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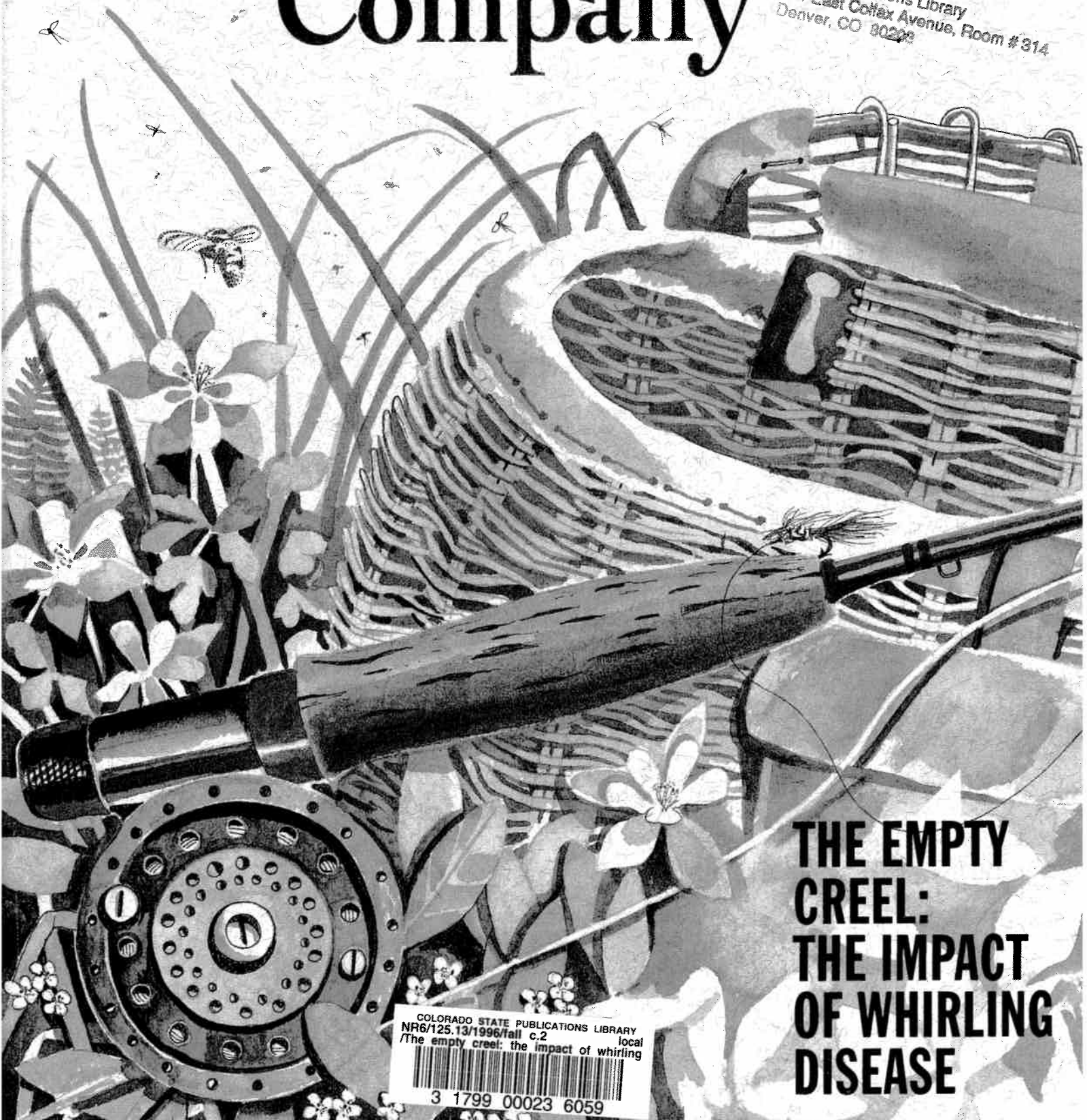
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1996 FALL COMPENDIUM OF WILDLIFE APPRECIATION



# Colorado's Wildlife Company

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**THE EMPTY  
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THE IMPACT  
OF WHIRLING  
DISEASE**

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# In a Whirl



Whirling disease is a parasitic infection of fish which has drastically impacted populations of trout in some of our state's rivers. But whirling disease affects much more than fish. Colorado hosts 765,000 anglers each year, of which two-thirds are state residents. Sales of fishing licenses bring more than \$12.6 million directly to the Colorado Division of Wildlife and DOW estimates annual expenditures for fishing in Colorado, including secondary impacts, may exceed \$932 million. That includes money spent by anglers for equipment, food, lodging and other ancillary expenses. Loss of quality trout fishing, which constitutes a major portion of

Colorado's sport fishery, would not only deny enjoyable recreation to thousands of anglers, but could also impact local and state economies. Whirling disease also has great implications for the ecology of our state's wildlife and environment. Fish in our rivers, lakes and streams, from the egg stage to adult, provide food for all manner of creatures—herons, otters, osprey, diving ducks, and, of course, other fish. The sudden disappearance of trout from the interdependent system would probably have cascading effects. Whirling disease has the potential to affect many, or all, of us in Colorado, both anglers and non-anglers.

