A person wearing a wide-brimmed hat, a light-colored shirt, and waders is wading through a shallow, rocky stream. The stream is surrounded by dense green foliage and trees, creating a lush, natural setting. The water is clear, and the rocks are visible beneath the surface.

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Montana Outdoors

MAY-JUNE 2010

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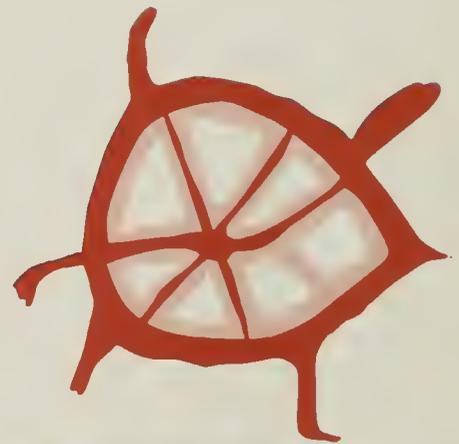
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FLASHY SWIMMERS Shiners, a type of minnow, are named for the way sunlight reflects off their shiny scales. Learn more about Montana's minnows on page 20. Photo by Eric Engbretson.

FRONT COVER Fishing solo on a Blackfoot River tributary. Find secret streams like this on page 8. Photo by Craig & Liz Larcom.

Wolves inspire passion

I just read your article about wolves ("A Steady First Step," March-April) and am sorely disappointed. The only guy you interviewed has lived in the Bitterroot only 12 years—and he thinks wolves are sacred. He's barely been here long enough to know how good we used to have it. I really think it would have been appropriate to mention wolves eliminating our huntable surplus of game, such as the 90 percent reduction in elk numbers in the Taylor's Fork of the Gallatin, and the more restrictive regulations across much of western Montana. I lived in Gardiner from 1986 until 2005 and saw firsthand the decimation of the northern Yellowstone elk herds. We've always had droughts, bears, and whatever else these losses were blamed on, yet the herd always bounced back with remarkable resiliency. Then we got wolves and, well, we all know what has happened since. I think it would be nice to see FWP step up and say "enough is enough" before it's too late everywhere else.

JIM DARR
Livingston

For the latest biological research on how wolves affect deer and elk, see "Another Mouth To Feed" (September-October, 2009).



"So far I've caught a cottonwood, lost a nice aspen, and now I've got a willow on the line."

A STEADY FIRST STEP

BY TOM DICKSON

What Montana learned from its first regulated wolf hunting season

What Montana learned from its first regulated wolf hunting season

How close the wolf hunting season of 2009 came to being a disaster for wolf recovery has been reported in a recent issue of *Montana Outdoors*. The wolf hunting season was a success, but it was not without its challenges. The wolf hunting season was a success, but it was not without its challenges. The wolf hunting season was a success, but it was not without its challenges.

CONTRIBUTOR

"This first hunt was a learning experience. We really didn't know how it would work out, because there never had been a wolf season in the lower 48 states."



now employs, including the use of hunters to assist in population management. Without this control, I fear wolves will be exterminated once again, by whatever means necessary. There is a limit to people's patience.

MIKE JONAS
Helena

More deer overhead

I enjoyed reading the article "Conserving Wildlife (and Culture) on the Flathead Indian Reservation" (March-April). It's amazing how something as simple as over- and underpasses can have a positive effect on wildlife and the people who drive on our highways. The Evaro overpass you mention will soon be joined by another now under construction north of Wells, Nevada—coincidentally also on U.S. Highway 93—on a stretch with high deer mortality.

JOHN BOEHMKE
Billings

Corrections

Several readers wrote to point out that we mistakenly identified a bear on page 40 of our article on Flathead Indian Reservation wildlife management (March-April) as a black bear. "The long, light-colored claws on the right front paw, the 'dish' face, and the slight bump on the back lead me to believe it is a grizzly," wrote one reader. Also, we misidentified the tree on the back cover of that issue as a whitebark pine when in fact it was a Douglas-fir.

We welcome your comments, questions, and letters to the editor. We'll edit letters as needed for accuracy, style, and length. Mail to: Montana Outdoors, P.O. Box 200701, Helena, MT 59620-0701. Or e-mail us at tdickson@mt.gov.

I love your magazine but am disappointed you continue to publish letters to the editor that are ignorant and lack any understanding of how an ecosystem functions. One example is the letter "Wolf story raises hackles" (March-April). How can you print a letter that states, "Wolves are killing machines only, and the food chain functioned quite well without them since they were eliminated in 1930.?" This is such a ridiculous statement that it is incomprehensible to me how a conservation magazine could give space to it. I really expect better from you.

JOHN ARENSMEYER
Torrance, California

One letter in the March-April issue was unsettling. The writer states that John Muir, the father of conservation, asked President Theodore Roosevelt why he had not outlawed the "childish" activity of hunting. The writer goes on to ask Montana Outdoors readers who hunt the same question. I have partici-

pated in this pursuit for the better part of 50 years and have never thought it a childish endeavor. In fact, I am proud of the skills, friendships, contributions, and experiences I have gathered over the years. It was Teddy Roosevelt, the hunter, who Muir sought to further his cause of conservation. In fact, most true hunters I've known through the years are conservationists. Hunters and fishermen have paid for the recovery, reestablishment, and health of this nation's fish and wildlife. That is why the wolf re-introduction to Montana and other western states was a slap in the face to those of us who have footed the wildlife recovery bill. Yet we tolerated it lawfully, though grudgingly. We continue to do so as the wolf's numbers have multiplied beyond any possible logic. My friends who operate ranches in my area are now subjected to economic damage by these creatures. They certainly did nothing to deserve this added burden to their lives.

Despite this, I do not advocate exterminating wolves, or any other species. But their numbers must be regulated and controlled, if they are to survive. This requires the scientific management techniques that our state

INTO THE HEART OF IT

Given the choice between float-fishing a big, famous blue-ribbon trout river or wading some little-known brush-choked stream, I'll take the creek any day.

Don't get me wrong. I'd like to hook into a 4-pound rainbow on the Missouri or Big Hole as much as anyone. But for sheer enjoyment and relaxation, I can't think of anything that tops fishing for 8-inch cutthroats on a mountain stream.

Not everyone thinks of backwoods trout fishing as relaxing. There's the bugs. And the often impenetrable streamside vegetation. Nowadays my adult sons occasionally accompany me to fish small streams, though truth be told they prefer full-sized rivers. But when they were boys, it was like pulling teeth getting them to my favorite trout creeks. They got tired of swatting mosquitoes, busting brush, and untangling snagged flies from branches.

They're in good company. The vast majority of fly anglers living in and visiting Montana shy away from skinny waters and instead flock to the Madison, Bighorn, and other famous rivers. They like the big water, big casts, and, of course, big fish.

But big is relative. To me, fighting a foot-long trout in a narrow meadow stream on a 3-weight fly rod is as exciting as working a fish twice that size with a 7-weight on the Yellowstone.

What I like most about small-stream fishing is it takes me into the heart of nature. It's exciting to work your way upstream, never knowing what you'll see around the next bend. Maybe it will be the perfect hole, with trout rising everywhere you look. Or maybe you'll see wildlife unaccustomed to human visitors. Over the years while fishing small streams I've seen otters, mink, kingfishers, dippers, warblers, ospreys, and more. One time while fighting my way through a tangle of brush I peered out to see, just a few yards away, a herd of grazing elk, unaware of my presence (until the bull caught wind of me and the

What I like most about small stream fishing is that it takes me into the heart of nature.

whole group bolted). It's that kind of intimacy with the natural world I find so appealing.

I'm biased of course, but I believe fly-fishing small streams takes as much skill as fishing big water. Sometimes more. My favorite challenge is seeing a deep spot beneath an overhanging branch where I just know a nice fish is resting. Should I try a slingshot cast, where you hold the fly in your fingers and use the rod to fling it at the target? Sneak along the bank to just upstream of the spot, then reach over the brush and lower the fly down to the water? Or take a chance with a short cast, knowing the fly could easily end up snagged? It's always a thrill to get the perfect drift and see the fish rise up to take the fly.

Even with the challenges of confined casting and having to bushwhack to get to the better spots, backwoods fishing helps me unwind more than any other activity. When I'm on the stream, I get so focused on what I'm doing that time disappears.

My wife could never understand. She'd ask how I could get so absorbed with a stream that time lost all meaning (causing me to be late getting home more than a few times). She likes to fish, but only in small doses.

Then last August I took her to a small meadow creek. It was grasshopper season, and that day the browns were coming out of the water like torpedoes to chase our imitations. After a few hours of non-stop action, I figured Alice had had her fill. But she wouldn't quit. Every time we'd finish working a pool, she'd say, "Let's go up to that next one!"

At that moment I had the satisfaction of saying to her what so many dedicated anglers long to say to their spouses: "See, *this* is what I've been telling you about for the past 40 years."

—JOE MAURIER, *Director, Montana Fish, Wildlife & Parks*



DEWEYBROWN.COM

NATURAL WONDERS

ILLUSTRATION BY PETER GROSSHAUSER

Q. I've read that snowpack in Montana has been very low. How will that affect fishing this season?

A. Overall, not by much. According to the Natural Resources Conservation Service, snowpack on April 1 was well below average because of meager winter snowfall in the state's western half. Stream flows across Montana are forecast to be 58 percent of average. That said, fishing is expected to remain very good in most popular rivers and streams. But those not backed up by reservoir storage may be very low, especially in July and August. Good rainfall could change all that, however, so before heading out to fish, call local fly shops for stream conditions.







For three consecutive years, Bozeman photographer **Cindy Goeddell** watched this female coyote fish for spawning cutthroat trout in a Yellowstone National Park stream. "The coyote would work her way upstream, looking behind every boulder and under banks and into pools," says Goeddell. "Then she'd sneak up and strike, emerge with a fish, and trot over to the shade of a large tree and enjoy her prize. She tried to teach her mate and her pups how to fish, but they'd have nothing to do with it." The radio-collared coyote, part of a park study, was nine years old the last time Goeddell saw her: "That's old for a coyote, especially considering she'd lived most of her life in the middle of the Druid wolf pack's territory." ■



NO FEAR

Participants in Becoming an Outdoors-Woman workshops learn how to shoot, fish, build a fire, make a campsite, and other basic outdoors skills.

ISTOCKPHOTO.COM

While taking daily walks near her home in Stevensville, Norma Fender can identify the tracks of cats, dogs, and other animals, as well as many native plants. The 59-year-old Spanish language court interpreter also can build a fire, pitch a tent, cook in a Dutch oven, and shoot a shotgun safely.

It wasn't always so. When she moved to the Bitterroot Valley in 1993, Fender was intimidated by the outdoors. "I was fearful, especially of the possibility of getting stuck somewhere while out on the road," she says.

No longer. Fender admits she's no Grizzly Alice, but she has gained confidence in the out-

doors by taking several Becoming an Outdoors-Woman (BOW) workshops. "For my job, I travel around Montana on my own, and I don't feel as frightened as I did before," says Fender.

Giving women confidence in the outdoors was one reason BOW was created. Another was to remove barriers that prevent women from learning about hunting, fishing, camping, and other outdoors activities. Liz Lodman, who coordinates the FWP program, says a recent department survey of participants verified that BOW is achieving both. For instance, 50 percent of survey respondents said that before taking a class they were unsure how to become involved

in outdoors activities. That dropped to only 16 percent after respondents had taken the class. Other obstacles to participation, such as "fear of looking stupid or unskilled," "being the only female in the group," and "fear of getting hurt while participating" showed similar declines. "That tells us BOW really is helping remove barriers," says Lodman.

Other survey highlights:

- BOW helped improve fishing skills: 92 percent
- BOW helped improve hunting skills: 80 percent
- BOW helped improve other outdoors skills: 93 percent
- Overall satisfaction with BOW workshops: 99 percent

Lodman says 94 percent of survey respondents said what they liked most about their BOW experience was learning new skills. Other reasons cited in the survey were being with others who have similar interests and gaining self-confidence to participate in outdoors activities.

"Another encouraging survey

finding was that 90 percent said they have urged female friends and family members to participate in outdoors activities, and 86 percent have encouraged other women to sign up for a BOW workshop," Lodman says. "This tells us they gained skills and knowledge to share with others and found the workshop valuable enough to recommend it to others."

Lodman adds that she was also pleased to learn that BOW classes help women already skilled in fishing or hunting. "Roughly 25 percent of survey respondents said they 'frequently fished' before taking a fishing-related BOW class," she says. "That increased to 41 percent after taking the class. That's exactly what we want to see—more participation by women, more fishing, hunting, camping, and other outdoors recreation."

Though Fender hasn't begun hunting or camping yet, she likes learning those and other skills. This year she plans to sign up for her fourth BOW workshop (see box, below left). "The instructors are absolutely great," she says. "I am so very happy to have BOW in my life."

MT and BC agree to protect North Fork Flathead

FWP fisheries biologist Mark Deleray has spent years conducting research on the North Fork of the Flathead River. So he understood the significance of an historic agreement signed in February by Governor Brian Schweitzer and British Columbia's Premier Gordon Campbell to protect the 5.7-million-acre watershed from all

SIGN UP TODAY

This summer's BOW workshop is August 27–29 near Bigfork. Those with little or no experience, or anyone wanting to learn a new skill, are welcome. The \$200 fee covers instruction, meals, and lodging (which includes indoor restrooms and hot showers). For more information, visit fwp.mt.gov and look under "Education," or contact FWP at (406) 444-2615 or lodman@mt.gov.

forms of mining and oil and gas drilling. "It's an incredible place, almost wilderness," says the Kalispell biologist. "It's a clean river with great cutthroat trout and bull trout habitat, and it's an important corridor for wildlife like elk, grizzly bears, and wolves."

The two-page agreement commits the province and state to "prohibit the exploration for and development of mining, oil and gas, and coal in the British Columbia Flathead and the Montana North Fork Flathead River Basin...by July 2010." The negotiations call for both sides to reimburse existing mining and coal interests.

In 2009 the conservation group American Rivers placed the North Fork of the Flathead on its list of the nation's ten most endangered rivers. A proposed coal mine in Canada just north of Glacier National Park posed a threat to fish and wildlife in the watershed. An FWP study found that bull and cutthroat trout from as far away as Flathead Lake spawn in tributaries threatened with waste from the proposed development.

The governor says the next step

is for Montana's congressional delegation "to convince their colleagues this is the right thing and the right time to do it."

Montana senators Max Baucus and Jon Tester are drafting federal legislation to back up the deal, which Tester calls a "good-faith effort to work together."

