

Bob Taylor

Home 703-278-8060

Office 528-3162

Jim Dugg 337-0301

Bill Race

356-4546

Bill Pearl

560-7827

Shaving kit Can opener

Sweater

jean

food

glasses

CATCH AND RELEASE: IS IT WORKING?

No one knows for certain who first coined the term "catch and release." In the late 1950s the assistant executive director of the Pennsylvania Fish Commission, Albert Hazzard, pioneered a program of catching trout and putting them back in Clinton County's Old Woman's Creek. He called it "Fish for Fun." Not long thereafter Richard Stroud, the head of the Sport Fishing Institute, gave a speech in which he remembers saying, "I don't like the term 'Fish for Fun.' All fishing is fun. So I'll use the term 'catch and release.'"

Whether Stroud was actually the first to utter the enduring words is beside the point. In a time of increasing angling pressure, the concept of catch and release struck anglers as a superb idea. True, one gave up fish in the skillet, but one kept everything else: time on the water; fooling and playing the fish; and—a newfound pleasure—watching fish swim away to fight again. As one of the pioneers of no-kill fishing, Lee Wulff, wrote in 1937, "The finest gift one angler can give another is a good gamefish to catch."

FLAWS IN THE PANACEA?

Within 20 years catch and release came to be viewed by many anglers as a panacea—a tonic to restore overfished waters and a maintenance program for quality streams that were seeing increased fishing pressure. Like Midas, we could wave no-kill regulations over bodies of water, and they would turn into piscatorial gold. But every Midas has his day of reckoning. On some heavily fished Western rivers, anglers began to notice that they were catching fish with numerous puncture wounds in their mouths. In Alaska guides began to question the practice of letting their clients hook, fight, and release numerous king salmon to get one 70-pound keeper for the wall. What was happening to these fish, some began to ask, once they were let go? Might it be true that the incident mortality associated with catch and release on

*The answer is
a resounding "yes"... but there
are still a few problems that have
to be dealt with.*



One problem is that trophy fish often suffer the greatest mortality rates.

heavily fished waters (the number of fish that inevitably die from hooking injuries and poor handling) was approaching that of the catch-and-keep mortality in days of less angling pressure? Was this good for fish or were we deluding ourselves in the name of sport? As one guide put it, "When fish are being caught a dozen times a season, aren't we just tormenting them?"

Biologists have now done enough studies to answer some of these questions—at the least the ones that can be answered by numbers—and the answers show that the mortality associated with catch and release is not only dependent on the handling techniques used to release fish, but also on the water temperature, the species of fish, its size, what kind of tackle it was hooked on, and where the hook was actually embedded. Some of the data is surprising and worth keeping in mind the next time one has a fish on.

MORTALITY RATES AND CAUSES

One of the more careful studies took place on Alaska's Kenai River. As catch-and-release fishing for kings gained popularity, the Alaska Department of Fish and Game grew concerned that "escapement goals"

were being jeopardized. (Escapement means the number of fish that actually spawn.) In fact, they theorized that catch-and-release mortality could be as high as 20 percent.

In 1989 Terry Bendock, a biologist with Fish and Game, initiated a two-year study. He timed anglers fighting kings to the boat, then asked them if they would mind if he tagged the fish with a radio transmitter. One pulse per second meant a live fish. Two pulses per second indicated a fish that hadn't moved for four hours. If the fish died within five days of being released, it was termed a hooking mortality. In all, 447 fish were tagged and then tracked by air. For identification purposes, each fish bore a different frequency. The results were thought-provoking.

Most anglers believed they had played their salmon for 30 to 40 minutes. However, Bendock's stopwatch told a different story. Mean time for fighting a king, including time spent tagging it, was 15.3 minutes. Contrary to popular belief—that the time a fish had been played contributed to post-release mortality—Bendock found that "survival is mostly dictated by where the fish is hooked." Fish played for an hour didn't show significantly greater mortality than those played for a fraction of that time, but almost all of the salmon hooked in the vital areas of tongue, eye or gills (5.6 percent) died. Overall mortality was 7.6 percent.

Though sportfishermen were pleased with the low mortality suffered by kings, Bendock was quick to caution that the results from the Kenai couldn't be transferred to other fisheries. "We've done other studies," he said, "and have found extremely high mortality rates on cohos. On the Susitna, boats are anchored and the fish ingest the bait deep. On the Kenai, baited spinners are just being snapped at. On the Susitna the coho catch-and-release mortality approached 70 percent."

Studies involving trout have shown similar variations in mortality. For

example, researchers have noted that wild trout suffer greater mortality than hatchery fish when caught and released, even though the former are physiologically more fit. It is theorized that they fight more aggressively and frantically, and often hook themselves more deeply. As many anglers have correctly concluded, artificial lures kill fewer fish than bait—five to 10 times fewer. If bait is placed on an artificial lure, however, mortality once again skyrockets.

WARM WATER KILLS

What many of us haven't understood is that higher water temperatures boost mortality. For instance, play a trout for 20 minutes in the cold Yellowstone River, release it gently, and its chances of dying are about one in 100. Drive over to the Firehole, the Madison or the Gibbon (which have higher water temperatures), play a trout for the same amount of time, release it in the same gentle way, and its chance of dying, says John Varley, chief of research at Yellowstone National Park, can be as high as 14 percent. In warm water fish are more easily stressed and prone to disease.

Another surprising fact is that the

largest trophy fish, seemingly healthy and robust, often suffer the greatest mortality—in cold or warm water. Barry Nehring,

On heavily fished rivers, it's gotten to the point where we're loving the fish and the place to death.

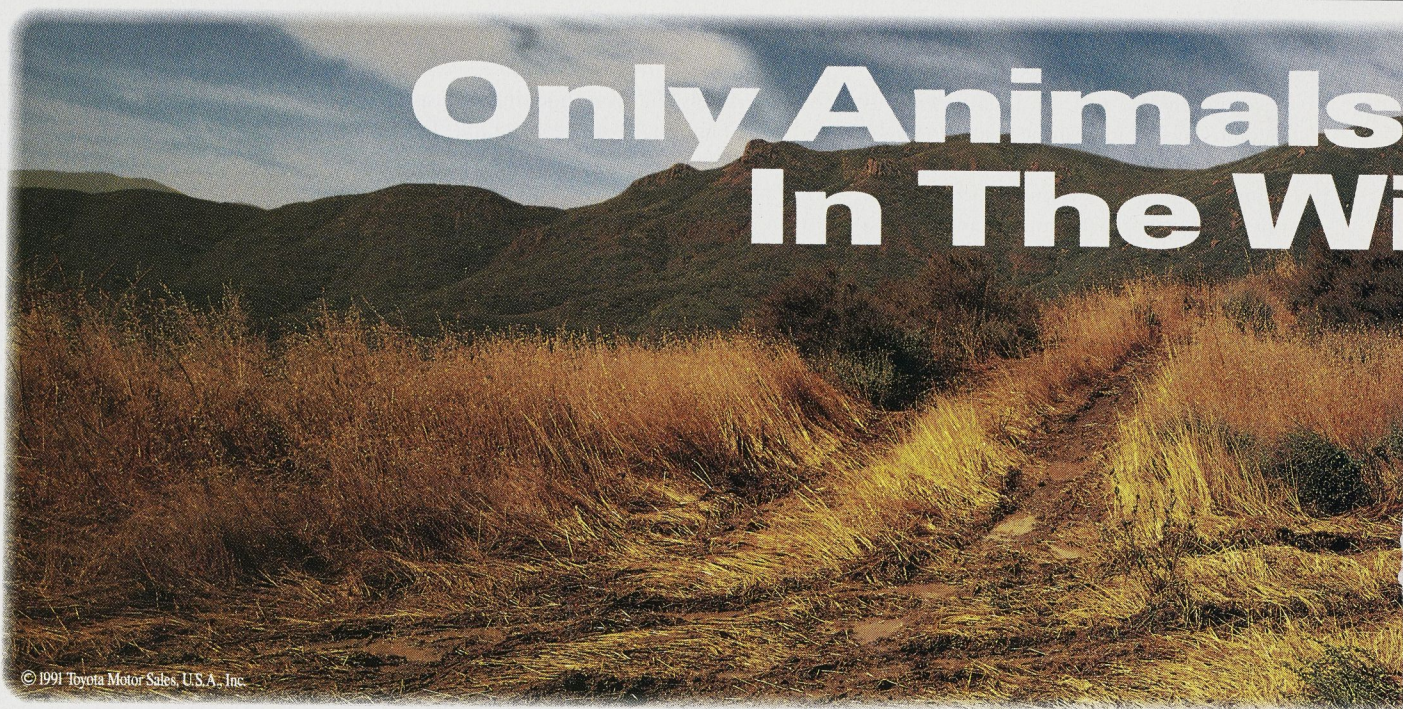
a biologist with the Colorado Division of Wildlife, explains why. "Large girth-to-length ratio in fish," he says, "does not necessarily imply super health anymore than it does in human beings." Many of these giant fish, feeding on such fatty diets as Mysis shrimp or amphipods, have liver tis-

sue like marbled beef. Obviously, these are the fish most avidly photographed before being released, and it's often the stresses of photography that kill them.