## DOW WORKING FOR WILDLIFE

### Dealing With Whirling Disease

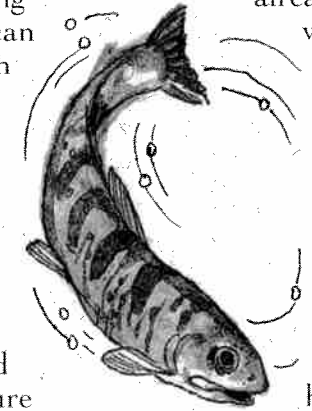
..... Wildlife is moving to study, manage and control the disease in a number of ways.

A great many questions remain unanswered about whirling disease and the organism which causes it, *Myxobolus cerebralis*. The effects and biology of the disease organism, its mechanisms of infection, the resistance of some fish species, and distribution of the disease in the state are among the many focuses of ongoing research. Once biologists have a better understanding of whirling disease and its effects, they can formulate means of dealing with its negative consequences.

Meanwhile, controlling the spread of the disease is a major focus. Because of the parasite's life cycle, eradicating the disease in the wild is impossible. Thus DOW is focusing on hatchery procedures to lessen the impact and spread of the disease. To ensure WD-free hatcheries do not become infected with the disease, DOW has installed water disinfection equipment to kill spores and parasites present in hatchery water. Because the parasite's host worm lives in mud at the bottom of waterways, dirt or gravel bottoms in hatchery raceways, where fish are reared, are being replaced with concrete.

The *myxobolus* parasite presents a significant threat to naturally-reproducing populations of native cutthroat and other trout species. Maintenance of this valuable component of Colorado's wildlife heritage is a primary management goal in dealing with whirling disease. To protect these fisheries, the Wildlife Commission has established specific guidelines for the

stocking of Colorado streams. Waters designated as "Protected Habitats" cannot be stocked with fish which have been exposed to the *myxobolus* parasite. Protected Habitats include all native cutthroat trout recovery and special management waters; waters in wilderness areas, wilderness study areas, national parks and designated primitive areas; waters set aside now or in the future as salmonid (a family of fish which includes trout and salmon) spawning habitats; and all cold water streams, with few exceptions. To continue to provide recreational fishing, as desired by the public, limited stocking of fish will continue, with restrictions. Fish which test positive for WD, or from WD-positive hatcheries, will only be released in standing waters already determined to be infected



with whirling disease, or in low-risk areas where there is no further threat of expansion of the parasite to other waters. To replace generations of young fish lost to the disease, stream fisheries affected by the parasite are being re-stocked with fingerling fish which are four-inches long or greater. This management effort will help ensure that even in streams impacted by WD, quality fish will be available to the state's anglers.

DOW is working to educate the public and enlist the aid of anglers to help limit the inadvertent spread of the disease. Because the parasite's host worm lives in stream mud, anglers are encouraged to wash their boots and equipment if they have been wading in mud. Rinsing equipment with chlorine is also encouraged to help kill the organism. Old habits such as disposing of fish entrails and skeletal parts in streams, or transporting and releasing live fish, is discouraged.

Whirling disease may be here to stay, but the Division of Wildlife is determined to control and manage it to preserve the quality of Colorado's trout fisheries.

by Mary Taylor Gray

Whirling disease. It's been in the headlines all over Colorado this past year, but just what is it and why all the fuss?

Whirling disease is an infectious disease of cold water fish, particularly trout and salmon. It is caused by an amoeba-like microscopic organism with the tongue-twisting name *Myxobolus cerebralis*. When this parasite invades a fish's body, it can cause nerve damage, skeletal deformities and death. Whirling disease is only a disease of fish so it won't hurt humans. In fact people can handle and even eat fish which are sick with whirling disease without being affected at all.

Whirling disease isn't transmitted directly from fish to fish. Instead it goes through a complex, two-stage life cycle in which fish are just one of the hosts (animals in which the parasite lives). In the first part of its life cycle, the parasite is released from the bodies of diseased fish in the form of very hardy spores which can withstand drought and freezing and survive for decades in streams. These spores then infect a common type of worm, called a tubifex, which lives in the muddy bottoms of streams and rivers. In the worm the spores grow rapidly, changing into an active form which can infect fish. Once the parasites are released by the worm, they invade the bodies of healthy fish through the skin, migrating parallel to the nerves to the cartilage. Spores can also be transmitted when a fish eats an infected worm. Birds and mammals which have eaten infected fish can spread the spores to unaffected waterways via their feces.