No, I'm not "abandoned"

Fawns, fledglings, baby rabbits, and other young wildlife that appear to be abandoned or orphaned usually are not. "It might seem like the most humane thing is to try to 'rescue' these animals, but that's not the case," says Gary Olson, FWP wildlife biologist in Conrad. According to Olson, many young animals, born in May and June, appear to be helpless or lost when discovered in backyards, parks, and forests. "Usually the mother is nearby and will return as soon as you've left," he says.

Wildlife parents often temporarily leave their young to forage for food, but rarely do they part for long. Doe deer and cow elk, for example, must leave periodically to graze and build



ERIK ARIGOTTI

An orphan? Most likely, say biologists, its mother left only for a few moments to graze and is nearby waiting for you to leave.

energy for nursing. If you move a baby animal, says Olson, that makes it harder for the mother to find it. What's more, a mother might reject an offspring covered in human scent.

Some people think it is okay to "adopt" a baby wild animal and make it into a pet. Not so. It's illegal to possess or remove wild animals. What's more, most wildlife, even the young, can scratch, bite, and potentially carry rabies.

"When wild animals become conditioned to human scent and food, that becomes their death sentence," says Olson. "Eventually a game warden or biologist will have to dispose of them because they keep causing problems. People essentially love them to death."

What should you do if you discover an apparently abandoned wild animal? Count yourself fortunate for seeing such a sight and then, hard as it might be, leave the animal alone.

Place name origins now on-line

Ever wonder why the Big Hole River, Tiber Reservoir, Absaroka Range, and other places are named as they are? Now you can find the answer in seconds.

The Montana Historical Society (MHS) and Montana State Library have announced a new on-line application based on the book *Montana Place Names from Alzada to Zortman*, published in 2009 by MHS



Press. The book details the origins of place names for 1,263 geographic locations across Montana. The new on-line Montana Place Names Companion adds even more detail by allowing Internet users to see the sites on either topographic maps or in actual aerial photographs. Viewers can even zoom in to see buildings and parking areas.

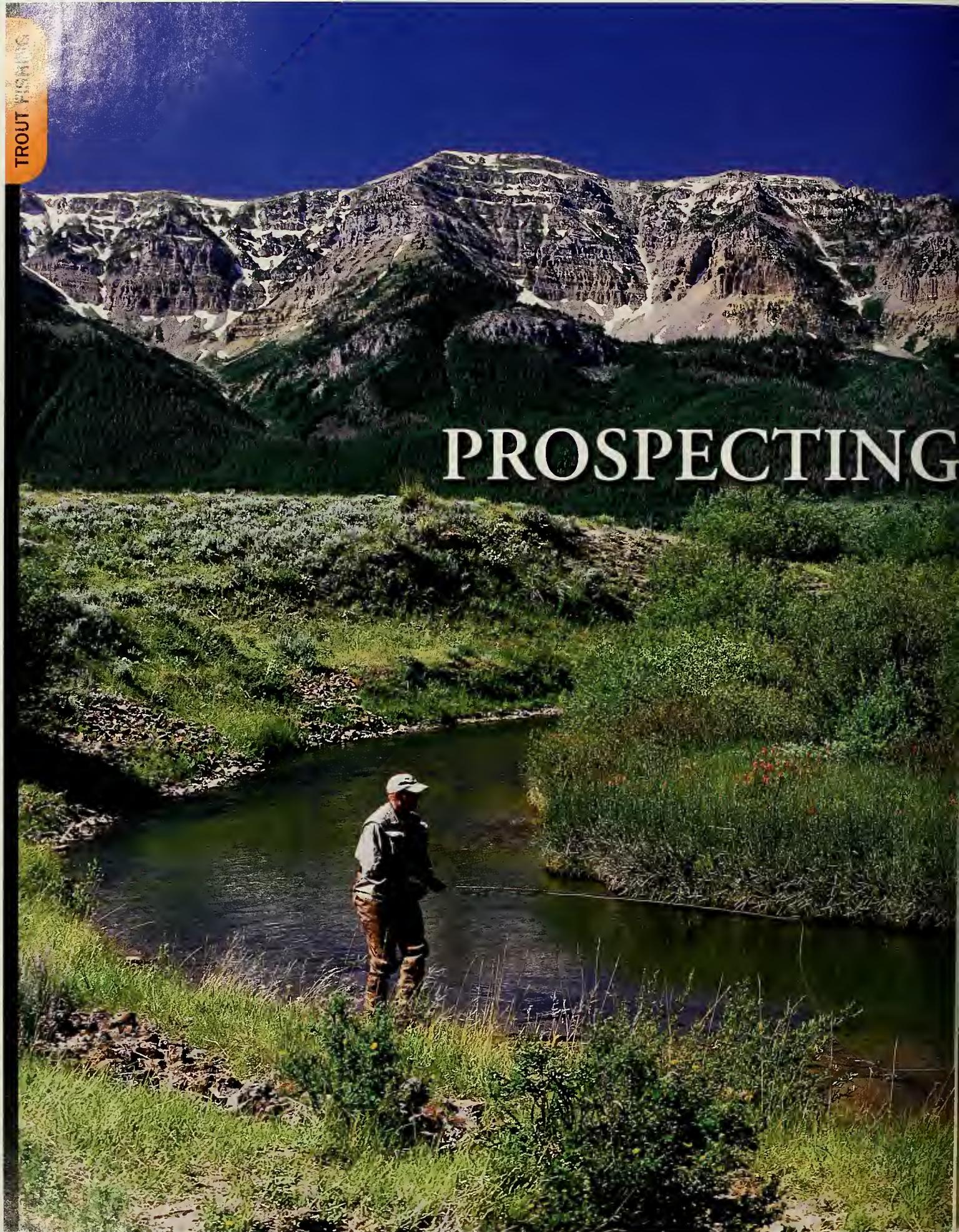
Visit the place names website at <http://mtplacenames.org>.



The North Fork of the Flathead: home to grizzly bears, elk, wolves, and cutthroat and bull trout spawning tributaries.

BOOBY SHEREMETA

PROSPECTING





SMALL TROUT STREAMS

Leave Montana's famous rivers to the teeming hordes. Creeks and minor tributaries are where an angler can find fly-fishing solitude these days.

BY JOHN BARSNESS

One June day many years ago, a cousin and I were floating the Bitterroot near Missoula when we saw a good-looking little stream flowing into the river. We paddled my canoe to the bank and worked our way up the creek, casting dry flies onto the pools and deeper riffles. A quarter mile upstream, the creek flowed next to a gravel road. We were drifting our flies along the limestone riprap, where there just *had* to be a nice trout, when a pickup came down the road and pulled over above us. A middle-aged guy in a cowboy hat rolled his window down and asked, "Doing any good?"

I shook my head. "Nothing."

He smiled. "That's not surprising. This crick goes dry toward the end of July."

He rolled up his window and drove off; I didn't hear him laugh, but imagine he did. I waded into the middle of the creek, the water almost up to my wadered knees, and grabbed a good-sized rock from the bottom. The only thing on it was clean water, no algae or insects. I dropped the rock into the stream and we hiked back to the canoe.

NO ONE FOR MILES A trout angler fishes solo on Red Rock Creek in the Centennial Mountains. Montana is laced with small, little-known streams, many with big trout.

DAVE BROWN

Like any sort of prospecting, the search for small-stream trout doesn't always pan out. But over the decades I've become more attuned to the signs of a possible find. In many cases, the least productive streams have super-clear water, exactly like the water in that beautiful little stream. The best trout streams usually have translucent, greenish water. That's because they're loaded with nutrients and organic matter, the microscopic meat and potatoes that feed aquatic insects that trout eat. On many streams, if you can clearly see all the rocks in the bottom of a pool, it isn't going to hold many trout—and sometimes none.

Streams don't have to go seasonally dry to have transparent water the rest of the year. Some feel the pain of acid mine drainage and other industrial pollution. The two upper forks of a small river near my home in Townsend illustrate the point. Both look pretty good, but one flows as clear as turpentine, the result of industrial pollution. The other fork has the telltale greenish water of a fertile stream, along with other indications of potential trout such as more bankside grass and brush. I test-fished the clear fork many years ago, mostly out of curiosity. It does contain some trout, but a 9-incher is a big one, and even the rainbows that size are like supermodels: skinny, with swelled heads.

The other fork is full of fat trout up to a foot long, occasionally bigger. Yet far more people fish the clearer fork, probably because it flows close to a highway and they can see it from their vehicles. The more productive fork can be reached only by a gravel road, and even then it rarely flows near the road. After getting permission from the landowner, you have to park, hike across a pasture, and then fight some willows to reach the bank. This is a little too much work for most anglers.

Accepted wisdom is that 90 percent of the

John Barsness is a writer and co-owner of Deep Creek Press in Townsend.

A general
rule of
thumb for
small streams:
the bigger
the log over
the pool,
the bigger
the trout.



fish are caught by 10 percent of the anglers. In Montana, I suspect this is partly because 90 percent of the anglers fish the same places everybody else does. They fish where they don't have to walk far from where they parked, and they park where everybody else does. You can usually find more (and less-educated) trout by hiking at least a half mile from any popular parking area before starting to fish. If you have to plow through some willows, so much the better.

Willows are always a good signpost for

decent fishing, and possibly great fishing. They shade small streams, cooling the relatively shallow water, and their roots create little still-water rooms where trout hide without much effort, close to the main current where food floats by. Willows also make casting more difficult, keeping average anglers away.

Some of Montana's very best small-stream fishing is in willowed-up waters miles from the nearest mountain. As the land gradient eases, the streams start to wind slowly back and forth. Apparently a lot of people think no mountains or riffles means no trout. It's true that often there are fewer trout than farther upstream in the "classic" water. But in many cases, flatland trout grow bigger. Almost all the 15- to 20-inch trout I've caught from small streams came from slow willow creeks.

A favorite stretch of stream I often fish with my wife, Eileen, flows right next to a public Bureau of Land Management campground. This may seem like a strange place to find good fishing, because the campground is pretty full all summer long. But most of the hundreds of anglers fish the same stretch of water day after day. The campground is fenced from surrounding pasture, meaning that cattle can't graze down the streambank, which is lined with a wide zone of willows, alders, and (perhaps most important) wild rosebushes. Most people don't like to bust through thorns. There's only one place where the bank can easily be reached, a clearing next to the main cluster of camping spots. Judging from the Styrofoam worm containers and empty snelled-hook packages on the bank, the pool by the clearing is the only place anybody else fishes on the entire half mile of stream. It's also the only pool where we've never caught a trout. Eileen and I rarely see a wading boot track along the rest of the creek's banks.

In addition to the campground stretch, the upper reaches of that creek hold quite a few trout. The best fishing is in a mile-long



BANK-TO-BANK CASTING Clockwise from top left: Covering a pool on Wood Creek, west of Augusta near the Rocky Mountain Front; a tiny catch on Prickly Pear Creek near Helena; a brown fooled by a terrestrial imitation is landed on a small stream near Bozeman.



Another general rule is that often the best creeks to fish for trout are near famous rivers.

stretch of canyon not visible from the road. The canyon isn't really deep, but evidently it's deep enough to keep most people from hiking down and then hiking back up again. The steeper creek gradient in this mountain stretch produces fewer pools than stretches along the campground, but the pools are deeper. Many contain big conifer deadfalls. The fallen timber protects young trout from kingfishers and other predators while providing places for large fish to lurk. It also makes casting a little more difficult. Fortunately, accuracy isn't essential. Those fish see flies so rarely that they'll often come up through 2 or 3 feet of water to grab an elkhair caddis. A general rule of thumb for this and most other small streams: the bigger the log over the pool, the bigger the trout.

Often some sections of a creek hold a lot of trout, while other stretches are almost barren. Sometimes the best stream section is farther upstream, above an overgrazed stretch of water down in the valley; other times it's farther downstream. Don't give up on a stream just because you don't catch fish in one spot. Try other stretches. One classic piece of

CRAZY FUN Fishing for rainbows on Big Timber Creek in the Crazy Mountains.

ERIK ARGENTI



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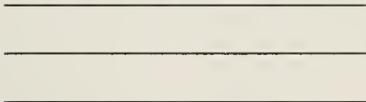
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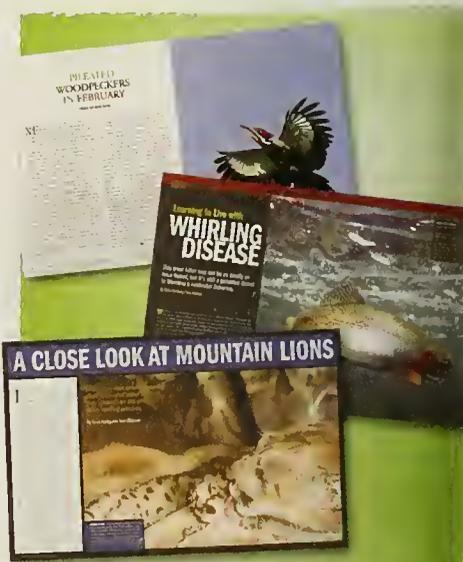
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IN THE THICK OF IT Above: Willows and other shrubs shade creeks, like this small tributary of the Big Hole River. Thick vegetation also discourages many anglers from reaching the prime pools. Above right: Netting a cutthroat in a Blackfoot River tributary.

meadow trout stream I fish in late summer is only a few hundred yards long. It's the lower end of a creek flowing into a big reservoir, and the only section of the creek that holds many trout is trapped between the reservoir and an irrigation head gate. Above the head gate the stream is essentially a ditch, but below the head gate the water meanders under willows and grassy banks. I stumbled upon this stretch while hunting Hungarian partridge one fall in grain fields along the stream's grassy corridor. As my bird dog and I were wading a riffle between two pools to reach wheat stubble on the other side, a half dozen rainbows spooked up into the shallow water. I came back the next day with a fly rod and caught several trout that were fat from eating grasshoppers blown down from the grassy banks.

Some of Montana's best creeks to fish for trout are near famous rivers. One reason is that famous rivers tend to grow big trout because the water is fertile, and their feeder streams contribute to this fertility. Another is that famous rivers attract anglers—but only to the rivers themselves. Drift boats of hatch-

matchers float down the renowned blue-ribbon waters in long lines like freight trains, while local tributaries are almost empty of anglers—and full of nice trout.

