WISCONSIN MILK MARKETING BOARD

You've eaten whey protein in a variety of processed foods, baked goods and pharmaceuticals.

New ways for whey

Still, the cheese industry grew and the amounts of whey increased as well. Cheese factories had to find other uses for this by-product. Typical of the industry was the challenge facing Krohn Dairy, Inc. of Luxemburg, Wis. At the height of the cheese wars in 1982, Krohn produced approximately 30,000 gallons of whey per day.

"Most of our whey was condensed for animal feed," said Carl Krohn. "It provided the protein in dog food and chicken feed. In the early '70s, we landspread most of our whey like most other companies, but 10 years later our industry was looking for other uses. We developed them."

"Now whey is a valuable resource, but people still perceive whey products as inferior because they are seen as a waste. It makes it difficult to market," Krohn said.

These days, whey is separated into protein concentrate and lactose (milk sugar). Whey protein is used in hundreds of foods from infant formulas to Cheetos. The lactose portion is shipped to firms like Packerland Whey Inc. where it is fermented and evaporated to 62 percent solids. Evaporation increases the protein content of whey from 14 percent to a hefty 71.5 percent on a dry-matter basis.

Lacto-Whey is a high-quality, competitively-priced supplement that can be mixed into the diet of milking cows, said Fred Juengst, general manager at Packerland.

The changes in handling whey haven't hurt the cheesemakers. Krohn Dairy's production has more than doubled in the last 12 years.

According to Bud Sholts of the Department of Agriculture, Trade and Consumer Protection's Marketing Division, environmental regulations and global markets challenged all cheesemakers to find other uses for whey.

As whey products have become more valuable, landspreading of whey decreased significantly.

"In the mid '80s, whey and lactose prices were very low, down to 11-14 cents per pound. Then the technology to dry and store the products really took off. Asian markets in particular were attracted to this cheap source of protein and "all of a sudden the price shot up to 45 cents per pound," Sholts said.

Most of the supply came from Holland and Germany, while Wisconsin farmers were still giving away their whey for fertilizer.

And as biochemists and others returned to the drawing board, they came away with more and more uses for whey.

ECOCHEM, a DuPont/Con-Agra

whey processing plant in Adell, Wis., ferments lactose into lactic acid that's used to form biodegradable plastics.

"A large portion of plastics that go into landfills come from food packaging," notes Mark Etzel, UW-Madison food scientist who works on whey projects at the Wisconsin Center for Dairy Research (CDR). "If we can convert food industry waste to plastic wraps that degrade when buried, it would be good for the consumer and good for the environment," Etzel said.

The CDR is also purifying whey proteins for use in infant formula.

Etzel explained that infant formulas now contain two proteins (casein and beta-globulin) that are very low or absent in human mother's milk. "By purifying individual proteins in whey, we can blend infant formulas that are more like mother's milk," he said. "This may reduce the percentage of allergic reactions to infant formula."

Etzel also worked with UW-Madison Chemical Engineer Doug Cameron to develop polysaccharide gums from whey that can be used as food stabilizers in ice cream and salad dressing.

The lactose from whey has also been converted into 190-proof drinkable alcohol. In the mid-'80s, generic brand vodka and gin were distilled from whey.

So the next time you eat a candy bar or a muffin, or feed your baby formula — check the label. This one-time waste is now recognized as a nutrient-rich building block.

A glimpse into whey's future? If one professor in Vermont has his whey (I couldn't resist!), flexible food wrap made from whey protein could replace plastic sandwich bags. But there's one catch — this wrap is edible. Right now he's just working on the flavor. Bon appetit! □

Tina V. Bryson worked as a public information specialist for DNR's wastewater program. She now works for DNR in Milwaukee in the Clean Air Employee Commuting Options program.

Readers Write

WHAT AN ISSUE!