But trout of any size, on a normal diet and living in cold waters, are amazingly adaptive to catch-and-release pressures. One study on the Yellowstone River showed that cutthroats were being caught and released 10 times during a season. Jack Griffith, professor of biological sciences at Idaho State University, who did the study, discovered that the cutthroats, which didn't fight strongly, seemed to have adapted by letting themselves be caught without too much struggle. On the other hand, on Silver Creek in Sun Valley, Idaho, he found that rainbows could be caught an average of only three times a season—they had grown shier. Large brown trout, on the average, could be caught and released only once.

HOOKING STRESS

What has been most intriguing, and what is important in measuring the biological cost of catch-and-release fishing, is that the stress of hooking affects cutthroats' ability



Although many people don't realize it, any area designated as "wilderness" is strictly off-limits to all mechanized vehicles. That includes off-highway vehicles (OHVs) like 4-wheel drives, ATVs, snowmobiles, even mountain bikes. After all, one of the rules of the wilderness is to leave

no trace of your visit. Not even footprints.

There are, however, millions of acres of public lands that are open to OHVs. And we encourage you to seek out and enjoy them. But remember, too, that even in these areas there are certain rules to follow—like always staying

to maintain their social position. As Griffith wrote, "The highest-ranking fish in a hierarchy had the highest probability of capture by angling, and these dominant fish lost (at least temporarily) their social status and feeding stations after they were returned to the water." The two researchers who did the original work on the Coeur d'Alene River also pointed out that "this selection is contrary to natural selection, where the smallest or weakest individuals have the highest probability of capture by natural predators."

Synthesized, all this data points to a general conclusion: When caught on artificial lures in cold water and released properly, trout suffer mortality of from 1 to 10 percent. Such management regimes have led to outstanding fishing—witness New York's Beaverkill, Maryland's Gunpowder Falls and Wyoming's Clear Creek, which have increased their productivity by as much as 15 times after switching to no-kill regulations. Still, the incident mortality associated with catch and release fishing, and the disruption of the trout's social structure, has reached the point where it's bothering some anglers.

STILL WILD?

Tom Montgomery is one. A well-known guide in the northern Rockies and a frequent photo contributor to *Sports Afield*, he calls it the "ultimate problem of too many people and too few fish." Recalling the summer he had just spent on the Snake River, he said, "I was astonished that, with few exceptions, I could see signs of multiple scarring on the fish's mouths and on the inside of their lips. As a business reality, catch and release is here to stay because a good fish is too valuable to be caught only once, and as a management tool, it's also necessary to the times—it's essential for the perpetuation of the sport. But as a guide and a fisherman, I've begun to be bothered by it. You can't tell me that these caught and released fish, or these places, are wild anymore. That's where catch and release has failed. The fish have begun to look scarred—not the pristine wild things we once caught—and we're also breeding a type of trout that lets you stand on top of it while it continues to feed. They've adjusted to the presence of man. They're still scattering when a boat goes over them but they're scattering for less

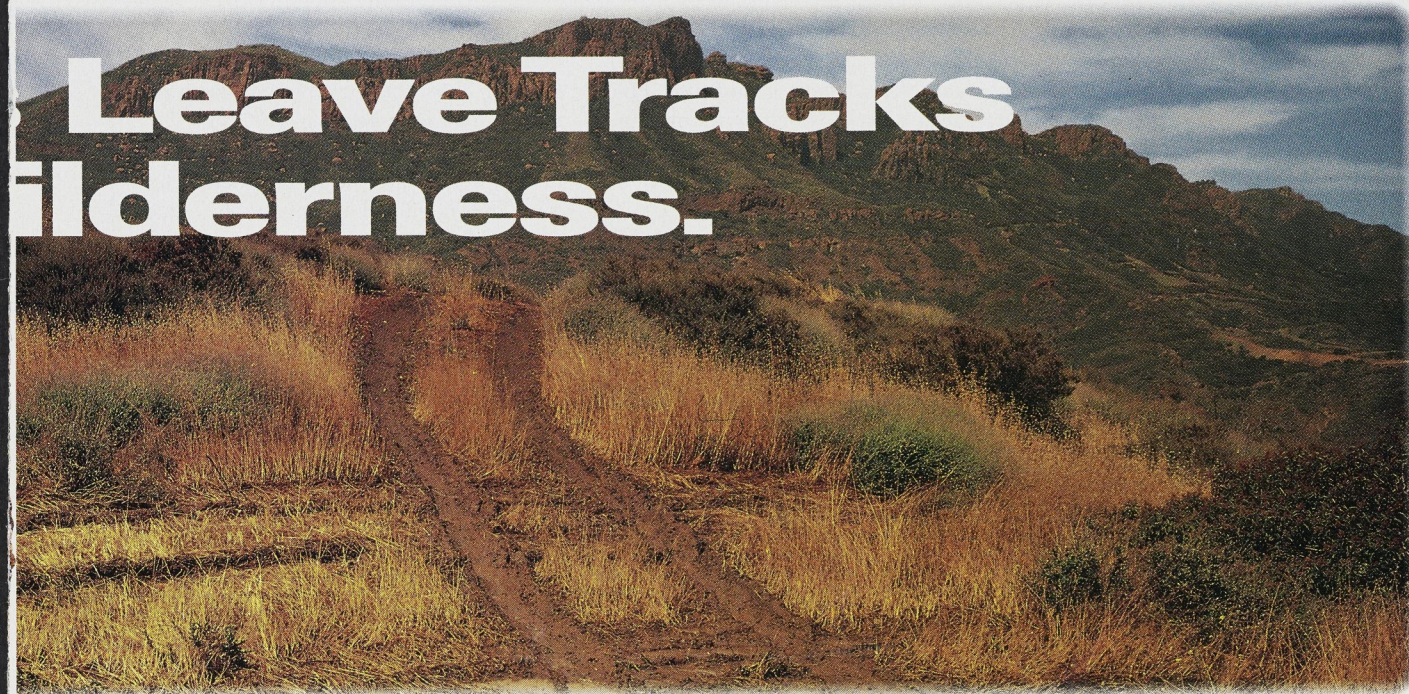
distance and less time than in the days when boats were less common. Some fish even know what being caught is all about. They just shake their heads and come in."

Montgomery's face became reflective. "I'm absolutely in favor of catch and release," he added, "but on heavily fished rivers I think we're loving the fish and the place to death."

The solution? Perhaps a permit or a lottery system on popular rivers, which would put some of the wildness back into the fish and the experience. But that's another story. SA

*Next Month In
Sports Afield*

**Be A Better
Trout Fisherman**



on the established trails. And even if someone else breaks that rule by blazing a new path—don't make matters worse by following in their tracks. Because remember, there's a name for people like that.

Toyota is a member of Tread Lightly!, Inc., a

non-profit educational organization that works to promote environmentally conscious OHV use and other forms of backcountry travel. For information on how you can become a member, call

1-800-966-9900.



SHOOTING

GRITS GRESHAM

REDISCOVERING THE ONE-OUNCE LOAD

In this era of the increasingly portly shotshell—express load, baby magnum, papa mag and super mag—it's revealing to hark back to the days of yore. What we discover, or rediscover, is that many of the shotgunning feats of yesteryear's gunners were accomplished with a very modest amount of shot.

What this means to us today is this: The one-ounce, 12-gauge shotshell is an excellent hunting load.

Some waterfowl market hunters were extremely efficient—first with muzzleloaders and then with breechloaders—using payloads of 1 1/4 ounces of shot, and less, regardless of the gauge. They would have been amazed at modern 12-gauge factory shotshells that contain 1 7/8 ounces of lead shot.

Ducks are difficult to kill. If market hunters successfully depended on such light loads for their living, it's logical that modern shotgunners can handle most sporting requirements with modest payloads. And we can—with the rigid exception of steel shot, where less shot is definitely *not* better.

Shooting driven pheasants in Denmark, I was impressed with the solid kills being made by some of the gunners on very-high-flying birds. The 12-gauge shells we were using contained one ounce of No. 6 shot. We tend to forget that the 12 gauge, when it was developed in England, used a 2 1/2-inch shotshell with a correspondingly light shot charge. In fact, in England from 1914 to 1918, during World War I, shooters were restricted by law to one-ounce loads rather than the standard 1 1/16-ounce load of that era because of the lead shortage. Hunters found it so pleasant and effective that, even after the war, the reduced load was almost as common as the "heavier" load. It worked then; it works now.