Sometimes feeder streams are even more fertile—and thus produce more and bigger trout—than the main river. Rock Creek is an example. Bigger than some rivers, Rock Creek flows into the Clark Fork 20 miles upstream from Missoula. As one of Montana's designated blue-ribbon trout streams, Rock Creek is by no means a secret. But most anglers drive upstream from I-90 and fish the upper stretches, usually right next to the road. What's not so well known is that Rock Creek's incredibly fertile water also bumps up the quality of the Clark Fork. Hardly anybody fishes the lower half mile of Rock Creek, or the Clark Fork just below the mouth of Rock Creek. That's their loss.

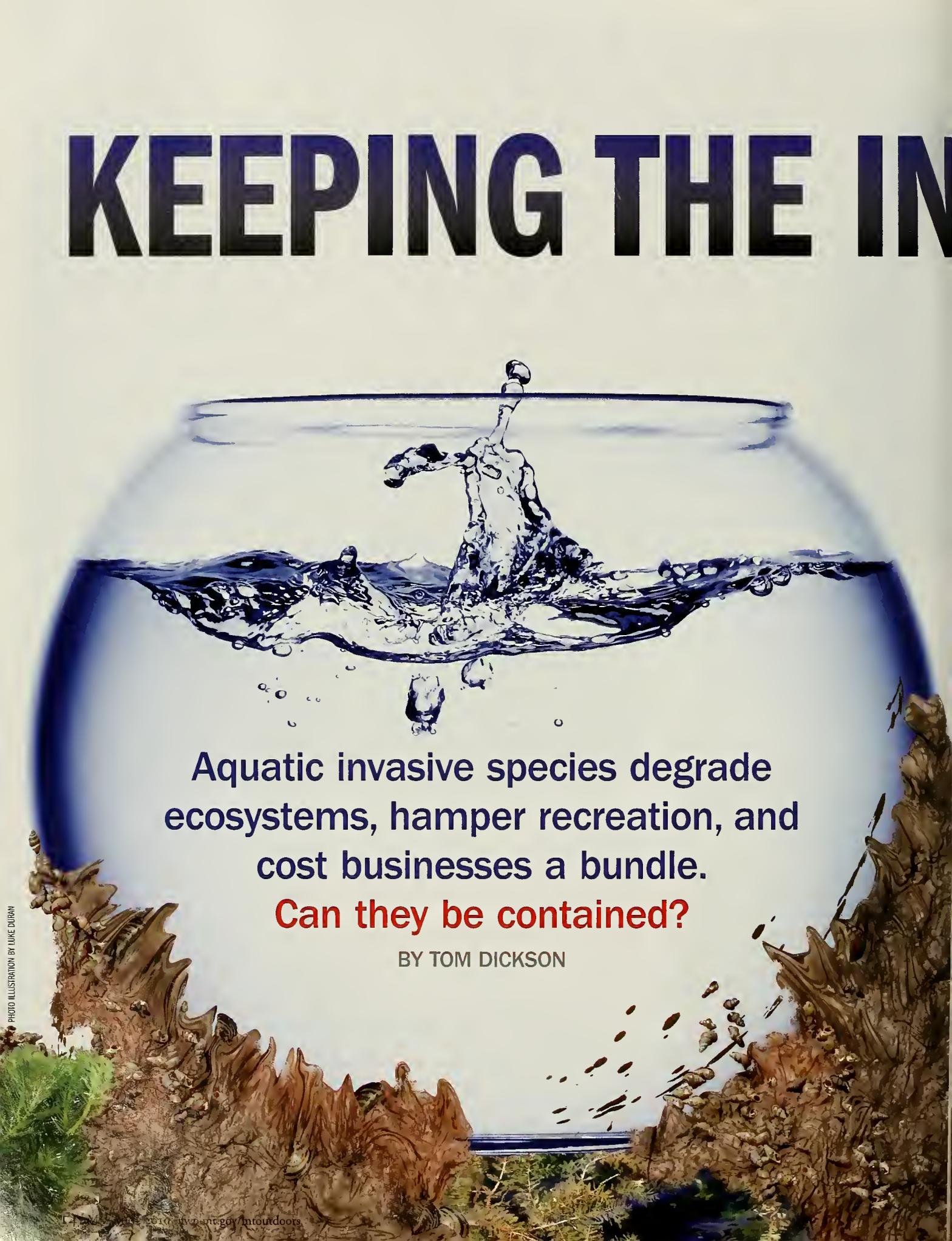
Similar things happen on a smaller scale at the mouths of many small streams flowing into rivers. Some of these are rarely fished because the stream is on the other side of a

river from the road. Reaching them requires heavy-duty wading or a canoe, and most people just don't bother.

The easiest time to prospect any small stream is during grasshopper season, which peaks in August. If any trout are in a stream, they'll come up to a hopper pattern and will also come farther from fly-snagging cover to grab your fly. The weather is often so warm in late summer that the best fishing will be early in the morning or late in the evening. But hey, that's when most of us aren't working.

While fishing is usually a social sport, I grew up in Montana when going fishing meant getting away from town and "lots" of people (lots of people always being a very relative thing in Montana). I always enjoy fishing with Eileen and some friends, but our famous rivers start to lose their allure when somebody's edging closer to where I'm casting, or when drift boats resemble barge traffic on the Mississippi. Both make prospecting for creek trout seem ever more desirable—even if occasionally all I find is a dry hole. 🐾

KEEPING THE IN



Aquatic invasive species degrade ecosystems, hamper recreation, and cost businesses a bundle.

Can they be contained?

BY TOM DICKSON

VADERS AT BAY

IT DIDN'T TAKE LONG. Kansas scientists first detected zebra mussels in the state's 8,000-acre El Dorado Reservoir in 2003. Within just three years, numbers of the fingernail-sized mollusks had mushroomed to 25,000 per square meter, putting the lake's population in the billions. In addition to covering every rock, log, and fishing pier in the reservoir, the foreign mussels filtered zooplankton from lake water, robbing food essential for native fish. "We saw a sharp decline in gizzard shad—the main forage fish here—and the condition of white bass and walleye really declined, with a lot of skinny fish," says Jason Goeckler, aquatic nuisance species coordinator for the Kansas Department of Wildlife and Parks. The pest species has since spread in Kansas to eight other reservoirs. "I've told other states, 'You do not want these things in your waters,'" Goeckler says.

Montana is listening—and also to warnings about Asian carp, VHS virus, Eurasian watermilfoil, and other aquatic invasive species (AIS). The water-borne invaders take over lake and river ecosystems,

kill native fish, and ruin recreational and industrial equipment. "There are so many reasons for Montana to be very concerned about these species," says Hal Harper, a lifelong angler and chief policy advisor for Governor Brian Schweitzer. "This is an urgent matter for everyone in the state."

Adding to the urgency is the ease and speed by which invasive species are spread by boats, engines, wading boots, and other gear of mobile anglers, boaters, fisheries workers, bridge and dam contractors, and irrigators. "You've got anglers fishing the Yellowstone or Fort Peck one day, and then the next day they're at the Bighole or Canyon Ferry," says Eileen Ryce, aquatic nuisance species coordinator for Montana Fish, Wildlife & Parks. "People move around, and they unknowingly carry AIS with them."

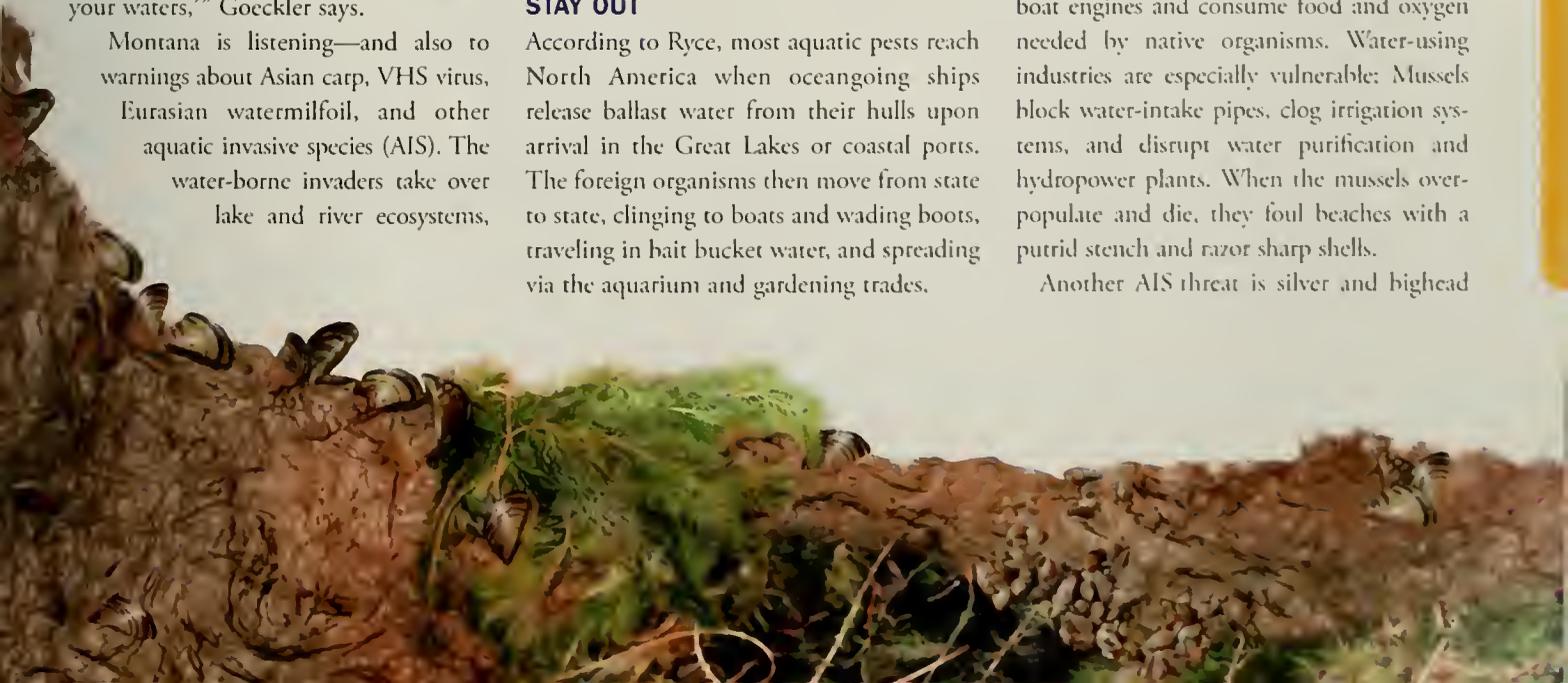
STAY OUT

According to Ryce, most aquatic pests reach North America when oceangoing ships release ballast water from their hulls upon arrival in the Great Lakes or coastal ports. The foreign organisms then move from state to state, clinging to boats and wading boots, traveling in bait bucket water, and spreading via the aquarium and gardening trades.

Ryce says that of the several dozen aquatic invasives lurking outside Montana borders, she and other watchdogs are most concerned about zebra mussels (and the closely related quagga mussels), VHS virus, and Asian carp. First discovered in the Great Lakes in the 1980s, zebra mussels have since spread throughout nearly every major river in the midwestern and mid-Atlantic states. They were likely transported in boat livewells, where the microscopic larvae can survive for weeks. Western states sounded the alarm in 2007 when quagga mussels appeared in Nevada's Lake Mead—the first infestation west of the Rockies. "That was a huge wake-up call for everyone out here," says Ryce.

Lacking natural predators to keep numbers in check, the mussels reproduce and spread at astonishing rates across hard surfaces, blanketing marina piers and boat hulls. They jam boat engines and consume food and oxygen needed by native organisms. Water-using industries are especially vulnerable: Mussels block water-intake pipes, clog irrigation systems, and disrupt water purification and hydropower plants. When the mussels overpopulate and die, they foul beaches with a putrid stench and razor sharp shells.

Another AIS threat is silver and bighead





A SORRY STATE Kansas officials say that within three years, zebra mussels in 4,000-acre El Dorado Reservoir mushroomed to 25,000 per square meter, covering every hard surface in the lake.

carp. Originally from Asia, the species have moved upstream along the Mississippi and Missouri rivers after escaping from commercial fish ponds in southern states. (The species are related to the common carp, a fish found throughout eastern and central Montana that was first imported into the United States from Europe in the late 1800s.) “When I was touring the Illinois River last year, I saw stretches where silver carp were so thick it looked like you could have walked across the river on their backs,” says Ryce. The plankton-feeding carp have displaced entire fish populations in the lower Mississippi River. “Our biggest concern is these species getting into the Yellowstone and lower Missouri rivers,” Ryce says. “They could outcompete paddlefish, sauger, and sturgeon by taking out all the primary production in the food chain.” Asian carp now swim in South Dakota waters; at FWP check stations, anglers from that state have been caught bringing live bait illegally into Montana. “If Asian carp get here, they will

Tom Dickson is editor of Montana Outdoors.

likely be mixed in with other minnows in someone’s bait bucket,” Ryce says.

The newest blip on Montana’s aquatic invasives radar is VHS (viral hemorrhagic septicemia), a virus linked to large fish kills in the eastern United States. A new and unique strain of the disease first appeared in the eastern Great Lakes in 2005. Scientists have since verified VHS in several midwestern inland lakes, and in January 2010 they detected it in Lake Superior for the first time. The viral disease causes fish to bleed

through the skin surface and internally before dying. “One of the most troubling things about VHS is that it can be passed directly from fish to fish. If one gets sick, they all can,” says Andy Noyes, fish pathologist with the New York Department of Environmental Conservation. According to Noyes, the virus is likely responsible for killing 90 percent of the St. Lawrence River’s world-renowned muskie population in recent years and causing large die-offs of freshwater drum and perch in other waters.

Groups urge anglers to take the pledge

Many Montana and national angling groups and conservation agencies are urging anglers and boaters to pledge to “inspect, clean, and dry” their boats, boots, and other gear between trips. Sponsors include the U.S. Fish & Wildlife Service, Montana FWP, Recreational Boating & Fishing Foundation, Federation of Fly Fishers, National Wildlife Federation, Montana Trout Unlimited, Montana Trout, Walleyes Unlimited of Montana, Walleyes Forever, Greater Yellowstone Coalition, Fishing Outfitters Association of Montana, and Whirling Disease Foundation. To take the pledge, visit cleanangling.org.