Just want to let you know that I found the February issue most interesting, especially "Seafaring on the Great Lakes" and your special section "It Started with Fire." All in all the magazine is much improved and I

You can savor Justin Isherwood's fine prose in his first novel, The Farm West of Mars, published in 1988 by Heartland Press, Minocqua, Wis. Justin also wrote the text for Wisconsin, a handsome collection of photographs by

O'Lakes race, Walt is the race marshal at the Elton 80 — a mid-distance and sprint race in Elton, Wis.

Being a history enthusiast and a collector of sled dog materials, I recently obtained this photo postcard dating from

fragrance that instantly captivates. It's one of nature's great joys. No perfumer could concoct such a crowning scent.

I'm 81, from the Springbrook area in Washburn County. Seventy years ago we had trailing arbutus in large patches, always secluded. Sadly, the blossoms are short-lived.

I've been a reader since the old Wisconsin Conservation Bulletin days. Some of my old issues have been damaged. What's the price on back issues?

Albert Pratt
Milwaukee, Wis.

Depends on how far you want to go back, Mr. Pratt. We have most back issues of Wisconsin Natural Resources, dating from 1977 on. Prices range from \$1 for earlier issues to \$3 for more recent issues. For a list, write Kathy Kahler, Wisconsin Natural Resources, Box 7921, Madison WI 53707.

Back issues of the old Bulletin aren't so easy to come by; our stock has long been depleted. But the Milwaukee Public Library, 814 W. Wisconsin Ave., has a complete set (1936-1976) that you can peruse and photocopy.



look forward to each issue. You are doing a great job and are a credit to the State of Wisconsin.

Robert G. Dent
Madison, Wis.

ITCHIN' FOR ISHERWOOD

I enjoy your magazine, especially Justin Isherwood's essays. He expresses things so clearly that I can see and feel them all over again. Has he ever had a book of his works published? I would sure love to read it.

Mrs. B.L. Paciorek
Loretta, Wis.

Tom Algire, published in 1981 by Graphic Arts Center Publishing Co., Portland, Or.

SLED DOG DEVOTEES

My wife and I enjoyed the article on sled dog racing ("Pawprints on the trail," February '94). Like co-author Walt Brockman, we train and race a team of purebred Siberian Huskies. Walt was unable to "blow his own horn" in his article, but readers should know that Walt is a highly respected member of the sled dog racing community. Along with managing the Land

around the turn of the century. I thought other readers would enjoy seeing what a dog team from Land O'Lakes looked like back then.

Bob Thomas
Elkhorn, Wis.

FRAGRANT MEMORIES

That was a pretty good article in your April issue on trailing arbutus, but author Anita Carpenter merely glossed over the plant's most outstanding characteristic — its heavenly, exquisite perfume. This is an exotic, soul-stirring, mystical, tantalizing

continued from page 2

The wail is the long, lonely hoo-oo-oo that David Letterman occasionally does on his show. It sounds rather like the mellow note of a clarinet, which is perhaps not surprising because if you took a loon trachea and stretched it out, it would be about the size and shape of a clarinet. The wail carries well because, like a clarinet note, it is a pure tone, and pure tones dissipate slowly.

The tremolo is the quavery laugh that gave rise to the expression "crazy as a loon." Because it is modulated, a tremolo doesn't travel as well as a wail, but it's better for sound location. When a squad car in hot pursuit approaches an intersection, the siren is switched from wail mode to a warble because that sound is easier to pinpoint. For similar reasons, loon parents use tremolos to keep tabs on their chicks on summer nights.

Yodels, the most spectacular call in the loon's repertoire, are distinctive shrieks, described by one less-than-enchanted gentleman I met as "just plain hollerin'." Sliding up the scale from a wail-like introduction, a yodel ends with paired notes repeated as many as 15 times. In full yodel, a male heaves his body like a bellows, spraying sound across his domain. Each male has a distinctive yodel. A colleague of mine has been able to follow some male loons for as many as 18 years, recognizing them by their yodels. Females do not yodel.