Twenty-gauge fans often brag a bit about what can be done with that

smaller gauge...and with a one-ounce load. But consider that such a load is more efficient in a 12 bore. And there are now 12-gauge guns with weight and balance that enable them to equal the quickness of smaller gauges.



The light charge is plenty effective, yet pleasant to shoot.

now aiming for a 28-gram load in order to be safe."

Over the years, the maximum permitted shot load for international competition has gone from 1 1/4 ounces to 1 1/8 ounces to one ounce—and amazingly

enough, scores are improving. Just since the recent change to one ounce, said Woodhouse, international skeet scores have gone up, and international trap scores have either remained the same or improved slightly. Scores have definitely improved for women and slightly built men.

Due to the scarcity of international skeet and trap ranges in the U.S., some shooters may yawn over such problems as maximum loads, but we can profit from the

Olympic experience. It tells us that one-ounce, 12-gauge loads will do the job for sporting clays, for conventional skeet and trap, and for most hunting.

Federal has six one-ounce loads in its lineup. Winchester has three; Remington two. They're offered in shot sizes 6, 7 1/2, 8, 8 1/2 and 9.

FRINGE BENEFITS

Recoil is reduced when the shot load is lighter, which means you can shoot better. The cost of lead shot is a significant expense for reloaders; thus a lighter shot charge means more trigger pulls for the buck. That lighter shot load translates to less powder for the same velocity, another saving. Youngsters and ladies, especially, may find one-ounce loads an advantage, since they'll benefit from the 12 gauge's efficient pattern, yet recoil will be compatible with their size.

COMPETITION SHOOTING

International clay target competition, including the Olympic games, now limits shotshells to approximately a one-ounce load. The actual maximum load is 28.5 grams, while one ounce equals 28.35 grams.

"We've had a little problem with U.S. loads that are a bit heavy," said Lloyd Woodhouse, coach of the U.S. international clay target shooters. "As few as three No. 7 1/2 pellets put the shell over the limitation, and factory production lines are not that precise. Companies are



The differences between one-ounce and 1 1/8-ounce loads are negligible—in both size and performance.

HOW TO LET GO

When Mike Strandlund released the 40-inch muskie into the Minnesota lake, he liked the way the fish darted out of sight like a misguided torpedo. But when Strandlund returned to his favorite water a few days later, something appeared to be as fishy as it smelled: The bloated muskie, floating belly-up on the surface, looked too familiar to be a coincidence. The thought that he had killed such a trophy turned Strandlund's stomach more than did the foul odor under his nose.

Ever since R.H. Stroud first coined the term "catch-and-release" in 1964, thousands of anglers have voluntarily released millions of fish. Those who carve up a few fillets for the dinner table should in no way be snubbed, but the idea that some fish are more valuable alive than dead makes



PHOTOGRAPH BY MIKE BARLOW

New information on the right and wrong ways to catch and release fish could mean the difference between killing that trophy and letting it live to fight another day.

By Jeff Murray

biological as well as recreational sense.

Unfortunately, research suggests that many anglers need to refine their release techniques. "Sloppy catch-and-release can actually hurt a fishery," said John Daily, Minnesota Department of Natural Resources aquaculture specialist. "Take a bass angler who lands 50 fish but doesn't keep any. If 80 percent survive, 10 will die. That's worse than if the guy caught his limit and quit fishing."

On the other hand, improving catch-and-release techniques could easily reduce mortality rates by 25 percent (some authorities say 100 percent). To do this, anglers need to keep in mind some basic rules when releasing any species.

A basic rule of release is to handle fish as little as possible, and to do so only with wet hands.

THE RULES OF RELEASE

Ironically, when catch-and-release principles first made news, ultralight fishing dominated the headlines. Catching big fish on lightweight tackle seemed vastly superior to "less sporty" methods. Since then, research has shown that playing gamefish to the brink of exhaustion can actually turn catch-and-release advocates into wishful thinkers. The reason is that the buildup of lactic acid during

a lengthy battle can substantially reduce a fish's chances of survival.

So start by matching equipment—particularly line and rod strength—to your quarry. Enjoy the battle, but don't overdo it; the fish should have plenty of spark left at the end, instead of having to struggle for equilibrium. If a fish does become stressed, take time to revive it by gently holding it upright in the water and moving it back and forth to force water past its gills.

Second, avoid unnecessary handling of fish, and when you do handle them, make sure you do so with wet hands to preserve their protective mucous coating. (For the same reason, also try to avoid using nets, as mesh can damage fins and gills as well as the protective slime.) Go ahead and snap a picture, but consider sun angle, background and exposure *before* you touch the fish. Remember that prolonged periods out of water can cause a fish to suffocate.

If you wish to know the weight of your catch, think inches, not pounds. Various fish-weight guesstimation charts available from state conservation agencies accurately convert body length into weight—and measuring a fish is less traumatizing to it than hanging it by its mouth or gill plate.

And finally, use artificials instead of bait when angling for fun and not food. The reason for this is that bleeding may occur when fish swallow a hook attached to bait. To help avoid this problem, bait anglers should try for immediate hook-sets by using quick-strike rigging, spring bobbers and by rod-watching.

Following these rules will help ensure the survival of fish in general, but extra caution should be taken with specific species.

SALTWATER SPECIES

Conservation-minded saltwater anglers have been releasing—and tagging—sharks since the 1960s. Coded tags, implanted by anglers with a "tag pole" near the fish's dorsal fin, have taught marine biologists much of what they know about sharks. "Within the past 30 years, 100,000 shark captures have given us growth, range and seasonal migration data that would have otherwise been impossible to gather," acknowledged the National Marine Fisheries Services' Jack Casey.

Shark tournaments have long enforced rules that keep kills to a minimum. For example, top weights are broadcast on a marine band "tournament channel" so that contestants can release all fish that won't make the cutoff. Of course, scrupulous catch-and-release practices apply: cutting the leader near the hook (bronze, not steel); using stout equipment to reduce muscle

temperature buildup; helping fish "vent off" stress next to the boat (sharks must swim to breathe because they lack gill flaps to ventilate water); treating a shark's belly, which is exceptionally vulnerable to bruising, with care.

Billfish, such as marlin, sailfish and swordfish, are routinely released with excellent results, according to Norm Bartoo, a California fisheries biologist. A crew (one wearing a cotton glove to hold the fish's bill) can tag, revive and release a billfish in minutes. The free pamphlet *Marine Gamefish Tagging* tells all, and it can be ordered free from the National Marine Fisheries Service, Southwest Fisheries Science Center, Box 271, 8604 La Jolla Shores Drive, La Jolla, CA 92038. Ask for pamphlet NOAA-PA 71050.

Another pamphlet, *Giving Something Back: Catch & Release And Tag & Release Fishing—An Angler's Guide To Programs And Resources On The Atlantic Coast*, is available free from the National Marine Fisheries Service, Northeast Fisheries Science Center, 166 Water St., Woodsall, MA 02543 (508-548-5123).



A billfish, such as a marlin (above), sailfish or swordfish, can be tagged, revived and released in a matter of minutes.

After a successful release, a flag is then raised to indicate that a trophy was brought to boat, tagged and let go.



BASS

Bass tournaments have largely paved the way for today's catch-and-release ethic. According to the Competitive Fishing Committee of the American Fisheries Society, about 31,000 competitive events are held annually; 80 percent target bass in inland waters. Fisheries scientist Ralph Manns, who served on the committee, has diligently studied catch-and-release data for 25 years. He boils it all down to one common-sense rule: "Next to playing a bass quickly and minimizing handling, land it properly by its lower lip. It's

such a handy handle that nets are rarely needed."

The weight and strength of exceptionally large fish can lead to some anxious moments. Manns adds two precautions: Don't overbend the lip to subdue a fish; and don't lip-land a fish prematurely. "You not only risk jaw damage during an unplanned tussle," he warned, "but you could drop the fish. A carpeted boat floor has millions of sharp fibers that can strip the bass' protective film."

Because of pressure buildup, bass taken from deep water may need to be "fizzed" (see page 116). Deflating the air bladder of a bass with a hypodermic needle is explained in a free pamphlet entitled *Needle Deflation Of Largemouth Bass*, which is available from the California Department of Fish and Game, Attn.: Dennis Lee, 1701 Nimbus Rd., Rancho Cordova, CA 95670 (916-653-0842). The department's warm-water fisheries board and the Bass Research Foundation are studying survival rates with the technique, and results should be published soon.