STAY PUT

Just as troubling as the aquatic invasives outside Montana borders are the ones already here. The most worrisome is Eurasian watermilfoil, which first appeared in Noxon Rapids and Cabinet Gorge reservoirs near the Idaho border in 2007. The plant likely was carried there on boats trailered from the neighboring state, where the species was first discovered a few years earlier. Or it could have been dumped from a store-bought aquarium, in which the plant is sometimes unlawfully stocked. (Eurasian watermilfoil is listed as a prohibited noxious weed, making it illegal to propagate the plant.) Eurasian watermilfoil forms thick underwater strands of tangled stems and, on the water surface, creates vast mats of vegetation. It clogs irrigation pipes and canals, blocks boating lanes, makes swimming areas unusable, and displaces native lake vegetation. In the Midwest, anglers curse Eurasian watermilfoil for rendering many lakes unfishable. Beaches have been closed to public use after swimmers became entangled in thick milfoil mats. The plant now occupies nearly 400 acres of Noxon and Cabinet Gorge reservoirs.

“Containing Eurasian watermilfoil is a top priority for us,” says state weed coordinator Dave Burch, with the Montana Department of Agriculture (MDA). Burch says the agency is working with a local task force to

contain the plant. Check stations will be set up this summer to make sure boats leaving the two reservoirs are weed-free. MDA is also working with scientists from Mississippi State University and the U.S. Army Corps of Engineers to test methods of controlling the invasive plant.

MONTANA RESPONDS

Montana took a major step in containing the AIS threat in 2004 when it created the position of a statewide aquatic nuisance species coordinator to manage the prevention and control of water-borne invaders. Ryce says part of her job is to work with counterparts in nearby states and provinces to monitor new infestations, share research, and coordinate control work. “We’re only as safe as the states around us,” she says.

Another important measure came in 2009, when the Montana legislature passed the Aquatic Invasive Species Act. The legislation authorizes MDA and FWP to designate infested waters as Invasive Species Management Areas, where they can restrict boat movement, require anglers to inspect and clean boat exteriors, and levy fines for non-compliance. The legislation establishes a state fund to increase control and prevention measures and boost public education; it also authorizes the two agencies to work cooperatively on aggressive public outreach.

3 EASY STEPS

Anglers, boaters, and other water recreationists should follow these simple steps to reduce the spread of aquatic invasive species:

1. INSPECT

After leaving a lake or stream, inspect your boat, engine, trailer, anchor, waders, wading boots, and other fishing and boating gear for mud, water, and vegetation that could carry aquatic invasive species.

2. CLEAN

Completely remove all mud, water, and vegetation you find. Boaters should use a pressurized power sprayer, found at most car washes. Hot water helps kill organisms, and the pressure removes mud and vegetation from small nooks and crannies in the trailer, boat exterior, motor, and other equipment. There is no need to use soap or chemicals.

3. DRY

Aquatic invaders can survive only in water and wet areas. Drying all boating and fishing equipment thoroughly will kill most alien organisms. The longer you can keep your boat, trailer, waders, wading boots, and other equipment outside in the hot sun between fishing trips, the better.

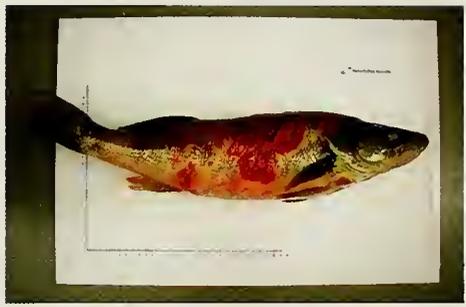


AIS DELIVERY SYSTEMS People inadvertently spread aquatic invasive species into and throughout Montana by moving heavy equipment from one lake or river to another; in bait bucket water; in mud, vegetation, and moisture on wading boots and waders; and on propellers, engines, trailers, and other boating equipment. Conservation groups say keeping gear clean is essential to stopping the spread of aquatic invasives.

Agency officials say bumper stickers, radio and TV ads, and other formats containing invasive species information will begin appearing this summer.

Montana is fighting Eurasian watermilfoil and other AIS on several fronts. FWP crews inspect watercraft at boat ramps, fishing tournament sites, and other high-use areas. Last year seasonal technicians examined nearly 1,000 boats and other watercraft at 82 events on 18 different lakes, reservoirs, and rivers. "One thing we're finding is that tournament walleye anglers are showing up with some of the cleanest boats," says Ryce. "They are very well educated about aquatic invasive species because it's such a big deal in the states many of them are from." FWP crews also looked for AIS at 252 sites on Flathead Lake, Canyon Ferry Reservoir, Fort Peck Lake, and other high-use waters last year. "Early detection is critical," says Ryce. "If we find a new species soon enough, the odds are much better that we can take steps to contain it."

Among the MDA outreach efforts begun last year are roving border check stations and increased surveillance for new aquatic weeds, says Erik Hanson, hired as the agriculture



AQUATIC ANIMAL HEALTH PROGRAM, CORNELL UNIVERSITY

NOT A KEEPER A New York walleye ravaged by viral hemorrhagic septicemia (VHS). The fatal fish virus, first detected in the Great Lakes region, is now moving west.

agency's invasive species coordinator in 2009. He says MDA staff will soon begin visiting pet stores and plant nurseries to educate owners about the importance of not stocking potential invaders in their inventories.

CYNICISM A CHALLENGE

Despite Montana's proactive response to aquatic invasives, the state faces several major challenges. "It's hard to get the public's attention, because they don't see aquatic species," says Bob Gilbert, president of Montana Walleyes Unlimited and a previous president

of the Montana Weed Control Association. "With spotted knapweed, you can point to the purple hills outside Missoula. But with things like zebra mussels, the problem is largely hidden."

Another obstacle is public cynicism. Many anglers believe FWP and conservation groups in the past overstated the potential threats of aquatic invaders. Despite a decade's presence in Montana, New Zealand mudsnails have not been proved to harm fish populations, despite evidence the mollusks are crowding out native mayfly and caddis fly populations in some river stretches. And whirling disease, once hyped by East Coast media as the possible death knell of western fly-fishing, may be less harmful than early reports predicted. The disease nearly wiped out wild trout in many Colorado streams and caused Montana's Madison River rainbow population to decline by 80 percent in the late 1990s. But it has not—so far—created the devastation agencies and environmental groups warned of. The Madison's surviving rainbows appear to have become genetically resistant to the parasite, which still infects the river. Trout numbers have rebounded, attracting anglers and mak-

Traditional wading boots felt to be a problem

One of the major paths, or "vectors," by which aquatic invasive species spread is on the felt soles of wading boots worn by trout anglers, fisheries workers, and others who spend time in streams and rivers. A 2007 study conducted at Montana State University on angler movement found that the average pair of wading boots sampled carried more than 16 grams of sediment. The study estimated that in one year, angler boots moved more than 6,300 pounds of sediment between access sites in southwestern Montana and that nonresident anglers carried more than 1,600 pounds into Montana.

Responding to growing evidence that aquatic invasives can survive in the sediment and moisture retained in felt's dense mat of woven fibers, Trout Unlimited in 2008 called for eliminating the material on fishing boots by 2011. Felt-soled boots are now banned in New Zealand and will not be allowed anywhere in Alaska beginning in 2012. The Utah Division of Wildlife Resources has eliminated use of felt soles by its professional staff.

This year Bozeman-based Simms Fishing Products discontinued its felt-soled boot line and began selling Vibram-soled boots only. "We know felt is not the only material that has spread invasive species and disease, but it is surely part of the problem" says Simms president K. C. Walsh. Patagonia, Korkers, Chota, Orvis, Dan Bailey's, and others have also introduced boots with rubber soles.

Previous models of rubber-soled wading boots were notoriously slippery on algae-covered rocks. Dave Kumlien, executive director of Trout Unlimited's Whirling Disease Foundation and a longtime Montana fly-fishing outfitter, has tried several new versions and says they are superior to earlier rubber soles. "The rubber is grippier and stickier. In my experience the new boots, when used with metal studs, are actually better than felt," he says. "On grass, felt is really slippery, and in snow it's a disaster." The lugged rubber soles also improve traction for climbing muddy riverbanks, he adds. Kumlien acknowledges that studded soles can tear up boat bottoms, "but we put rubber mats or carpet down, and that works real well for protection." ■



The new generation of sticky, stay-clean rubber-soled boots.

PHOTO COURTESY SIMMS FISHING PRODUCTS

ing the Madison the state's most heavily fished river. "I definitely think anglers have become jaded because of some aspects of how the whirling disease issue was handled," says Bob Wiltshire, executive director of the Livingston-based Center for Aquatic Nuisance Species and previously chief operating officer for the Federation of Fly Fishers.

As these examples illustrate, no one can definitely predict what AIS will do to aquatic ecosystems. That's why experts now believe the best response is for anglers, boaters, and others to take three easy steps to reduce the spread of all water, mud, and vegetation (see sidebar on page 17). "People don't need to understand complicated biological life cycles or even what the different species look like," says Wiltshire. "All they need to remember is that mud, water, or vegetation on your boat, boots, and other gear could be carrying aquatic nuisance species of some sort. And that they need to inspect their gear, clean it thoroughly, and make sure it dries completely before going out again.

"We want people to make these precautions part of their regular routine," he adds.

Other experts concur. "If people follow the 'inspect, clean, and dry' guidelines, they'll be doing their part to reduce the risk of spreading aquatic invasive species," says Dave Kumlien, executive director of Trout Unlimited's Whirling Disease Foundation and a 30-year Montana fly-fishing outfitter.

That's advice Goeckler, the Kansas AIS coordinator, wishes his state had taken to heart several years ago. "People tend to not be concerned about these species until they show up in their own backyard," he says. "They need to take this issue seriously today. Prevention is a lot easier and cheaper than any attempts at control." 🐾

Learn more about the threat of AIS and what you can do at:

- Center for Aquatic Nuisance Species: stopans.org
- Montana Department of Agriculture: agr.mt.gov (look for "Aquatic Weeds")
- FWP Aquatic Nuisance Species Program: fwp.mt.gov/fishing/guide (look for "Aquatic Nuisance Species" under "Quick Access" on the left panel)
- Aquatic Nuisance Species Task Force: anstaskforce.gov



PROLIFIC PIECES Eurasian water-milfoil reproduces by fragmentation. When disrupted by waves or boat motors, the plant breaks into small pieces, each of which can form roots to create an entirely new plant. In one year, a single stem fragment can multiply into 250 million new plants. "The thought of that kind of spread happening in Flathead Lake, the Thompson Chain of Lakes, or Canyon Ferry Reservoir is a nightmare," says Eileen Ryce, FWP's aquatic nuisance species coordinator.

TINY FISH UNDER BIG SKIES

Why minnows matter. BY TOM DICKSON. ILLUSTRATIONS BY JOSEPH TOMELLERI

Walleye anglers and trout devotees sometimes argue over whose fish deserves the most respect in Montana. On their side, trout anglers have 100-plus years of fly-fishing history, Norman Maclean, and some of the nation's most renowned coldwater fisheries. To their credit, warmwater anglers can point to the vastness of walleye waters here (roughly 300,000 acres) and the fact that their fish tastes like heaven when sautéed in butter. The thing is, neither side is right.

In Montana, as in so many states, it's minnows that rule.

Of the state's 54 native fish species, more than 30 percent (18 species) are members of the minnow family, or Cyprinidae, including the lake chub, redbreast shiner, and long-nose dace. The percentage is even higher in the state's middle and eastern regions. From 1999–2007, crews from Montana Fish, Wildlife & Parks and Montana State University (MSU) swept seining nets through prairie streams across the state's eastern two-thirds and found more minnows than any other species. "The continent's great bastion of minnow diversity is in Appalachia and other parts of the South. Some of those minnow species have been able to move up along the Mississippi and then the Missouri and Yellowstone rivers into eastern Montana over the past 10,000 years," explains Bob Bramblett, an MSU research professor and coordinator of the university's share of the stream surveys. "Western Montana, cut off from the continent's minnow strongholds, contains far fewer species."



Peamouth *Mylocheilus caurinus*

Anglers have been baiting hooks with minnows at least since the mid-17th century, when Izaak Walton wrote, “A large Trout will come as fiercely at a Minnow as the highest mettle Hawk doth seize on a Partridge.” Minnows are natural prey for all game fish, from cutthroat trout and walleyes to crappies and yellow perch. Still, most anglers pay scant attention to what turns out to be the most abundant and diverse group of fish swimming in Montana.

Pinning down a commonly accepted minnow definition is as difficult as grabbing a squitmy shiner from a bait bucket. Biologically, minnows are members of the world’s largest freshwater fish family, which contains more than 2,000 species. Most cyprinids, as they are known to biologists, have a scaleless head and spineless fins. (The common carp, a minnow species, has dorsal rays that harden into what feel like spines but aren’t.) Minnows have one to

three rows of pharyngeal “teeth,” hard structures in the throat the fish use to grind food against a rough-textured pad.

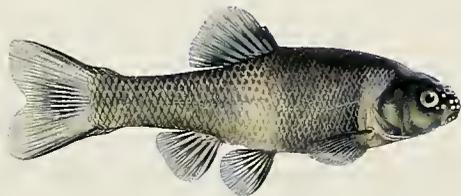
As Webster’s second definition of the word confirms, people often refer to any small fish as a minnow, though technically that’s not correct. Bait shops also have their own nomenclature. What some call sucker minnows, for example, aren’t real minnows but

Most anglers pay scant attention to what turns out to be the most abundant and diverse group of fish swimming in Montana.

small white suckers. On the other hand, crappie minnows aren’t tiny crappies; they’re small fathead minnows used to catch crappies. Dace, chubs, and shiners are all min-

Continued on page 24

SIX MONTANA MINNOWS



Fathead minnow

Pimephales promelas

Pimephales: Greek for “fat head.”
promelas: From the Greek words for “before” and “black,” possibly referring to the darkened head of the original specimen.

Found throughout Montana east of the Rocky Mountain Front, the **fathead minnow** lives in shallow lakes, ponds, and murky prairie streams. Like creek chubs, fathead minnows can survive in water with almost no oxygen. According to Bob Bramblett, a research professor at Montana State University, nearly 80 percent of the waters sampled in eastern Montana prairie stream surveys during the 2000s held fatheads, more than any other fish species.

The chunky fathead minnow grows to 3 inches long. Its back is dark olive or brown and its sides are dusky above and pale below. The fathead’s head is round and flat on top, the eyes are large, and the terminal (front-facing) mouth angles up slightly.

During spring breeding, the male fathead darkens. His head turns almost black and swells. Three rows of small, bony bumps, called tubercles, develop on the snout, making the fish look like a pimply faced teenager. The tubercles serve no apparent purpose other than as a weapon for head-butting males.