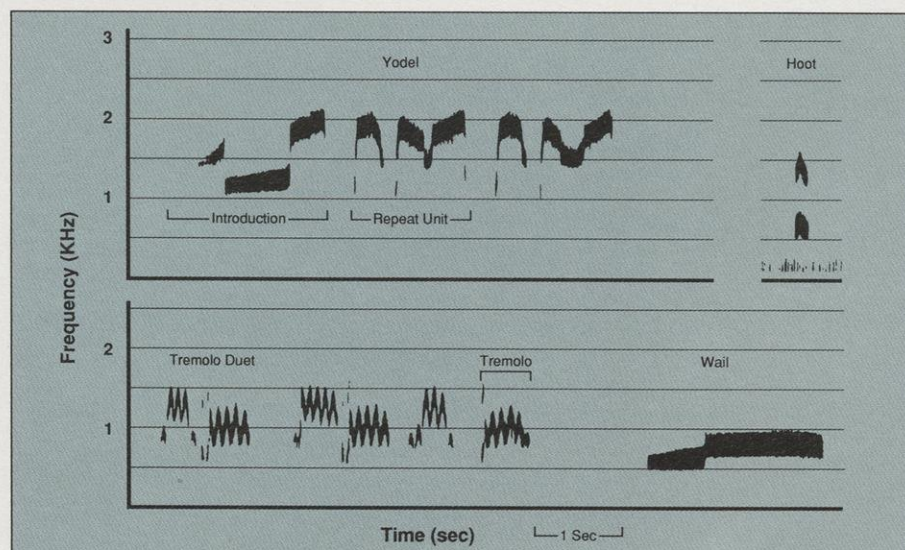
Loons are most vocal at night and during the weeks before nesting. On any calm night in May, a listener is likely to hear the loons calling one another, a medley of wails, yodels, tremolos and hoots that echo across open water for miles. As the calls become familiar, the listener may begin to recognize conversational units, such as bouts of wailing, tremolo duets and loon choruses.

This spring, shortly after the loons returned, I overheard a calling bout on a small lake in Vilas County. One bird called periodically throughout the night. It wailed 10 or 20 times, was silent for half an hour, wailed a couple of times, was silent for two hours, then called again. There were



STEPHEN J. LANG

Biologists are recording and hypothesizing on the meaning of loon yodels, hoots, tremolos and wails prevalent during the breeding season.



other birds in the vicinity, but none responded. Wails often precede extended calling bouts, which has led one observer to liken the wail to dialing 1 before placing a long-distance telephone call.

Female loons sometimes wail or tremolo while their mates yodel, perhaps by way of standing by their man. Tremolo duets may soon follow.

But the ultimate Northwoods experience is a nocturnal loon chorus. On lakes that are home to two or more loon pairs or where several small lakes are within earshot, choruses are common early in the breeding season. A few hours after sunset, almost without warning, loons begin vocalizing, one after another, the calls overlapping in a cacophony of weird sounds, until as suddenly as it started, the calling stops. The birds then chorus sporadically throughout the night. Choruses are spellbinding, but what are the birds doing? My research sug-

gests they are asserting their status as healthy territorial adults, avoiding daytime confrontation by nighttime vocalization.

Once nesting begins, Northwoods nights become much quieter. Loons still call occasionally, but by the end of July, the nights are nearly silent.

To be fair, it is not inconceivable that a Texan would see a loon. The birds have two homes. In the winter they bob up and down at sea, off the Atlantic, the Pacific or Gulf coasts. But by all accounts, they are silent during the winter, barring an occasional soft hoot. They give throat only after they've returned to their Northwoods summer homes. □

Lauren Wentz is an assistant professor of biology at UW-Whitewater. She has recorded and studied nighttime loon calls in northern Wisconsin and the Upper Peninsula of Michigan for seven years. Wentz is currently studying loon behavior in Alaska where summer nights do not get dark.