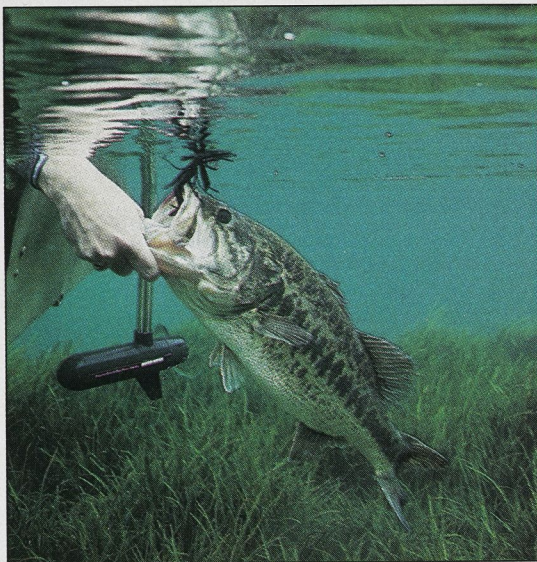
Proper live-well procedures are a must for tournament anglers who must transport live fish, typically to a designated weigh-in site. The same goes for non-tournament anglers who may wish to release fish at the end of the day because they have too few (or too many) for a meal. Dr. Harold Schramm, a prominent educator of catch-and-release principles, recommends recirculating live wells that have ample space, but he doesn't advocate the use of popular commercial live-well additives. The chemicals contained in the formulations "aren't approved by the U.S. Food and Drug Administration for use on food fish," Dr. Schramm said. Instead, sea salt (or non-iodized rock salt) "reduces stress to fish and stimulates mucous secretion." The correct application rate is 0.5 percent (0.7 ounces of salt per gallon of water).

For more information, send \$2 to the Bass Research Foundation, 1001 Market St., Chattanooga, TN 37402 (615-267-1680). Ask for Dr. Schramm's brochure *Live Release Of Bass—A Guide For Anglers And Tournament Organizers*.

TROUT AND SALMON

Thirty-four hooking mortality studies conducted over a 50-year period and involving 16,000 fish disclose what it takes to let that trout or salmon go unharmed. Paul Mongillo, fisheries manager with the Washington Department of Game, condensed these studies in his landmark work, *A Summary Of Salmonid Hooking Mortality*. Some highlights include:

- Wild trout and salmon, when taken with artificial lures and flies, suffer a two to four times higher



When lippping large-mouths, don't try to land the fish before it's ready, and don't bend the "handle."

PHOTOGRAPH BY JACK BISSELL

hooking mortality rate than hatchery fish (though wild and hatchery fish caught with bait suffer similar hooking mortality rates).

- With the exception of adult winter-run steelhead, bait fishing increases mortality on all salmonids—as high as 20 to 50 percent, depending on the species. "Hook penetration in critical areas" leads to a 50 percent mortality, compared with 10 percent or less for artificials.

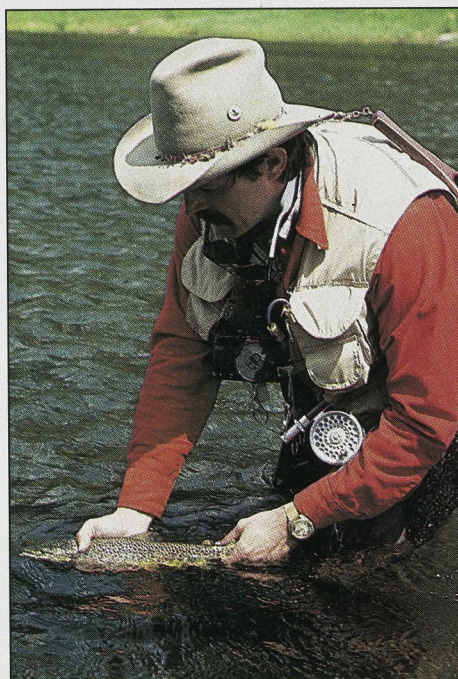
- Mortality resulting from trolled bait is "comparable" to that from bait still-fished or drifted.

The effects of hook style, water temperature and release strategies also proved enlightening:

- There's "no valid technical reason" to require single barbless hooks; hooking mortalities resulting from artificial lures and flies—with or without barbless hooks—are essentially the same for salmonids.

- Treble hooks on artificials may lead to "less hook-

continued on page 115



Studies have shown trout hooking mortalities to be the same whether or not an artificial's hook is barbless.

PHOTOGRAPH BY JIM VINCENT



HOW TO LET GO

continued from page 59

ing mortality" than single hooks; however, when fishing with bait, large single hooks may lead to lower mortality than smaller treble hooks.

- Higher temperatures "likely lead to higher mortality," but lure-caught rainbow trout, even at higher temperatures, died 10 percent of the time or less.

- Specific handling techniques may reduce mortality. For example, cutting the line is preferred over removing hooks from the throat or stomach area.

REMEMBER THAT PROLONGED PERIODS OUT OF WATER CAN CAUSE A FISH TO SUFFOCATE.

And cradling trout upside down tends to tranquilize the fish temporarily. However, the type of hook injury largely determines the fish's fate: Those trout that are hooked in the gills, esophagus, tongue or eye are about "four times more likely to die" than those hooked in the mouth or jaw.

WALLEYES

No fish has experienced a revival in voluntary catch-and-release like the walleye. "Used to be that the only good walleye was a filleted walleye," commented the Minnesota DNR's Tim Goeman, who researched guidelines for minimizing mortality in live-release tournaments. But a new walleye ethic has indeed evolved, as evidenced by a recent survey documenting the voluntary release of 132,000 walleyes exceeding 13 inches in length in central Minnesota's Mille Lacs Lake. That's one fish released per acre of water. Nevertheless, walleyes have a reputation for being fragile and catch-and-release-unfriendly.

"Not true," said Ron Lindner, walleye catch-and-release pioneer and initiator of the Professional Walleye Trail (PWT) tournament circuit. "They're just different. Only so much bass [catch-and-release] biology applies to walleyes. The rest we've got to research on our own. That's one of the major



We hope you'll come pay us a call here at Jack Daniel Distillery sometime soon. And bring your camera along.

THE MOST PHOTOGRAPHED man in Lynchburg, Tennessee is Jack Daniel. No doubt because he stands still so well.

Visitors to our distillery have always liked taking pictures of the man who made the world's finest whiskey (so said the judges at the 1904 World's Fair). Today, Mr. Jack's statue keeps us mindful of the high standards he set—and we still abide by. Occasionally, a visiting expert will suggest we modernize and change our oldtime whiskey. But, as you might guess, nobody around here would stand still for that.

SMOOTH SIPPIN' TENNESSEE WHISKEY

Tennessee Whiskey • 40-43% alcohol by volume (80-86 proof) • Distilled and Bottled by Jack Daniel Distillery, Lem Motlow, Proprietor, Route 1, Lynchburg (Pop 361), Tennessee 37352
Placed in the National Register of Historic Places by the United States Government.



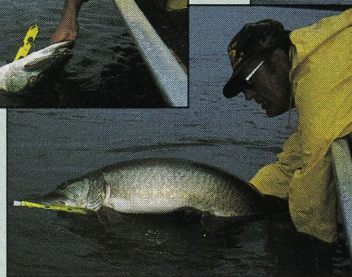
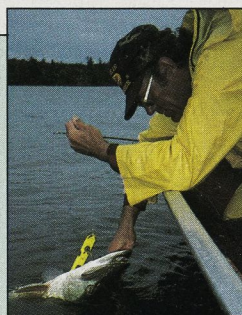
objectives of the Professional Walleye Trail."

Billed as a live-release circuit, the PWT took some heat following a 1990 Mille Lacs Lake event, during which only 38 percent of the fish survived. But as Lindner points out, tournament officials at that particular event knew ahead of

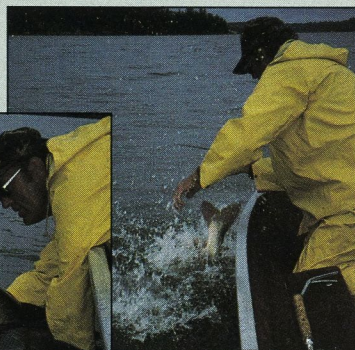
time that live-release rates would be lower than normal because of warm and turbid waters. (Survival rates averaged more than 85 percent for five tournaments in 1992.)

Findings from the PWT can help

When releasing sharp-toothed critters, such as muskies (right) and pike, the key is to use extra caution and to keep them out of the boat. If you must lift the fish from the water, grip its underside gill plate.