The female fathead minnow deposits her eggs beneath logs, stones, or other debris in slow-moving or still water. Before mating, the male cleans the underside surface with his mouth, head tubercles, and dorsal fin. He defends the site as ferociously as an NHL goalie, whapping any intruder with his tail fin. When a ripe female enters the nest, she turns upside down, and the male uses his pectoral (front) fins to press her body up



Flathead chub

Platygobio gracilis

Platygobio: Latin for “broad goby” (a goby is a European fish found in marine shallows).
gracilis: Latin for “slender.”

tight against the underside of the rock or other item. She then deposits eggs, which stick to the surface, and the male vibrates to release milt.

The female then swims off, but the male holds down the fort. He swims back and forth beneath the eggs, stroking them with his back to remove sediment and circulate oxygenated water. He also eats any eggs that become covered in fungus to protect the others from infection. He rests only when the eggs hatch and the tiny fry—his genetic future—swim off.

Chubs are another group of fish in the minnow family. The **flathead chub** is a fish found mostly in the Great Plains, from Texas north through eastern Montana into Alberta and the Northwest Territories. It lives in the main channels of large rivers, sometimes moving to smaller tributaries to spawn.

The flathead chub’s seemingly contradictory scientific name (both “broad” and “slender”) actually makes sense. The fish has a broad, flat, wedge-shaped head, while its body is long and trout-shaped. The minnow is brownish above, silvery on the sides, and light below. In both corners of the large mouth, which is overhung by a long snout, is a distinctive barbel the fish uses to smell food.

Flathead chubs eat mostly aquatic insects as well as terrestrial bugs that blow into the river. The fish average about 5 inches long but can reach nearly a foot. The



Pearl dace

Margariscus margarita

Margariscus: Latin for “pearl,” perhaps referring to the sharp tubercles, also known as pearl organs, that develop on the pectoral fins of males during mating season.
margarita: Greek for “pearl.”

larger specimens eat small fish, and biologists have even found small rodents in flathead chub stomachs.

Flathead chubs will occasionally grab a baited hook or a fly angler’s nymph and offer some sport, though the species is not considered edible. Anglers in some Midwestern states use these large, hardy minnows as catfish bait.

According to Bramblett, the **pearl dace** is likely a “glacial relic” minnow pushed south from Canada 15,000 years ago with the last ice age, then left behind as the glaciers retreated. “It’s a fish tolerant of cool streams, rivers, and lakes, and we find it only in a few disjunct locations in north-central and northeastern Montana,” he says. The species is found swimming with trout in cool streams throughout Canada, from British Columbia to Nova Scotia.

Because of its limited distribution in Montana, the pearl dace is classified as a state species “of concern.” Given their preference for cool temperatures, pearl dace may be vulnerable to the warming of water from global climate change.

The pearl dace has a small, flaplike barbel in a groove of the upper lip above each corner of the mouth. The cylindrical body is almost round in cross section, similar to that of the creek chub, which it closely resembles. It averages about 3 inches long.

Unlike most minnows, a male pearl dace establishes and defends his territory during



Northern pikeminnow

Ptychocheilus oregonensis

Ptychocheilus: Latin for "folded lip," referring to the fleshy border of its mouth.

oregonensis: Latin for "of Oregon," where the first specimen was identified.

spawning season. Rather than make a nest, he selects an area over a gravel or sand bottom and drives away intruders. When a ripe female enters the male's territory, he moves parallel to her, slides his pectoral fin under her body, and puts his tail fin over hers in a piscatorial embrace. He then presses her lower body down into the substrate as she arches her back slightly and angles her head up. The pair then vibrates, waving their tails frantically while releasing eggs and milt into the gravel or sand.

Some anglers in northwestern Montana who think they caught a trout actually reeled in a northern pikeminnow, one of the largest minnow species in North America. Northern pikeminnows average a foot long in Montana, though some specimens reach 27 inches. Even larger northern pikeminnows swim in Alberta, where trophy fish topping 30 inches have been recorded.

The northern pikeminnow can be distinguished from a trout by its long head, toothless mouth (trout have teeth), lack of an adipose fin, and deeply forked tail.

This native species is found in lakes and slow river and stream stretches within the Clark Fork drainage.

Young northern pikeminnows eat mainly aquatic insects, but the adults are piscivores (fish eaters). Other large minnows such as the creek chub occasionally consume fish, but not as much as adult pikeminnows do. That's largely because of the northern pikeminnow's large size.



Common carp

Cyprinus carpio

Cyprinus: Greek for "carp" and derived from the island of Cyprus, from which it was once thought the first specimens came to Europe.

carpio: Latin for "carp."

Though anglers consider them too bony to eat, adult pikeminnows provide good sport. They take worms, spinners, or crankbaits, as well as streamers or other minnow-imitating flies.

Anglers usually do a double-take when first hearing that the common carp is a minnow. After all, the big, whiskered fish looks nothing like the pinkie-sized species that swim in bait buckets. But they are closely related.

The common carp is Montana's largest minnow (elsewhere in the United States, only the Colorado pikeminnow grows larger). Though disdained by many American anglers as a "trash" species, carp are the most widely eaten freshwater fish in the world and are considered a top game species in Great Britain and Europe. And increasingly, in the United States.

In 1995, the venerable *In-Fisherman* magazine predicted that the common carp would be the "world's greatest sportfish" in the 21st century. It's already happening in Fort Smith, where each summer Bighorn River fishing guides vie for top honors by trying to catch the largest carp on a fly on Bighorn Lake above Yellowtail Dam.

Common carp were first imported to this country by the U.S. Fish Commission in 1871 to shore up flagging native fish stocks. No one knows when the carp and closely related goldfish came to Montana. Carp are found in many lakes, reservoirs, and large rivers east of the Continental Divide.



Redside shiner

Richardsonius balteatus

Richardsonius: For Sir John Richardson, who first described the shiner in the Columbia River.

balteatus: Latin for "girdled," perhaps referring to a belt of color around the body of the first identified specimen.

The fish are bronze with large scales and a long, sloping forehead. They are occasionally mistaken for native smallmouth buffalo, which also have a lipped, subterminal (below the head) mouth. The best way to tell the two species apart is to look for the two barbels on each side of the carp's upper jaw. Buffalo and other sucker species have no barbels.

Contrary to myth, nothing is inherently "dirty" about carp. It's true they tolerate warm, polluted water and can be found downstream from wastewater treatment plants. But they also swim in the Missouri River below Holter Dam, one of Montana's premier blue-ribbon trout waters, and in the clear waters of Fort Peck Lake.

The redside shiner is a distinctly western Montana minnow. The name "shiner" refers to the glare that comes off the scales when struck by sunlight, causing the body to sparkle. The redside is darker than most shiners, with a dark olive back and a dark midside band and parallel light stripe above the band from snout to tail fin. Like many minnows, the male lights up like a Las Vegas showgirl during spring spawning season, turning brilliant crimson and bright yellow on the sides and belly.

The redside shiner is a flat-sided minnow, with a body shape more like a goldeye's than a trout's. It averages about 4 inches long but can reach 6 inches.

The redside is found throughout the Clark Fork drainage in lakes, ponds, and rivers. ■

Continued from page 21

nnows. But Montana's Iowa darter, another small native fish, is not. Nor, oddly enough, are central mudminnows, members of a completely different fish family that were introduced to a few small streams and ponds west of the Continental Divide.

All minnows have what's called a Weberian apparatus. This series of small bones connects the swim bladder to the inner ear and allows the fish to "hear" vibrations in the water. During mating season, most male minnows develop tubercles, also known as pearl organs. They use these bony bumps and spikes that grow on the head, body, or fins to fight rivals and attach themselves to females while mating. Males of some minnow species also develop brilliant breeding colors, turning various combinations of red, green, and gold in spring.

Almost all minnows in Montana are small—3 inches or less—but two species can grow much bigger. The largest is the common carp, the state angling record for which is 40.27 pounds. Another oversized cyprinid is the northern pikeminnow, known as the squawfish until 1998, when the American Fisheries Society changed the name. The Montana record for this species, which lives in the state's northwestern region in lakes and slow rivers, is 7.88 pounds. The closely related Colorado pikeminnow, North America's largest minnow, can reach over 6 feet long and top 100 pounds—the size of a tall,



Spottail shiner
Notropis hudsonius

“If you didn’t have minnows, you wouldn’t have game fish. They are like what grass and forbs are to elk and deer.”

skinny middle-schooler.

Bramblett says the primary ecological value of most minnows is as food for other species. “Pelicans, cormorants, kingfishers, garter snakes, herons, and other wildlife all rely on

Tom Dickson is editor of Montana Outdoors. Joseph Tomelleri is a biologist and artist whose illustrations have appeared in more than 350 publications.

minnows, especially in eastern Montana,” he says. Minnows are especially important for larger fish, including popular sport fish such as walleyes, sauger, and big trout. “If you didn’t have minnows, you wouldn’t have game fish,” says Bramblett. “They are like what grass and forbs are to elk and deer.”

Minnows so effectively attract other, larger fish, that inventors have been trying to replicate them since the mid-19th century. After dropping a silver teaspoon overboard and seeing a fish attack the reflecting metal, Julio T. Buel took out the first U.S. fishing lure patent for a spoon lure in 1852. Mepps and other brands of spinners mimic shiners or other bright minnows. Fly anglers tie blacknose dace, Zonkers, Marukas, and other minnow lookalikes to fool trout and other game fish.

The most realistic minnow mimics are plugs, or crankbaits, like the one invented by Finnish angler Lauri Rapala in 1936. These fish-shaped lures dip and wobble like wounded minnows. Constantly being improved and modified, some crankbaits are now impregnated with fish scent or coated in holographic paint. A recent invention, the Vibra-Strike, has a built-in electronic vibrator.

Despite these improvements, few man-made lures can beat a live minnow for catching fish. In bait shops, anglers select minnows proven to catch specific game species in certain waters. Small fatheads are the top choice for catching crappies on Tongue River Reservoir. Emerald shiners and flathead chubs are popular for walleyes on Fort Peck Lake and burbot on the Yellowstone River. Another factor in minnow selection is hardiness. Many minnows, such as fatheads and some shiners, tolerate the low oxygen and crowded conditions in bait buckets. Other small fish, such as darters, are delectable to game fish but make poor bait because they turn belly up when crowded or handled.

Because bait buckets can transport the deadly VHS virus and other fish diseases and aquatic invasive species (see “Keeping the Invaders at Bay,” page 14), Montana restricts minnow movement. It’s illegal to 1) bring minnows and other live bait into Montana from another state, 2) use or possess live min-

Montana's 23 Minnows

*denotes nonnative

- Common carp
- Goldfish
- Northern pikeminnow
- Peamouth
- Sicklefin chub
- Utah chub
- Lake chub
- Creek chub
- Flathead chub
- Sturgeon chub
- Northern redbelly dace
- Northern redbelly dace x
Finescale dace hybrid
- Pearl dace
- Longnose dace
- Fathead minnow
- Brassy minnow
- Western silvery minnow
- Plains minnow
- Emerald shiner
- Sand shiner
- Spottail shiner
- Redside shiner
- Golden shiner



Creek chub
Semotilus atromaculatus



Western silvery minnow
Hybognathus argyritis



Emerald shiner
Notropis atherinoides



Northern redbelly dace
Phoxinus eos



Lake chub
Couesius plumbeus



Utah chub
Gila atraria



Sand shiner
Notropis stramineus

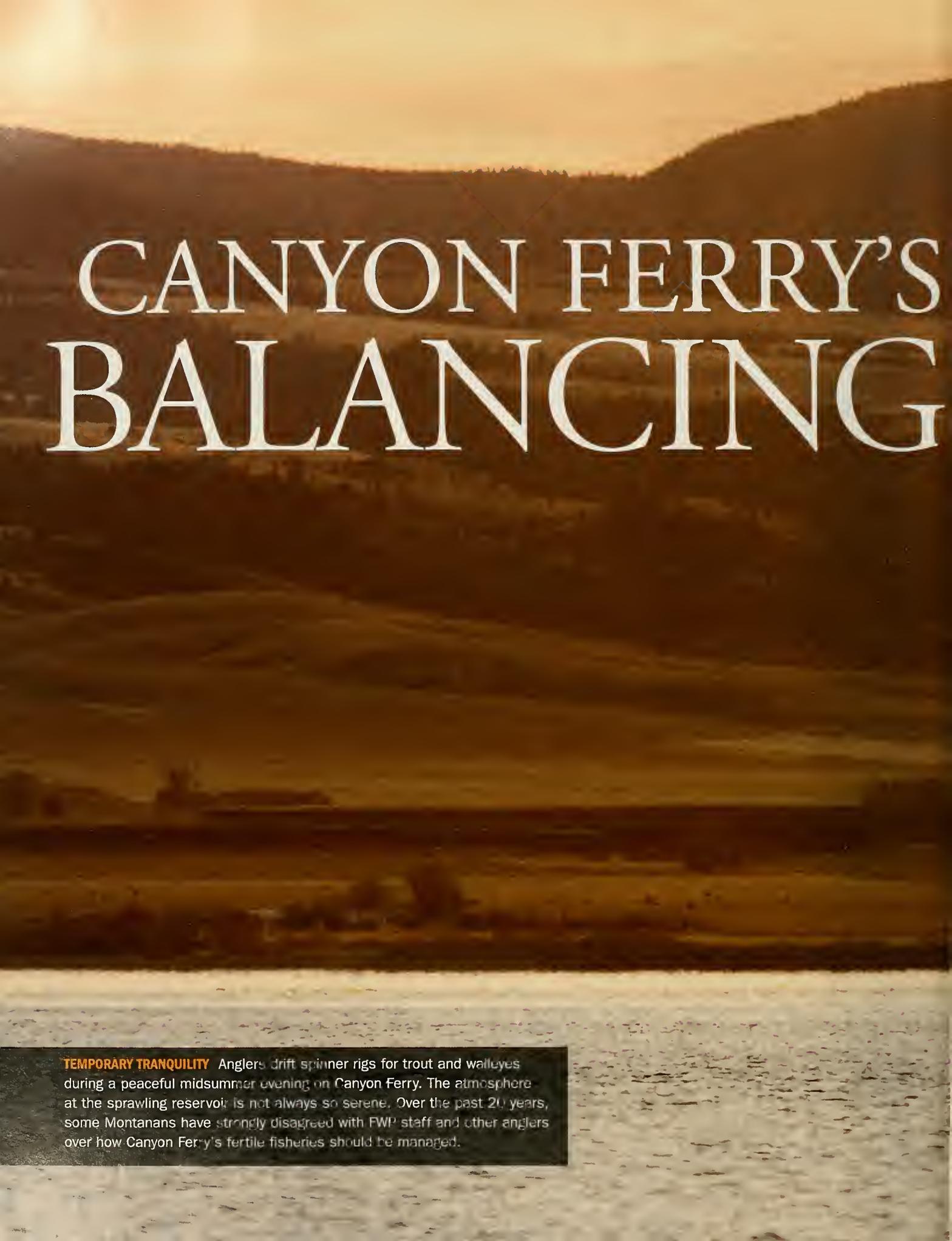
nnows in northwestern Montana and in some lakes and rivers elsewhere in the state, or 3) release live bait into any waters. According to FWP south-central region fisheries manager Ken Frazer, minnow movement in eastern Montana is a growing concern. He says anglers from as far away as Glasgow and Havre drive to the Yellowstone River and adjacent irrigation canals to collect minnows for use at Fort Peck Lake, Frenso Reservoir, and other waters. "When you move minnows around like that, you're certainly moving other things too," he says. In addition to possibly spreading disease and invasive species, overaggressive seiners may deplete some prairie streams of forage fish needed for other fish and wildlife, Frazer adds.

Because zebra mussels have reached western states and silver carp are now in South Dakota, Montana may need to further tighten intrastate minnow movement. "Most surrounding states and provinces are tightening their restrictions on minnows, and Montana is feeling pressure to do the same," says Steve Dalbey, FWP northeastern region fisheries manager. Dalbey says the use of live bait has been banned in Idaho, Alaska, Saskatchewan, Alberta, and parts of Ontario. In Wyoming, minnows may be used only in the drainage from which they were seined.

Further restrictions on minnow collection and use would be tough on Montana bait dealers such as Ron Herman, who with his

son Michael owns Pryor Creek Bait in Laurel. "If you ask me, we've got plenty of bait restrictions as it is," he says. But most bait shops would likely survive. Jerry Reller, owner of Bent Willow Bait and Tackle in Townsend, says he does a brisk business in plastic and salt-preserved minnows used by anglers on nearby Canyon Ferry, where live bait is banned.

For now, Montana has no plans to tighten regulations on minnow collection, use, or transportation. But if the state wants to reduce the risk of aquatic invaders and fish diseases harming its multimillion-dollar fishing industry—not to mention lake and stream ecosystems and native minnows and other fish species—it may have few other options. 🐟



CANYON FERRY'S BALANCING

TEMPORARY TRANQUILITY Anglers drift spinner rigs for trout and walleyes during a peaceful midsummer evening on Canyon Ferry. The atmosphere at the sprawling reservoir is not always so serene. Over the past 20 years, some Montanans have strongly disagreed with FWP staff and other anglers over how Canyon Ferry's fertile fisheries should be managed.

ACT

Trout, walleye, and perch anglers on the sprawling reservoir want more and bigger fish. Is that possible, given the ecological limits of the lake and the complex relationships among species? **BY EVE BYRON**

Gerald "Perch Man" Hintz recalls catching hundreds of firm-fleshed yellow perch at Canyon Ferry Reservoir each winter in the 1980s and '90s, when he and fellow ice anglers regularly hauled five-gallon buckets of fish off the ice. The abundance of perch, as well as rainbow trout, made the sprawling 35,200-acre reservoir between Helena and Townsend one of Montana's top fisheries. Thousands of people from throughout the state and elsewhere came to try their luck, providing a much-needed boost to the local economy.

Then something strange happened. In 1989 state fisheries biologists conducting population surveys netted several walleyes, a famed game fish and close kin to yellow perch with a voracious appetite and no sense of kinship. As walleye numbers exploded in later years, the perch population declined to almost nothing and trout numbers plummeted.

And so began what has been a balancing act for Montana Fish, Wildlife & Parks. Agency biologists must determine—then find ways to produce—the right mix of rainbow trout, perch, and walleyes for different angling constituencies all clamoring for more of their favorite fish. And they must do it in a reservoir environment where widely fluctuating water levels hamper the growth of underwater plants. Perch need that vegetation to spawn, find food, and escape predators so they can grow big enough for anglers to catch. "Water levels affect Canyon Ferry's submergent vegetation, the vegetation affects perch productivity, and the perch population affects walleye size and numbers," says Eric Roberts, FWP fisheries biologist for the reservoir. "It's all connected."

JASON SAVAGE/WILDLIFEPHOTOS.COM

A NEW PREDATOR ARRIVES

When the Missouri River was first impounded in 1955 to create Canyon Ferry Reservoir, the water held various native sucker species and burbot as well as yellow perch, rainbow trout, and brown trout that had been stocked in the 1920s and '30s. Then, in the 1990s, walleyes began appearing on the end of anglers' lines. (No one knows how the fish got into the reservoir.) At first there were too few walleyes to affect other fish populations. But by 1997 numbers of breeding-sized walleyes had grown to the point where the fish could take full advantage of what turned out that year to be ideal spring spawning conditions. "Suddenly—boom—walleyes were everywhere," says Roberts. FWP surveys jumped from showing an average of two walleyes per survey net in 1996 to ten per net just two years later.

The 1997 walleye "year class" (generation of fish) became famous—or infamous, depending on your viewpoint. For two

Seemingly overnight,
Canyon Ferry became
Montana's hot walleye
destination, drawing
anglers from across the
state and as far away as
Minnesota and Ohio.

years, those young walleyes were still too small to eat anything but minnow-sized fish. But by 2000 they had grown big enough to get their jaws around larger specimens. "After that we saw significant declines in perch and trout numbers," Roberts says. The

Eve Byron is a writer in Helena and a reporter for the Independent Record.

1999 survey showed 47 perch per net. Only one year later, that dropped to 19. In 2004 numbers plummeted further to just 0.5 perch per net—less than 2 percent the number five years earlier. "We were alarmed," says Roberts. "Perch are the foundation of the system." In response, FWP slashed the daily perch limit in 2005 from 50 to 15.

"In just a few years, Canyon Ferry's perch sport fishery was more or less replaced by a walleye fishery," says George Liknes, FWP regional fisheries manager in Great Falls. "It was definitely a plus for walleye anglers, but a real loss for people who'd been used to catching perch. It was especially tough for families that liked going out and catching perch through the ice."

Rainbow numbers also were falling, as hungry walleyes gobbled up the finger-sized trout FWP stocked in the lake each year. Survey net catches went from an average of roughly 15 rainbows in the late 1990s to about two per net in 2002. Numbers of long-nose suckers and white suckers, important native forage species, also declined as walleyes consumed any prey they could find.

Meanwhile, the walleye fishing boomed. Seemingly overnight, Canyon Ferry became Montana's hot walleye destination, drawing anglers from across the state and as far away as Minnesota and Ohio. The fishing wasn't always great, however. In midsummer,

walleyes often had so many newly hatched perch and stocked fingerling trout to eat they ignored anglers' offerings. "[FWP biologists] were getting some monster fish in the gill nets, but to catch them really depended on the [abundance of] perch," says Craig Campbell of Manhattan, president of the Gallatin/Madison chapter of Montana Walleyes Unlimited.



THE PRIZED EYES The walleye is named for its reflective retina ("wall" derives from the Icelandic *vagl*, which means "film over eye"). Native to the upper Midwest and much of Canada, walleyes are among the most sought-after game fish in North America. The perch cousin grows big, fights moderately hard, and produces delicious, white, bone-free filets.

TOO MANY MOUTHS TO FEED

FWP responded to the trout decline by stocking 8-inch rainbows, too large for most walleyes to eat. That inflated annual stocking costs from \$20,000 to \$150,000, because the trout must be fed more while growing larger in FWP's Lewistown fish hatchery, and it costs more to transport the larger fish to Canyon Ferry. Trout numbers are not as high as before walleyes arrived, but anglers say the new stocking strategy has improved catch rates. Surveys in recent years show an average of five rainbows per net, up from a low of one per net in 2005.

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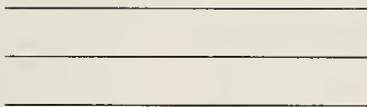
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DUSTAN SACKETT

trout, FWP increased the daily walleye limit from five to 20 fish per day in 2000. Some walleye anglers saw that as a gift, but others took it as an insult to their favorite fish. "They have managed the walleye in Canyon Ferry to keep the population low," Campbell says. "Their plan is that however the perch do, that's how well the rest of the fish will do. But the perch are not doing well, the trout are not doing that great, and the walleye are up and down and we just have a bunch of little ones."

Roberts says FWP has no desire to eliminate the walleye fishery—and even if it did, the job would be impossible. But he says the

lake definitely contains too many walleyes for the limited number of perch, and that's why the average walleye's size, growth rate, and condition have declined. "The same thing happened on [South Dakota's] Oahe Reservoir in the late 1990s," he adds. "The lack of forage caused the average size of walleyes to drop, and the fish got real skinny." Roberts says such problems are common in western walleye reservoirs, which lack the diversity of prey species found in midwestern lakes. He says FWP considered stocking perch, but even the new Fort Peck hatchery doesn't have anywhere near the capacity to grow the millions required to

make a significant difference in the Canyon Ferry fish community. "We'd need to stock enough perch that walleyes couldn't eat them all and there'd be enough left over to improve the perch sport fishery," he says. Roberts estimates that Canyon Ferry walleyes consume more than 30 million fingerling perch each year. "At full capacity—if they didn't produce anything else—our Fort Peck and Miles City warmwater hatcheries combined could only produce 5 million fingerling perch," he says.

Not everyone is convinced that Canyon Ferry's perch population has plummeted. Hintz believes that walleyes have pushed



THE LIMITING FACTOR Canyon Ferry's yellow perch population drives the walleye population and the perch sport fishery. If the lake can't produce enough perch, walleye numbers and condition suffer, as do winter anglers, who target the tasty panfish. So why not stock another forage fish in the reservoir to give perch a break? Biologists say any new species could rob food from young perch and walleyes, which has happened on other reservoirs in Montana and elsewhere in the West.

perch to new, deeper locations where FWP survey nets aren't finding the small fish. "People are crying that there's no perch, but I think they just moved," he says. Hintz adds

that if perch numbers are dropping, FWP should prohibit perch fishing derbies for a few years and give them a chance to rebound.

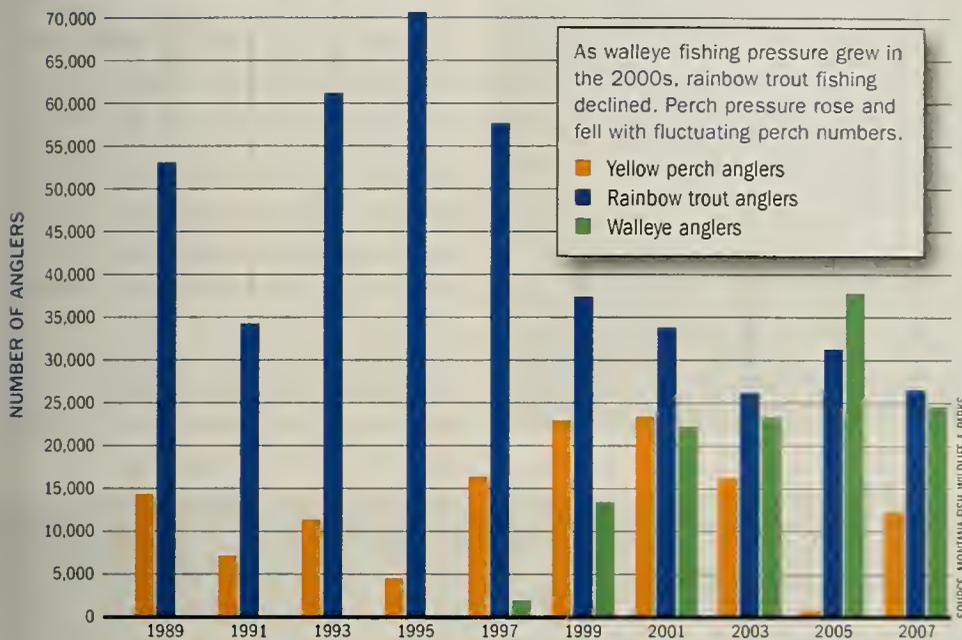
FWP is working with Walleyes Unlimited

and other civic and sportsmen's groups to enhance perch habitat by sinking thousands of used Christmas trees into the reservoir to provide perch spawning sites. Roberts says the effort helps perch, but as is the case with the stocking proposal, not nearly enough trees can be collected and placed in the reservoir to boost perch numbers enough to adequately feed the existing walleye population.

Campbell considers the tree project a good start, but he'd also like to see FWP introduce other forage species such as ciscoes and shiners. So would Harley Hankins of Townsend, a longtime Canyon Ferry angler. "We have suggested they consider stocking another food fish for walleye, but they just absolutely will not consider adding another fish to that lake," Hankins says, adding that ciscoes helped revive the Fort Peck fishery.

Liknes points out that anything FWP stocks into Canyon Ferry eventually will find its way downstream. He and his staff—along with downstream trout anglers—are concerned the additions could endanger not only Canyon Ferry and downstream reservoirs, but

Canyon Ferry Angling Pressure 1989–2007



The big difference: aquatic plants

North America's top walleye waters are shallow, large, fertile, and windswept, just like Canyon Ferry. But those productive walleye lakes have one crucial component far less abundant in the Montana reservoir: submerged aquatic vegetation such as pondweed and coontail.

Submerged plants provide places for perch to spawn, find food, and escape predators. They allow the tiny fish to grow and feed adult walleyes and also provide sport to anglers, especially in winter. Canyon Ferry has some shallow-water vegetation but not enough to produce strong perch numbers, says Eric Roberts, FWP biologist for the reservoir. That's because it lacks stable water levels found in natural walleye lakes.

Canyon Ferry is managed by the Bureau of Reclamation (BOR) for multiple uses—including hydropower, irrigation, flood control, recreation, downstream fisheries, and the reservoir's own fisheries. Roberts explains that the BOR holds back snowmelt flowing into the reservoir from the Missouri River in late spring, which raises the water level, then releases water through dam turbines in summer to generate electricity and fill irrigation canals. Water levels fluctuate an average of 12 feet each year.

Shallow-water plants can't take root. Vegetation beds are either left high and dry by fall when water levels drop, or the reservoir gets so deep in spring that sunlight can't reach the vegetation. "If we had stable water levels, I really think we could maintain a substantial perch population. Canyon Ferry would be more like walleye lakes in Canada and the Midwest," Roberts says. "Without that, we're looking at a lake system here that's missing a key ingredient to first produce enough perch to grow walleyes and then also provide enough perch for ice anglers." —Tom Dickson



Yellow perch, like these in a Wisconsin lake, thrive in shallow-water vegetation.