MUSKIES AND PIKE



PHOTOGRAPHS BY THE AUTHOR

boost live-release rates. One involves tanking fish in a recirculating live well. "All factors being equal," Minnesota's John Daily said, "ideal live-well conditions increase the odds [for survival]. Walleye fishermen don't winch-in their

the deeper your live well should be and the fewer fish you can handle." Interestingly, just one more fish in the live well can make a difference. PWT Tournament Director Mark Dorn noticed an increase in the live-release rate "of about 7 or 8

fish like bass anglers, so the rest period helps the fish rehabilitate from lactic acid buildup." About 20 minutes is usually a sufficient amount of time.

"What makes walleyes unique is their spiny dorsal fin," continued Lindner. "If you crowd too many together, they'll spike each other. And the rougher the water,

THE FIZZ BIZ

The latest buzzword among catch-and-release advocates is "fizzing." When some fish are caught from deep water, they could die from inflated air bladders and a resultant loss of hydrostatic balance. Physostomous species, such as trout, salmon and catfish, can usually "belch away" increased pressure because they have a small duct connecting their air bladders and alimentary canals. However, physoclistous species, such as largemouth and smallmouth bass, stripers, red snapper, white bass, panfish, sauger, walleyes and perch, lack this duct. Puncturing (fizzing) these latter species' air bladders can increase live-release rates.

Following is how trained Ohio officials fizz walleyes. The same procedure is used on bass, with one variation (noted later). Fizzing is best achieved within the confines of an aerated live well. The procedure takes practice (experience on bloated fish slated for the frying pan is a good prerequisite).

1) Obtain a 16 to 20-gauge hypodermic needle at least two inches long from a vet or medical supply firm. (The

needle cap from a Lindy-Little Joe worm blower also works.)

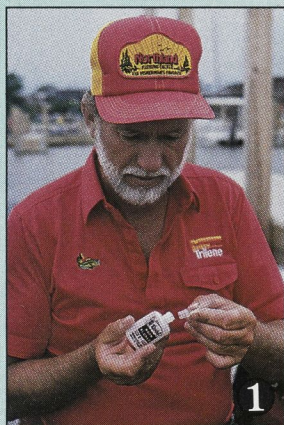
2) Locate the point of insertion: approximately one inch above the anal vent, slightly off to one side. Placement here avoids internal organs while penetrating the over-inflated air bladder. California Department of Fish and Game's Dennis Lee recommends puncturing the bladder of bloated bass "three to five scale-rows below the lateral line, after first drawing an imaginary line straight down from the spiny-ray dorsal fin and soft-ray dorsal fin."

3) While gently holding the fish upside down, slide the needle under, not through, fish scales.

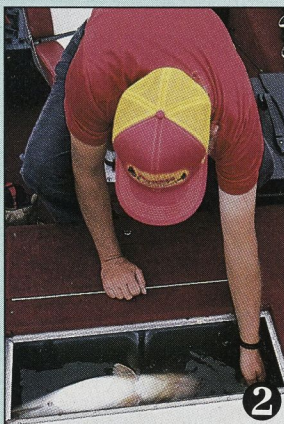
4) Fizzing occurs when air bubbles rise to the surface and the body cavity begins to contract. Gently stroke the belly cavity to force out remaining air after about 15 seconds or when bubbling stops.

5) The fish is ready to be released when it rights itself in the bottom of the live well.

6) Carefully return the fish to the water, and make sure that it's able to swim off under its own power.



1



2



3



4



5



6

PHOTOGRAPHS BY THE AUTHOR

Ten Years of Catch-And-Release In Yellowstone Park

Ronald D. Jones

NOTE: Paper presented at Wild Trout III Symposium, Yellowstone National Park, Wyoming, September 24-25, 1984. Ronald D. Jones is a Fishery Management Biologist, Yellowstone National Park.

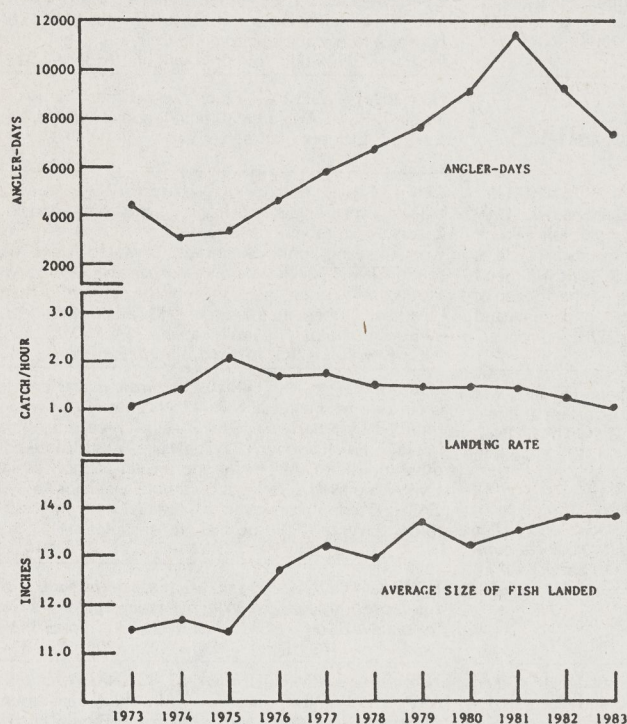


Figure 1.--Angler-days, landing rates, and average size of fish landed for the trout fishery, Slough Creek, 1973-1983.

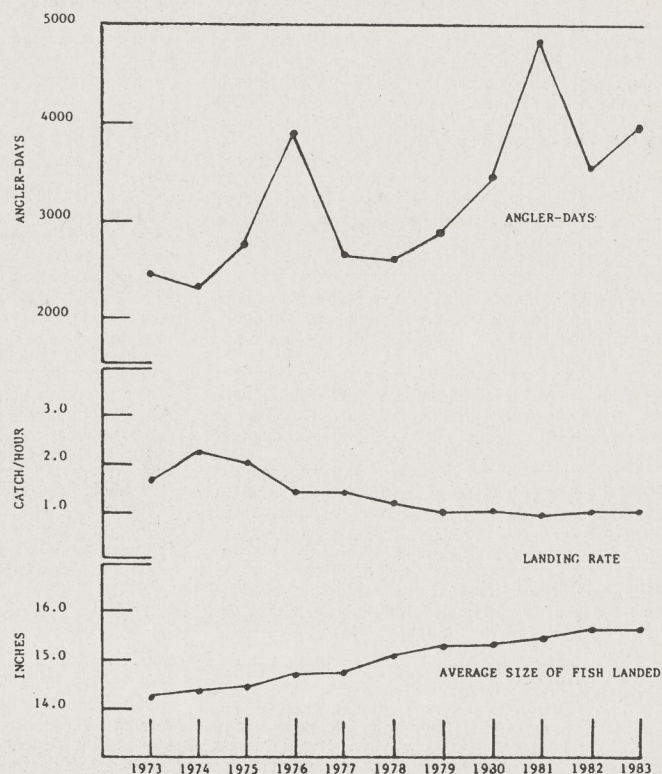


Figure 2.--Angler-days, landing rates, and average size of fish landed for the trout fishery, Yellowstone River C&R section, 1973-1983.

Yellowstone National Park is classified as a natural area in the National Park system and as such must be managed to preserve pristine conditions. The fisheries are supported mainly by fragile subalpine environments where replacement of a catchable size fish can take years.

Fishing has been a popular and accepted activity in the Park since its estab-

lishment in 1872. Increasing visitation and angler use since the 1930's has necessitated radical changes in the fishery management objectives. Regulations have gone from very liberal consumptive oriented, to more restrictive non-consumptive oriented of today. The specific objectives of the present sport fishing program are:

1. To manage the fishery as an integral part of the Park's ecosystem.

2. To preserve and restore native species and aquatic habitats.

3. To provide anglers with a high quality angling experience with wild trout in a natural setting.

The attainment of these objectives requires that naturally reproducing fish populations be maintained before any resource allocations are made to angling.


Regulations have included manipulat-

The first fishing regulation in force (two trout under 18 inches and one over) has been changed to the present limit of five trout, one over 18 inches and four under, one of which may be a rainbow. About one in nine Bighorn trout is a rainbow; creel census studies show that as much as 50% of the catch can be rainbows. Bighorn outfitter Mike Craig, who fished the river every day for months when it opened in 1981, claims that not only are rainbow populations down overall, but the number of really large rainbows is also down substantially.

Fish and Game biologists conducted a trout census in 1984 and determined that the Bighorn held 8,337 trout per mile, a two-fold increase over a similar census in

1981. No one refutes these figures. All the guides I spoke with offered that the conclusion usually drawn, that is, that management made all this possible, is erroneous. They point out that the winterkill of trout can be severe and as a result trout populations will naturally fluctuate from one year to the next.

Guided fly fishermen practice catch and release, at least in part because all the guides are outspoken advocates of this approach. (Clients who insist on killing any trout are not re-booked by the outfitters). Other anglers do not share this concern and come to the Bighorn to fill stringers. One evening at the takeout I discovered a couple of families setting out their limits, back to belly, and the trout

blocked the entire ramp. Guides who saw this were dismayed, but not surprised. Biologists argue that the river can withstand this kind of pressure. Guides and outfitters claim the river is already in decline. While views remain polarized, many eastern Montanans feel the Bighorn is first their river for their recreation and they are not about to deny themselves for the satisfaction of catch and release anglers who are often non-residents. They hold the political high card and laws governing Bighorn angling will not change until local opinion changes. In the meantime if they and their biologists are wrong, and angling pressure continues to build, we will have squandered a remarkably precious resource. 

FOR SALE: Name brand factory graphite fly rods starting at \$75.00. Custom-made graphite fly rods starting from \$120.00. Details: COLORADO CUSTOM TACKLE, 960 Secrest Street, Golden, CO 80401.

DAVID NORWICH — SCOTLAND'S PREMIER ROD-MAKER. Send \$3.00 (bills) for a copy of our Full-Colour Catalogue, which illustrates our fine Swelled-Butt, Solid and Hollow-Built Bamboo Fly Rods, and our exclusive Graphite Fly Rods (including the "STOWAWAY" Series of Four-Piece Travel Rods). **DAVID NORWICH — ROD-MAKER, HILLSIDE WORKSHOP, FOUNTAINHALL, NEAR STOW TD1 2SU, SCOTLAND.**

New Custom-Built 9' 9-10 wt. Diamondback 2 pc. mahogany color rod & wrap, met. gold trim, nickel silver reel seat & wind. ck., wln. spcr., w. grip; \$250. Depot Custom Rods, 15205 E Trent, Spokane, WA 99216.

FOR SALE: Edwards, Hardy, Orvis, Payne, Thomas Fly Rods 8' and smaller. Pre-1960 Hardy and Young Fly Reels. For list, SASE to: UDWARY, 629 Spencer Circle, Spartanburg, SC 29302.

Rare "matched" comb. Classic H. L. LEONARD 2 piece, 7 1/2', 3 1/2 oz. cane fly rod. Two tips. No. 5 line. Companion LEONARD "trout" reel. Collector condition. \$1,000 firm. (303) 337-3070.

HARDY FLY FISHING REELS, up to 34% off. Call our 24-hour catalog requests only phone—(503) 293-3443—or write: CASCADE ANGLERS, Dept. G, 3620 S.W. Corbett, Portland, OR 97201.

FOR SALE: Leonard fly rod, Duracane 806 No. 182, 8', 2 tips, excellent. Victor Lang, 52-40 39th Drive, Apt. 7H, Woodside, New York, NY 11377.

ROD BUILDING SUPPLIES: Lamiglas, Fenwick, Sage & G. Loomis Blanks. Everything for the rod builder. Free catalog. Catalog store. SHOFF TACKLE SUPPLY, 405 W. Gowe, Dept. FF, Kent, WA 98032; (206) 852-7304.

RODS MADE TO YOUR SPECIFICATIONS FROM: St. Croix, G. Loomis 96 percent and IM6 graphite blanks; Struble Reel Seats; Perfection or Fuji Guides. Supplies for the rod builder. WM/SON CUSTOM FLY RODS & FLIES, Bob Williamson, 909 Morris, Palatine, IL 60067; (312) 358-7185. Visit our booth at the Grand Rapids, Michigan Sport Show at the end of March.

BOOKS & MAGAZINES

SOFT-HACKLED FLY ADDICT, and one dozen different soft-hackled flies tied by the author. \$29.95 postpaid. A \$34.95 value. SYLVESTER NEMES, P.O. Box 3782, Bozeman, MT 59772.

FOR SALE: Complete set of *Fly Tyer*, Vol. 1 through current edition. Cost \$350. Includes three new binders & UPS charges. P. J. CLARK, Box 186, Twin Mountain, NH 03595; (603) 846-2214.

YOU NEED THIS NEW BOOK! LIGHT TACKLE FISHING GUIDES OF NORTH AMERICA profiles 837 fresh and saltwater guide operations. Includes guide notes on 460 blue-ribbon waters, 436 pages, 54 color maps. "Superb information"—John Randolph/*Fly Fisherman*. "Indispensable to any angler who travels"—Homer Circle/*Sports Afield*. \$16.95, satisfaction guaranteed. Write: CLEAR WATER PRESS, 218 California, No. 2044, Reno, NV 89509; (702) 786-0202.

FLIES/FLY TYING MATERIALS

UGLY RUDAMIS, BALES HOPPER, and MADAM-X: 1985-86's hottest flies on Montana's Bitterroot River. Ugly Rudamis and Bales Hopper developed by John Foust; Madam-X by Doug Swisher. Ugly Rudamis, No. 12; Bales Hopper, Nos. 8 and 10; Madam-X, Nos. 8 and 10. Send \$7.50 plus \$1.50 postage and handling per half dozen of your boxed choice of pattern on any mix of patterns and sizes to: ROGUE CUSTOM FLIES, 201 Adirondac, Hamilton, MT 59840.

QUALITY custom-tied flies for bass & trout. Dry flies, wet flies, nymphs & streamers. For more information and free listing, write or call today: BAUMBACH'S FLY TYING, 2529 S. Second St., Steelton, PA 17113; (717) 939-8938.

FOR SALE: Size 12 DRY FLY HOOKS, \$2.75 per 100. SPENCER GRIZZLY HACKLE CAPES, select, \$26.00 each. COASTAL DEER HAIR. LIGAS DUBBING. Most DRY FLY patterns, \$9.00 per dozen. Send \$1.00 for a complete list; refundable with your first order. BULL RIVER CUSTOM TACKLE, P.O. Box 567, Noxon, MT 59853.

FINE HAND-TIED TROUT FLIES. Painstakingly crafted with only the finest natural and name-brand materials, including Metz Hackle, Mustad and Partridge hooks, Fly-Rite and Ligas dubbing. Completely guaranteed. \$1.00 (refundable with your first order) brings you a sample and an informative catalog. MIKE HALE, 31021 Block, Garden City, MI 48135.

IF YOU ARE LOOKING FOR TOP QUALITY FLY TYING MATERIAL, ALL DOMESTICALLY GROWN, STRICTLY FOR FLY TYING, AT REASONABLE PRICES, THEN TRY US. Everything from wood duck flank and goose to natural blue dun. FREE BROCHURE upon request. CABIN CREEK PRODUCTS, 65 Flanders Road East, Hampton, CT 06424.

SALMON FLIES: If you fish this extraordinary hatch, you will want six of these flies developed by John Foust in your box. The segmented-extended body of Evazote and winged back are what make this fly out-fish, out-float, and out-last other imitations. Send \$8.00 per half dozen of No. 6 boxed flies, plus \$1.00 shipping and handling to: ROGUE CUSTOM FLIES, 201 Adirondac, Hamilton, MT 59840.

REAL ESTATE

UNIQUE 36-acre high mt. family retreat near Asheville, NC. Blue Ridge views, creeks, trails, meadows, 3 BR house, 2 furn. cabins, income, tractor, truck, etc., more land avail. \$169,000, low dn. own. fin. (813) 392-9243.

FOR RENT—WEEKLY: Cozy two-bedroom house on Madison River. Fish great summer and fall hatches, from June to October. Reserve early. (406) 682-7312.

CHETCO R., for sale: Unique secluded 17.5 acres w/half mile of river frontage, 15 mi. from Brookings. Spacious 2-story, 4 bedroom lodge-style home w/1,300 sq. ft. redwood decking; looks on private 30' waterfall and year round Class 1 creek where salmon & steelhead spawn. Property incl. guest cabin, greenhouse, garden, orchard, meadow, timber, many extras. \$175,000 with terms. Write for photos and information. SALMON'S LEAP, INC., P.O. Box 1283, Ashland, OR 97520.

FOR SALE—YUKON TERRITORY: Small, hand-hewn log cabin on seven acres at Mile 125 Haines Highway. Surrounded by Klutane National Park on three sides. Road frontage. Fish Rainbow, Grayling, Lake Trout! Three-hour drive to Haines, Alaska for spectacular Salmon fishing! Ownership by U.S. Citizens no problem. Sell for \$65,000 CASH. Deeded property in this area is nearly impossible to find! Write: P.O. Box 8929, Missoula, MT 59807.