SLIM PICKIN'S FWP creel clerk Chris Hurley asks perch anglers about their catch. In recent years, numbers have been low compared to the high harvest in the late 1990s.

KENTON ROWE

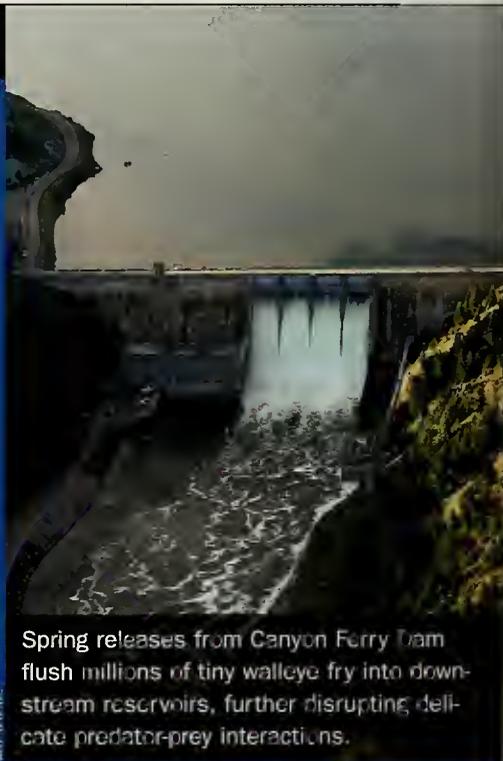
also the world-class trout fishing on the 35-mile blue-ribbon stretch of the Missouri River below Holter Dam. One cautionary tale is Tiber Reservoir, where FWP stocked ciscoes, a salmonid from the walleye's native range in Canada, to help walleyes fatten up. The ciscoes ended up eating zooplankton needed by newly hatched walleyes and perch, causing a decline in walleye numbers. A similar ecological disruption from a well-intentioned introduction happened after FWP stocked mysis in Swan and Whitefish lakes as food for kokanee salmon in 1968. The freshwater shrimp ended up downstream in Flathead Lake, where they directly competed with young kokanee and cutthroat trout for zooplankton, taking food from the very species they were intended to help. Kokanee and cutthroat populations crashed. "I can understand why some anglers want us to stock new forage

Canyon Ferry's walleyes go downstream

No discussion of Canyon Ferry's fisheries is complete without mention of the two reservoirs immediately downstream, Hauser and Holter. In fact, the combined fishing pressure on the two smaller reservoirs—Hauser is 3,800 acres and Holter is 4,800 acres—actually tops that on Canyon Ferry. (Each year more anglers fish the three reservoirs combined than any other single water in Montana.)

Like in Canyon Ferry, the two downstream reservoirs' fisheries have changed in recent years. Hauser and Holter have contained walleyes since the 1950s, but until recently, the populations stayed at low levels. Traditionally the lakes produced fishing mainly for rainbow trout and perch—along with kokanee salmon during the 1980s and '90s—and some walleyes. "Those were multispecies fisheries that were balanced pretty well," says Eric Roberts, FWP fisheries biologist for the three reservoirs. High water in 1996 and 1997 washed large numbers of walleyes from Canyon Ferry downstream while flushing most kokanee out of the reservoir system. Afterward, Holter and Hauser contained too many walleyes for newly stocked kokanee to survive. "We tried every stocking combination possible to get the kokanee going again, but we couldn't get them past the walleyes. Everything got gobbled up," says Roberts. The average annual kokanee harvest at Hauser from 1989–96 was 89,000 fish; that plummeted to an average of just 160 kokanee each year from 2000–07.

As it did on Canyon Ferry, FWP increased the size of rainbows stocked in the lower reservoirs and has been able to keep the trout fisheries afloat. Mirroring what happened upstream, walleye harvest on both Hauser and Holter has boomed. For example, from 1986–97 anglers harvested an average of only 744 walleyes on Holter each year. That jumped to an average of 9,300 annually from 1998–07, though the average size there and on Hauser is small because the predators lack an abundant food source. Also reflecting the situation downstream, the perch population in both reservoirs has tanked. On Holter, for instance, angler harvest has fallen from an annual average of 15,000 perch in the 1990s to just 16,000 perch in 2007. "Just like on Canyon Ferry, the perch populations are not surviving walleye because they can't grow large enough for anglers to catch perch in large numbers," Roberts says. —Tom Dickson



KENTON ROWE

Spring releases from Canyon Ferry Dam flush millions of tiny walleye fry into downstream reservoirs, further disrupting delicate predator-prey interactions.

species,” says Liknes. “But the potential ecological train wreck those fish could create for the entire food web in the reservoirs and the Missouri River downstream just doesn’t justify the possible benefits.”

STILL A FISH FACTORY

What often gets lost in discussions about how the Canyon Ferry fishery should be managed is that the sprawling reservoir continues to produce vast numbers of game fish. Trout aren’t as abundant as they were 15 years ago, but numbers are higher than in the grim years of the early 2000s, says Roberts. “And because of the larger stocking size, trout anglers catch lots of nice rainbows in the 18- to 20-inch range, with many getting up to 4 to 5 pounds. And angler catch rates for rainbows are good, averaging about .33 fish per hour.” FWP still finds between two to seven

walleyes per net in its annual surveys, and walleye fans can find plenty of 13- to 15-inch “eaters” from the abundant 2007 year class. Anglers still catch trophy-sized walleyes, though less often than in the early 2000s.

Despite Canyon Ferry’s steady game fish production, there’s no getting around the fact that, like on many western walleye reservoirs, perch production and survival is not adequate to maintain both the walleye population and a good perch sport fishery. That keeps walleyes underfed, and it deprives ice anglers once accustomed to catching bucketsful of the tasty panfish. “We’ve basically traded perch for walleyes, but the problem for Canyon Ferry

“We’ve basically traded perch for walleyes, but the problem for Canyon Ferry ice anglers is that they don’t catch a lot of walleyes in winter.”

ice anglers is that they don’t catch a lot of walleyes in winter,” Roberts says. “If they did, that would solve a lot of my headaches.” 🐟

To read the 2010–2019 Upper Missouri Reservoir Fisheries Management Plan, visit the FWP website at fwp.mt.gov or call (406) 444-2449.

ON THE REBOUND Since the mid-2000s, FWP has been stocking Canyon Ferry with 8-inch rainbows—too large for most walleyes to eat. Anglers say they are now catching good numbers of adult trout in the 18- to 20-inch range.



WHERE THERE IS ROCK WRITING

Visitors to Pictograph Cave State Park will discover a site rich in scenic beauty, prehistoric images, and early American Indian culture. BY MICHELLE MURPHY

People flocked to Pictograph Cave State Park last year, doubling attendance from 2008. The attraction? A newly opened visitor center, which complements the park's picnicking, hiking, wildlife watching, and educational opportunities.

Interest in the site may be growing, but it's nothing new. The three caves—Pictograph, Middle, and Ghost—have been luring people for more than 9,000 years.

The natural shelters are nestled in a sandstone bluff on a well-traversed path extending south from the confluence of Bitter Creek and the Yellowstone River, 6 miles south of Billings. The cave complex has long been a site of mystical power, a culturally significant gathering place for American Indians. On the interior wall of Pictograph Cave (the only one containing rock art), archaeologists discovered more than 100 pictographs, painted between 2,145 and 200 years ago. They also found stone and bone tools, moccasins, arrow shafts, basketry, grinding stones, and fire-starting tools. Excavations turned up jewelry too, such as pendants, bracelets, and beads beautifully crafted of seashells acquired from Pacific Coast Indians. "It's an amazing assemblage of artifacts," says Montana Fish, Wildlife & Parks archaeologist Sara Scott. "It's informa-

tion about life in prehistory, and it builds a picture of who these people were."

Scientific documentation of the cave's contents began in 1937. Archaeologist H. Melville Sayre, president of the Montana Society of Natural History and an instructor at the Montana School of Mines in Butte, investigated artifacts found by local residents at Pictograph Cave, then known as Inscription Cave. In this largest of the cave trio, a Works Progress Administration (WPA) crew documented 106 rock art images painted in white, black, and red. At the time, archaeologists did not fully realize the significance of pictographs. (The Lascaux Cave paintings in southwestern France were not identified until 1940, setting off worldwide interest in rock art.) But Sayre and his crew apparently knew they had found something significant and made full-scale drawings of the images.

Sayre brought in an amateur archaeologist, Oscar Lewis, and, with the help of WPA workers, they undertook a major excavation, uncovering tools, jewelry, animal bones, and hearths of ancient fires. (A dotted black line, still visible in Pictograph Cave, marks soil levels before the

excavation.) Trained archaeologist William T. Mulloy replaced Sayre in 1940 and took the lead in the excavation. According to rock art expert and retired New Mexico State University anthropology professor Lawrence Loendorf, Mulloy contributed significantly to archaeology when he devised a chronology based on where artifacts were found in successive layers on the cave's floor and how the artifacts' technologies changed. "Archaeologists in the Northern Great Plains are still using his chronology to date the artifacts they find," Loendorf says.

The excavation and Mulloy's study ended in 1941 with the advent of World War II. By



EARLY PROGRESS Unemployed men, put to work through the Works Progress Administration, served as the field crew for excavations at Pictograph Cave (then known as Inscription Cave) from 1937–41.



ILLUSTRATIONS BY LIJKE DUPRI, TRACED FROM PICTOGRAPH CAVE SOURCE PHOTOS

then the WPA-funded project had yielded more than 30,000 artifacts from Pictograph and Ghost caves and the area below the caves, named by early white settlers—ironically, as it turned out—Empty Gulch.

For the next several decades, the cave complex was neglected. Vandals carved into the rock art and covered pictographs with graffiti. Teenagers held beer parties at the sacred site. Pickups and four-wheelers tore across the fragile landscape. Meanwhile, thousands of artifacts were lost or stolen from a museum built (since removed) at the cave complex in 1939 and other storage sites.

Grasping the importance of the Pictograph Cave complex, former Billings mayor Willard Fraser and other local preservationists convinced the National Park Service in 1964 to designate the site as a National Historic Landmark. The area was managed by the city of Billings until 1969, when it was named Pictograph Cave State Historic Site by the Parks Division of what was then the Montana Fish and Game Department. In 1991 it became Pictograph Cave State Park. Over time the department landscaped the site, built a hiking trail and picnic area, and installed outdoor interpretive panels.

Unfortunately, the majority of the park's namesake pictographs have all but disappeared. The combination of vandalism, natural fading, and water damage has affected roughly 85 percent of the rock art images. That makes the replications from the late 1930s especially valuable. "Otherwise, we'd have no record of the many

pictographs that are no longer visible," says Darla Bruner, Pictograph Cave State Park manager. Visitors can view the reproductions on outdoor interpretive signs and throughout the visitor center.

The park offers many other amenities. Bruner considers the cave complex a living museum of natural history—the rare place

where rock art remains accessible to the public—roughly 20 pictographs are still visible—and where visitors can immerse themselves in the site’s historical and sacred significance. For much of the year, the park bustles with activity. Visitors view the remaining rock art images in Pictograph Cave and try to sense spirits in Ghost Cave. Many follow the short hiking trail, looking for birds and other wildlife. Over 60 bird species have been documented at Pictograph Cave State Park, making it a designated stop on Custer Country’s Southeastern Montana Birding Trail. Visitors commonly see wild turkeys pecking the ground for insects, red-tailed hawks soaring overhead, and songbirds flitting among shady cottonwoods.

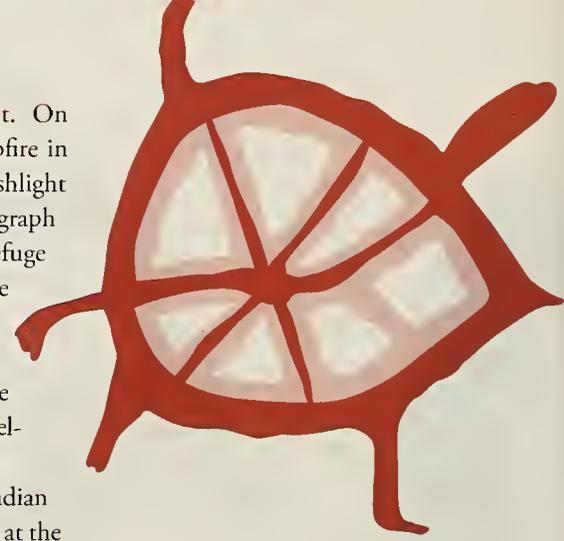
In spring and fall, busloads of inquisitive schoolchildren come to learn about the rock

Michelle Murphy is a writer in Helena.

art and the people who created it. On Halloween, visitors gather for a campfire in the picnic area, and Bruner leads a flashlight hike along the trail. In winter, Pictograph Cave State Park is a quiet place of refuge and solitude, snuggled against the snow-dusted rims and visited primarily by jackrabbits, mule deer, coyotes, and the occasional bald eagle straying south from the nearby Yellowstone River.

This May, says Bruner, Crow Indian interpreters will erect a traditional tipi at the park. The Yellowstone Valley Amateur Astronomers will offer three public stargazing opportunities—in mid-April, late August, and mid-October.

Loendorf, who grew up in Billings, says he spent memorable days as a boy exploring Pictograph Cave. He continues to visit whenever he’s in the neighborhood. “There are other



places [in the West] with more visible rock art,” the anthropologist says, “but Pictograph Cave has easy access and a pristine setting. You get a sense of the open space and the caves as they existed thousands of years ago.”

Another longtime visitor is Barney Old Coyote Jr., of Billings. The Apsáalooke (Crow) elder and historian visited the cave complex as a boy and remembers meeting Mulloy. He says the archaeologist hired his father, Barney Old Coyote Sr. as an interpreter so that Apsáalooke elders could help explain the pictographs. “Some of the drawings were so old even the elders couldn’t identify them,” Old Coyote recalls. “Pictograph Cave has been here since the beginning of our tribal memory.” According to Old Coyote, the Apsáalooke believe Pictograph Cave is a place with great power, where war parties and hunters left offerings and sought blessings for their ventures. “They didn’t question the source of the power,” he says. “They acknowledged the power and honored it. We still do.”

Apsáalooke phrases refer to Pictograph Cave as *Ammaáhpawaalaatuua* (“Where there is rock writing”) and *Alahpaláaxawaa-*



WHERE THERE IS WILDLIFE TOO Catherine Lynch, a science education consultant with Billings-based Mad Science, presents a summer family program on the park’s snakes and reptiles.

Peace in darkness

Barney Old Coyote Jr. of Billings, an Apsáalooke elder and historian, tells the story of how Pictograph Cave also became known to the Crow people as “The place where they counted coups on each other.”

(Counting coups means to physically touch an enemy and escape without harm):



JONIE ISSLEY

“One night, many years ago, an Apsáalooke man sought shelter in Pictograph Cave. It was very dark. He knew he wasn’t alone. Another man, also in the cave, was aware of the Apsáalooke man, but he couldn’t see, either. Each moved about in the dark trying to find the other. Soon, they touched. Neither could speak the other’s language. The Apsáalooke man took the stranger’s hand and brought it to his head. His hair was tied in a bunch, characteristic of the Apsáalooke, so the stranger knew he was Crow. The stranger took the hand of the Apsáalooke man and ran it across his throat, indicating he was a Cutthroat, or Lakota. The men made an uneasy, midnight truce. By daybreak, the Lakota man was gone, leaving the Apsáalooke man to tell the tale.”



BIG BLUFFS Visitors take in the splendor of Pictograph Cave, one of three large caves naturally carved out of an 80-million-year-old Eagle Sandstone formation south of Billings.



KENTON ROWE

waalaatuu (“Where there is ghost writing”). The cave complex sits in the heart of traditional Crow country, which once extended from Wyoming’s Wind River north to the Musselshell River, and from the badlands of eastern Montana west to the Crazy Mountains.

A new sandstone-hued visitor center, which opened in 2009, is the park’s latest attraction. Inside the 2,900-square-foot, energy-efficient building are interpretive displays, restrooms, a gift shop, and a meeting room. The displays contain replicas of arrowheads, dart points, and spear points found at the site at different periods of human occupation. (The originals are stored at the Montana Historical Society and other facilities.) The oldest and most intricately detailed projectile, an ivory-colored point likely lashed to the end of a hand-thrown hunting spear, dates back nearly 9,000 years. A small, sharp obsidian point represents the most recent period of occupation, from roughly 1,500 years ago until about 150 years before the present. The size and shape are consistent with smaller arrowheads used by hunters on horseback.

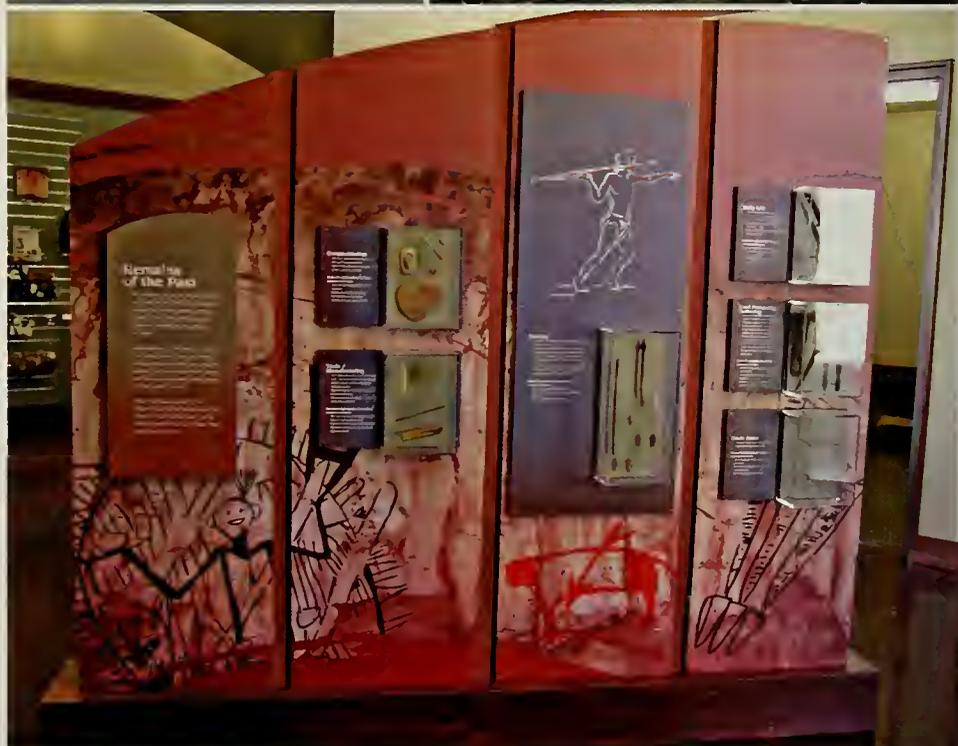
Another artifact replica is a diminutive black turtle effigy, the size of a quarter, carved into a charred bone. Turtles, a symbol of

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ARC-ITECTURE Right: Architects designed the roof line of the new visitor center to mimic Pictograph Cave’s ceiling arch. Top: Many older images in Pictograph Cave have faded, but more recent pictographs, such as one showing a series of seven rifles, are still discernable. Below: An interpretive display on early technology inside the center.



MONTANA FWP



MONTANA FWP

Pictograph's sloughing walls: preservation and problems

BY CHRISTINE HENSLEIGH

Some 9,000 years ago, small bands of nomadic people—most likely family units—congregated at the Pictograph Cave complex. Early humans in the western hemisphere followed vast herds of wildlife, including ancient woolly bison with horns spanning 6 feet. The caves were a natural resting spot, thanks to a nearby spring and abundant native plants used for food, ceremony, and medicine near the trio of caves now named Ghost, Middle, and Pictograph. Humans have been here since before the time of the Pyramids. “It’s the most important prehistoric site in Montana,” says John Douglas, a University of Montana archaeology professor and the department chairman. “And it’s the touchstone for all prehistory in Montana since.”

Migratory camps for prehistoric people were likely scattered throughout Montana. What made Pictograph Cave appealing is the protection it offered from the elements. Fortunately, those dry and comfortable living quarters for early visitors also preserved the materials of their cultures. The sheltered climate of the cave eliminated the freeze-thaw cycle and preserved rare bits of rope, basketry, and even roasted turnips—all items of great interest to archaeologists.

The artifacts are rich with information. The presence of abalone and olivella shells proves trading with distant tribes was common; the gaming pieces indicate that prehistoric man had the time and inclination for leisure and fun. The basketry is reminiscent of techniques used many hundreds of miles away in the Southwest. “A single fragment of basketry contains great cultural information,” says Montana Fish, Wildlife & Parks archaeologist Sara Scott. “The basketry technique itself, passed from one generation to another, has great antiquity.”

The caves preserved artifacts in a well-ordered manner, which allowed for easier analysis. Dirt and rock sloughed off the ceilings at regular intervals, creating a horizontally layered record that chronicled the four distinct eras of early visitors. Top layers date to 1750 AD, while subsequent layers neatly trap three more eras—500 AD to 1750 AD (when people used dogs to move belongings); 3,000 BC to 500 AD; and 7,000 BC to 3,000 BC (the oldest layer).

The colors in Pictograph are bold and expressive. The blacks were made from basic charcoal; the reds, an iron oxide; and the whites from unknown sources. Early archaeologists believed the images were records of events; these days the scientists speculate the drawings were a way of communing with the supernatural.

Shield-bearing warriors, animal figures, and weapons (including



LAYERS OF ARTWORK Many painted images in Pictograph Cave overlap or completely cover previous pictographs. Archaeologists carefully study this “superimposition” to learn which images were painted first and which are the most recent additions.

rifles) are the dominant motifs of the cave images. Most of the thousands of pieces unearthed from the site are animal bones.

Sadly, the pictographs are deteriorating. The same sloughing process that once preserved cultural material now threatens to collapse Pictograph Cave. Time has faded the colors. Slow seepage from a pond above the cave complex has formed a mineral skin over the images. Early preservation efforts that removed 1960s graffiti actually erased several pictographs.

The lesson learned from those early preservation efforts raises difficult questions: Should the park allow nature to take its course? Use chemical seals to slow deterioration? Repaint the images? “One option would be to remove the mineral overlay, but that would cost hundreds of thousands of dollars, based on estimates we’ve received from rock art conservators,” says Scott. “Another option is to let nature take its course and be grateful we have the to-scale reproductions made in the 1930s.” ■

Christine Hensleigh is a writer in Whitefish. Portions of this sidebar originally appeared in the July-August 2009 issue of Montana Magazine.

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longevity, were believed to represent the connection between the natural and spiritual worlds. In 1993, a small sample from another turtle image was removed from the wall inside Pictograph Cave. Radiocarbon analysis of the sample determined it was 2,145 years old, making it one of the oldest documented rock art images on the Northern Great Plains.

Bruner explains that the “BP” on the dates of many artifacts means “before present.” Scientists use 1950, the year that calibration curves for radiocarbon dating were established, as an arbitrary “present” date on which to base a time scale used in archaeology, geology, and other scientific disciplines. For instance, the oldest projectile point is dated around 9200 BP, or 9,200 years before 1950.

After more than half a century’s absence, archaeological work is again under way at the cave complex. “In compliance with the Montana Antiquities Act, we frequently hire archaeological contractors to conduct investigations before going ahead with any projects that might disturb the ground,” says Scott, the FWP archaeologist. In 2007, the department hired Steve Aaberg, owner of Cultural Resource Consulting Service, to perform test excavations at the sites of the proposed visitor center and new trail improvements. One discovery was an 800-year-old cooking hearth that contained a charred bison bone “We got lucky,” says Aaberg. “There’s a tendency to think the Pictograph Cave story has been completely told, but that’s not so.” The archaeologist believes even more artifacts lie buried deeper

“There’s a tendency to think the Pictograph Cave story has been completely told, but that’s not so.”

than what was previously excavated.

Aaberg says he greatly admires the hunter-gatherers who occupied Pictograph Cave. “The civilizations that left behind massive structures like pyramids and temples have come and gone, while the hunter-gatherer peoples continued to survive until relatively recently—and in some parts of the world they still survive,” he says. “To me, the remarkable knowledge that hunter-gatherers had of their complex natural environment—along with their cultural longevity and the light footprint they left on the landscape—make them as advanced as any other culture.”

Fortunately, previous visitors to the cave complex left some trace of their passing.



Their artifacts and rock art continue to attract people to Pictograph Cave State Park, a site of sweeping scenic beauty and rich historical significance. Visitors can still smell the fragrant sweet sage in the summer breeze and gaze upon the rimrocks and vast plains framed by a bright blue sky. And they can know they are at an important place where others have visited for thousands of years—and will continue to visit for many years to come. 🐾



DIGGING DEEP Above: Prehistoric hearth with bison scapula. Above right: Tubular bone beads and shell fragments. Below: Archaeologists conduct an excavation along a proposed trail site.



WHEN YOU GO

Directions: On I-90 near Billings, take the Lockwood Exit (452) to Coburn Road. The park is at 3401 Coburn Road, a distance of about 6 miles.

Hours: The park is open year round. Call (406) 254-7342 or visit fwp.mt.gov for more information and to learn seasonal park and visitor center hours.

Admission: Free for Montana residents. Non-residents pay a day-use fee.

Mayflies

Order Ephemeroptera

BY TOM DICKSON

Hang around fly anglers long enough and you'll think you're with a bunch of entomologists. They talk about mayfly species and life forms as much as they do trout. That's because mayflies are the primary reason trout rise to the water surface. And to many anglers, seeing a trout take a floating mayfly imitation is the ultimate fulfillment of their sport. As much as they like fighting big, strong fish, what dry fly anglers like most is to see the "take."

IDENTIFICATION

Montana contains 109 species of the aquatic insects known as mayflies. Among the most well known are *Ephemera inermis* (pale morning dun to anglers), *Drunella grandis* (green drake), *Baetis tricaudatus* (blue-winged olive), and *Tricorythodes minutus* (trico). Generally all adult forms can be poetically described as looking like miniature angels when flying and, with their delicate upturned wings, tiny sailboats when floating on the water. (Another common aquatic insect, the caddis fly, looks more like a drunken moth when it flutters past.)

According to Dave Stagliano, an entomol-

Tom Dickson is editor of Montana Outdoors.

ogist with the Montana Natural Heritage Program, Montana is home to seven mayfly species classified by the state as "of concern," including the Lolo mayfly, found only in Montana and Idaho.

NYMPHS

Mayflies are aquatic invertebrates (insects) that lay their eggs atop rivers and streams. After sinking to the bottom, the eggs hatch into naiads, or nymphs. The brown or dark green nymphs have long legs and seven pairs of platelike gills below or alongside their bare abdomen, which is usually tipped with three long filaments. Nymphs feed mainly on algae, diatoms, and decayed plants. Most species avoid predators by clinging to the underside of submerged rocks and logs.

As they grow, nymphs shed their exoskeleton a dozen times or more. The last "molting" occurs on the water surface when the nymph metamorphoses into the first of two winged stages. Anglers call mayflies in this stage emergers. The insects are vulnerable to trout because they are trying to swim while shucking off their cumbersome outer nymph skin.

SUBIMAGOS

With its exoskeleton now completely gone, the mayfly floats in the water film, then breaks through the surface to dry its newly formed wings. For a few moments, the mayfly is again vulnerable to trout, for it can no longer swim and can't yet fly away. When you see someone casting a dry fly, it's usually to imitate this subadult stage, known as a

subimago, or dun to fly anglers.

Though no one is certain why, apparently changes in water temperature, barometric pressure, light levels, or other environmental conditions cause thousands of mayfly nymphs to drift to the surface over a period of several hours and become duns. This is known as a hatch. When it occurs, the river surface can become blanketed with countless floating duns.

IMAGOS

After only a few moments, its wings dry and the dun takes flight. The mayfly flutters in the air then alights on a nearby tree or bush and—unique among insects—molts into a second winged form, this one with two pairs of wings. In this stage, known as imago, or spinner to anglers, the mayfly looks similar to when it was a dun, though slightly smaller and with clear wings rather than opaque.

Spinners wait anywhere from a few hours to two days before flying back to the water, where they mate in great swarms over the surface. As the males die and fall into the water, the females hover over the river, dabbing the surface with their abdomen while releasing fertilized eggs. Then they too die. Once again trout come up to feed, this time on what anglers call spent wing spinners.

The mayfly's brief adult life is over nearly before it begins. The scientific order name is Ephemeroptera, Greek for what could roughly be translated as "brief adult life." The French call the aquatic insects *éphémères*, or "one-day flies." 🐛



JOHN JERACK

PARTING SHOT



SPENT WINGS Tiny mayflies known to anglers as tricos lie dead on the water surface after their brief but thrilling adult life. Learn more about these and other species of what the French call *éphémères* ("one-day flies") on page 41. Photo by John Juracek.



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