FISHING LODGE—\$45,000. On aspen hillside, view, easy access, yet remote. Within 1 hour of: Henry's Fork, S. Fork, Madison, Teton, & Fall rivers, plus more. Brewer Land, Box 448, Driggs, ID 83422; (208) 354-8141.

FOR SALE—NEWFOUNDLAND, CANADA—SPORTS MAN'S PARADISE: Five-room, furnished, year 'round. Oil heat. New stove and refrigerator. Family kitchen. Overlooking ocean. Half-mile from famous salmon and trout river. Also, moose hunting area. On main highway and West Coast. \$30,000 American. Write for information: WILLIAM E. VIAU, 1605 Poinsettia Drive, Fort Lauderdale, FL 33305

MONTANA FISHING PROPERTIES: Statewide services. Let's fish while looking for your dream place! Examples: Clark Fork, 1.4 acres, \$7,000. Madison, 40 acres, \$7,500 per acre. Jocko River, 158 acres, \$100,000. Twenty-five miles Ruby River, 52,635 acres, 10 million dollars. Free brochure. RIC SMITH, BROKER C-21, BIG SKY REAL ESTATE, P.O. Box 1037, Polson, MT 59860; (406) 883-5201. Corporate Clients Welcome.

OREGON: Exclusive offering on the famous Williamson River. Parcels range from one acre in size up to 400 acres. From 160 feet of frontage up to nearly two miles of river frontage. Trophy rainbows and German browns on Oregon's finest Blue-Ribbon trout stream. PINE RIDGE RANCH, P.O. Box 545, Chiloquin, OR 97264. (503) 783-2330. Color brochure or video available.

ing season dates, bait and terminal gear restrictions, and the use of creel and size limits (including catch-and-release-only). Some waters have been closed to angling in order to protect spawning fish, nesting birds, or to provide scenic vistas with undisturbed wildlife (including fish). Catch-and-release-only has been one of the most successful regulations at attaining the Park's fishery objectives. Catch-and-release was implemented in 1973 on several of the popular roadside waters. These waters were selected because heavy fishing pressure was having a detrimental effect on the fish stocks. This regulation has provided maximum protection of fish stocks as determined by numbers, biomass, and size and age structure. It has enhanced angling quality in most situations. In Park waters with highly gullible native cutthroat trout, the response to no kill regulations has been positive and

through the northeast corner of the Park.

Prior to the 1970's, Slough Creek had a variety of regulations with a 3 fish creel and a 14 inch minimum size limit in effect during 1971-72. Under this regulation the fishery sustained 6,900 days of angling with a catch rate of 1.52 fish per hour and an average size of 11.9 inches for fish creel. When this fishery initially went under catch-and-release, angler use declined by 25% during the first four years, but then rose to a record high in 1981. The fishery sustained 11,726 angler days of use in 1981 with a landing rate of 1.48 and an average size of fish landed of 13.5 inches. In 1983 the fishery sustained 7,479 angler days with a catch rate of 1.03 fish per hour and an average fish size of 13.8 inches. The Slough Creek fishery during 10 years of catch-and-release regulations has provided up to a high of 70% more angler days of use, maintained a

decline the first year after catch-and-release regulations were implemented but has increased steadily since that time to a record high in 1981. By 1981, the fishery had regained its losses and had 48,800 angler days of use with a landing rate of 1.0 fish per hour and an average fish size of 15.4 inches. In terms of fishable water, these figures equate to 5,600 angler days per mile or 122 angler days per acre. The upper section, above Sulfur Caldron receives 95% of the angling use (7,200 angler days per mile). In 1983 the fishery supported 39,300 angler days with a catch rate of 1.06 fish per hour. The average size of fish landed was 15.6 inches and continues to increase (fig. 2).

The success of catch-and-release in the Park is in part related to the fish species. The cutthroat trout respond especially well to restrictive regulations for a variety of reasons. The variables which are most

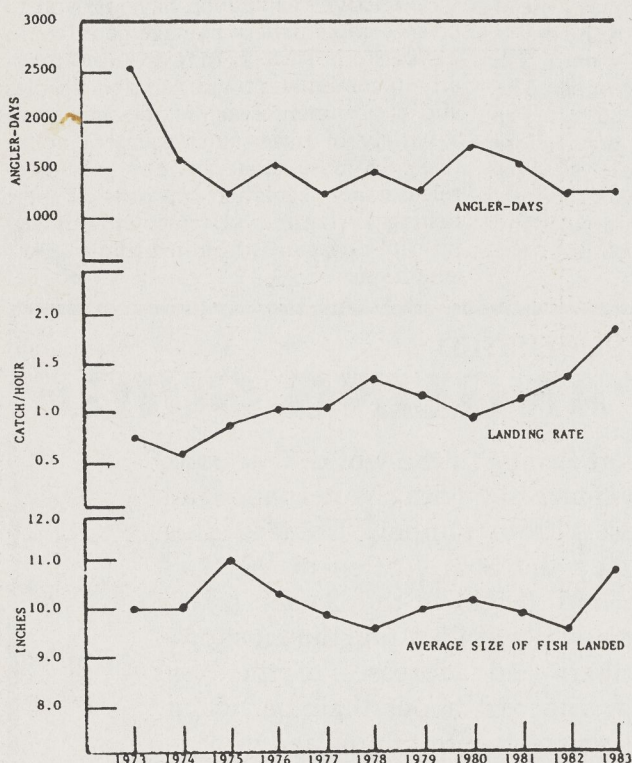


Figure 3.--Angler-days, landing rates, and average size of fish landed from the trout fishery, Lewis River catch-and-release section, 1973-1983.

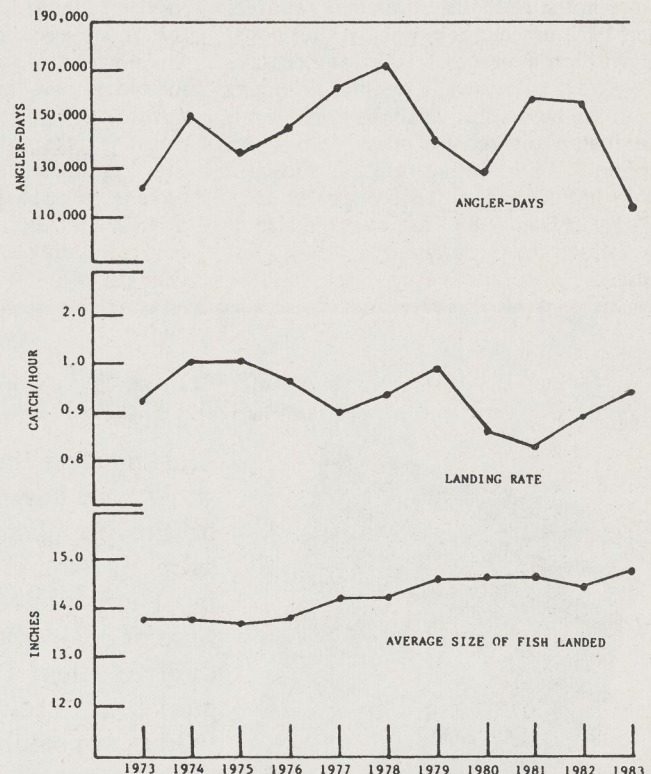


Figure 4.--Angler-days, landing rates, and average size of fish landed for the trout fishery, Yellowstone Lake, 1973-1983.

almost instantaneous, while the response from brown and brook trout has not been as positive.

Slough Creek has shown a very positive response to the catch-and-release regulation and has gained a reputation among many anglers for being one of the finest cutthroat trout streams in North America. The stream originates in the Beartooth Mountains of Montana and meanders

landing rate of over 1.0 fish per hour and has had an increase in average size of fish landed of 15.9% (fig. 1).

The catch and release section of the Yellowstone River below Yellowstone Lake has been our greatest success story. Prior to 1973, this section of the river sustained 45,000 angler days of use with a landing rate of 0.74 trout per hour and an average size of fish landed of 14.7 inches. Angler use on the river took a precipitous

important are low hooking mortality, catchability, and longevity.

A hooking mortality study was conducted on the upper section of the Yellowstone in 1980 and 1981 (Schill, Griffith and Gresswell). The study was conducted by counting actual fish mortality by snorkeling the river throughout the fishing season and counting mortality. The study reports a hooking mortality on a per capture basis of 0.3%, and a popula-

tion mortality of about 3%. Mortality rates were higher during the first part of the season when angling pressure was highest and the fish population was lowest, and lower near the end of the season when pressure was low and fish population high. A comparison of total fish landed for the study area (123,800 cutthroat) and population estimates for the section (1,750 trout per km) suggest that trout may be captured an average of 9.7 times during the 108 day season. The Yellowstone cutthroat also live a long time, with fish ranging up to 11 years.

One of our less successful experiments has been the catch-and-release section of the Lewis River. There is no information on this section of stream prior to 1973 except that it contained mainly brook and brown trout and was under a 5 fish any size regulation.

Angler use data on the catch-and-release section of the Lewis indicates a drop in use in 1973, however due to a lack of data we are not sure if this statistic is reliable. Since 1973 use has remained rather constant with an average of 1.427 angler days per year. If there was a decline of angler use on the Lewis similar to the type seen in other catch-and-release areas, it has not recovered. The landing rate has shown a steady increase from 0.8 fish per hour in 1973 to 1.85 in 1983. The average size of fish landed has remained virtually unchanged, with an average size of 10.1

inches since 1973. The only significant change in this fishery has been the increase in catch rate (fig. 3)

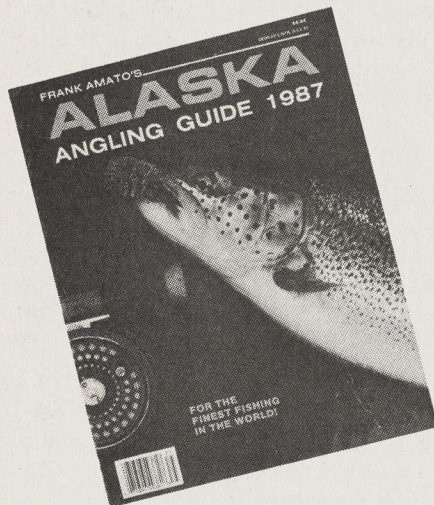
Another regulation has been very successful on Yellowstone Lake. Yellowstone Lake has had a variety of regulations over the years with a maximum sustained yield philosophy in effect during the 1950's and 1960's. A 14 inch minimum size limit was imposed during the early 1970's, but neither of these regulations proved successful against increasing effort and harvest.

In 1975, a 13 inch maximum size restriction was adopted and allowed a daily creel of two fish under 13 inches total length. This regulation takes advantage of compensatory survival in younger age groups and has improved the population age structure. The lake fishery experienced a 2.9% increase in angler use from 1974-1981 and a sharp decline in 1983. The landing rate remains over .9 fish per hour and the average size of fish landed increased from 13.8 to 14.7 inches. One of the most encouraging improvements is the survival of proportionately more fish to older and larger size groups. The number of fish landed in the 20 inch size range is substantially higher than before the regulation change. These changes have occurred while use remains approximately 150,000 angler days annually and harvest averages about 100,000 trout per year (fig. 4).

The catch and release portion of the Yellowstone River sustains the highest level of use in the Park and is probably one of the most intensively fished wild trout fisheries in the country.

The economic benefits of restrictive regulations on naturally reproducing fish populations can also be substantial. To obtain a trout as large as the average fish landed in the Yellowstone River (15.4 inches) from a fish hatchery would cost approximately \$1.55 per fish (Varley, 1984). In the catch-and-release section of the Yellowstone River, each fish is caught an average of 9.7 times in one year and is worth \$15.00 the first year. These fish remain in the fishery for approximately 3 years and are worth \$45.00 per cutthroat trout. From this example it is easy to see that the catch-and-release regulation could provide a workable alternative. Of course we must also realize that hatcheries, as good as they are, do not produce wild fish at any price.

Restrictive regulations have proven to be a valuable fishery management tool in Yellowstone Park. If they are used properly in combination with the right species and environmental factors, they can serve a variety of fishery management objectives. In most situations, the catch-and-release-only regulation can provide sport fishing in natural systems without significant departures from pristine conditions.



- Best flies and lures in color.
- Information about fishing for trout and salmon species, sheefish and pike.
- Fresh and salt water
- Time to go—where to go for best fishing.

JUST PUBLISHED 1987 ALASKA ANGLING GUIDE

Alaska offers the finest sport fishing in the world. Our book shows you how to take advantage of it with chapters about all of the popular sport species from rainbow trout to king salmon. You're sure to enjoy the text, written by Alaska's most experienced anglers, and delight in the *Guide's* multitude of color photos. Color fly plates illustrate the most productive flies. Phone numbers and addresses of the best guides are included along with text about their particular fishing opportunities. This is a great, entertaining and informative resource book for all fishermen

ORDER YOUR COPY BELOW

Please send me _____ copies of
ALASKA ANGLING GUIDE
1987 at \$4.95 each.

Name _____

Please add \$1.00 postage per book _____

Address _____

TOTAL (U.S. Funds only) _____

City _____

☐ Check/Money Order Enclosed

☐ CHARGE IT to my Credit Card:

State _____ Zip _____

☐ Visa ☐ Master Card Exp. _____

CC No. _____

Frank Amato Publications
P.O. Box 02112, Portland, OR 97202
(503) 653-8108

MA-87

REPORTS AFIELD

Conservation and Outdoor News/Edited by Kit Harrison

Are You Ready for Uranium Shot?

Preliminary tests by the U.S. Fish and Wildlife Service show that depleted uranium (DU) may be a safe substitute for lead shot in waterfowl hunting areas. The DU, a byproduct of nuclear reactor cores, has insignificant traces of radioactivity—so low that it apparently presents no health hazards to humans or ducks.

"Basically, it was a dosing study," explained J. Scott Feierabend, wildlife resources specialist with the National Wildlife Federation. "There are several criteria that an acceptable lead shot substitute has to meet, and the very first one is that it's nontoxic to birds."

Black ducks at the Patuxent Wildlife Research Center, Maryland, were fed varying doses of depleted uranium. Over the six-week test, only one died.

"It's a very preliminary study," Feierabend cautioned. "They have no idea how it

performs ballistically or what the costs associated with production would be. But one of the things that's so attractive about its possible use as shot is that it's a heavy metal, even more dense than lead, which ballistically is very desirable."

Air Raids on Wolves Incite Controversy

A government plan to shoot hundreds of wolves from helicopters became the biggest environmental issue in many years in British Columbia last winter.

The Ministry of the Environment claims wolves are killing too many big-game animals—moose, caribou and sheep—and endangering the province's vital hunting industry.

"We certainly aren't trying to eliminate wolves anywhere. We are carrying out wolf control only in areas where high wolf density is responsible for heavy mortality on

the game species and hunters are utilizing those game species," said Wally Macgregor, the provincial government's big-game expert. His ministry's plan calls for shooting about 80 percent—or 330 of the approximately 400 wolves—in the 5400-square-mile Muskwa area (less than 2 percent of the province). Another control program is in its third year in the Kechika region. According to Macgregor, there are probably 7000 to 9000 wolves in the entire province.

"Nobody really knows how many wolves there are in British Columbia or how many are taken by hunters," said George Clements, executive director of the Society for the Protection of Fur-Bearing Animals. "This plan might wipe them out completely."—Alan Mettrick.

Trout Management Proves Its Worth

Trout management is a high priority in many states, but techniques developed by the Wisconsin Department of Natural Resources have put the state on top nationwide, according to Bob Hunt, the DNR's trout research group leader.

"The trout habitat improvement techniques we've pioneered have doubled, even tripled trout populations," Hunt claimed. The bank cover-current deflector has proved to be one of the most effective structures in use. Another system, placing half-logs in waters with meager cover, produced in one river a 500 percent increase in the number of brown trout more than ten inches long.

"Adding 'brush bundles' in shallow stretches gives young trout more cover, resulting in increased survival, which means more legal-sized trout the next year," Hunt said. Over time, the brush bundles collect debris that diminishes their value to young trout, he said, but helps to channelize stream flow, producing more bends, more pools and greater depth.

Study May Improve Duck Nesting Sites

Information from duck nesting surveys conducted by North Dakota, South Dakota and Montana biologists is expected to help identify factors affecting duck nesting success in the prairie pothole region.

In some areas of North Dakota, fewer than one out of ten mallard nests hatch. That's not enough to maintain a stable population, according to North Dakota Game and Fish Department Wildlife Biologist Mike Johnson. "Intensive agricultural land use is the major cause of low nest success. Ducks are forced to nest in the small tracts of remaining habitat. Those tracts are the same areas in which the predators are



When you're bold. When you're shy.

English Leather MUSK COLOGNE

4 FL. OZ. / 100 ml

Wear Musk by English Leather when you're feeling bold. Or when you're feeling shy. Either way, Musk by English Leather will speak for you.

We know that the same guy can be outgoing sometimes, laid back other times. So we created an easy way to communicate without saying a word.

Get the bold/shy scent of English Leather Musk.

MEM COMPANY, INC., NORTHVALE N.J. 07647