Whirling disease gets its name from the behavior of fish with an advanced form of the disease. The disease particularly affects young fish whose cartilaginous skeletons have not yet hardened into bone. The parasite invades the head and spinal column, causing deformities like twisted backbones and sunken heads. The disease may also cause the fish's tail to turn black. Most noticeably, nerve damage causes sick fish to whirl or chase their tails, hence the name. Infected fish are not always directly killed by the disease, but it leaves them weakened and more vulnerable to disease, predation and harsh conditions. Once young fish are three to four inches in length, their cartilage hardens into bone and they are no longer subject to the deforming effects of whirling disease. Though unaffected by the disease, adult fish infested with the parasite remain carriers of the disease.

Whirling disease is not native to North America. It originated in Europe and first appeared in the United States around 1956—unwelcome baggage carried here in importations of live and frozen fish. Once released into waters in America, the parasite spread slowly but steadily throughout West Virginia, Pennsylvania, New York, Ohio and Michigan and most of the West. Whirling disease is particularly widespread in Colorado,



Whirling disease is particularly widespread in Colorado, Montana and Utah.

Whirling disease arrived in Colorado in the 1980s, introduced in a shipment of imported trout from a private hatchery. It has since spread to 13 of the state's 15 major river systems, including the South Platte, Arkansas, Colorado, Gunnison and Rio Grande systems, though many tributary streams in these drainages are free of the disease. Whirling disease has been a major factor in the drastic decline of rainbow trout in Colorado streams. Other trout such as brown, brook and native cutthroat are also susceptible. Whirling disease particularly affects trout native to North America, because they have no evolved resistance to the disease.

Prior to the introduction of whirling disease, most trout populations in Colorado's Gold Medal waters were self-sustaining. Now some stretches of stream have little or no reproduction of wild trout, due to the impact of whirling disease. Complicating matters is the infection of fish in eight of the state's 15 cold water hatcheries. Because whirling disease affects only cold water fish like trout, warm and cool water species such as bluegills, walleye, bass and perch are not affected.

Dealing with whirling disease is not an easy task. In many ways it is too early to predict what the full implications of whirling disease will be, but DOW biologists acknowledge the disease is here to stay. Once the disease becomes established in a stream, current technology offers no way to eradicate it. There is no known treatment for infected fish and the tubifex worm is a widespread and common stream inhabitant. Since wiping out whirling disease isn't possible, researchers are focusing on containing, managing and reducing the impact of the disease. One of the first steps is identifying conditions which favor the parasite. The disease is more prevalent in slow-running waterways with muddy bottoms which provide habitat for the disease's tubifex worm host. The parasite also can't readily move upstream. Understanding why some fish, like lake trout and kokanee salmon, have a higher resistance to whirling disease may offer clues to treating the disease. See *DOW Working For Wildlife* in this issue for a discussion of whirling disease management.

Trout and other cold water sport fish offer a terrific recreational resource which is very important to the many Coloradans who enjoy fishing. But why should non-anglers who never toss a hook in the water care about whirling disease? The answer lies in looking at the broad picture. Fish are a valuable part of Colorado's wildlife heritage, and essential components of the state's ecosystem. A loss or severe decline in self-sustaining wild fish populations reduces diversity and affects other wildlife. The three species of native cutthroat trout — Rio Grande, Colorado River and greenback — evolved in the high, cold waters of the Rockies, surviving in some of the most rugged terrain in our state. Colorado's greenback cutthroat trout is found nowhere else. Native wild trout represent Colorado's untamed character every bit as much as bighorn sheep, mountain lions and eagles. A loss of native cutthroat trout in Colorado waters is a loss of our wildlife heritage, and ultimately affects the quality of life of every Coloradan.



# Whirling Disease, What's It All About?

# FOREIGN INVADERS

Whirling disease is only one of a number of non-native wildlife diseases brought to Colorado over the last 150 years. With no evolved immunity, native wildlife can be greatly impacted by introduced diseases.

Prairie dog populations along Colorado's Front Range have been devastated by plague, which was introduced from Europe and Asia by shipboard rats. A major outbreak at the Rocky Mountain Arsenal National Wildlife Refuge in 1994 killed 99% of the Refuge's prairie dogs. Plague indirectly affects as many as 140 other species of wildlife, including black-footed ferrets, that in some way use prairie dog towns as habitat.

Familiar diseases of domestic



animals have shown up in wildlife. Parvovirus, likely introduced from domestic dogs or cats, now affects wild carnivores such as mountain lions and raccoons. Fowl cholera first became evident in wild waterfowl in the 1940s. Originally transmitted from domestic poultry, it can kill thousands of ducks and geese in a short period of time.

A variety of parasitic, bacterial and viral diseases were probably introduced to bighorn sheep popu-

lations from domestic livestock over the last 100 years or more. Scabies is caused by a parasitic mite which infects the skin, resulting in a general decline in health which can lead to death. Periodic outbreaks of pneumonia resulting from non-native pathogens have wiped out up to 95% of some Colorado bighorn populations.

The genesis of many wildlife diseases isn't known, and their effects vary. Some, such as parvovirus, show up as isolated occurrences, while plague and bighorn respiratory diseases have dramatic and wide-ranging impacts. Tools to manage or prevent these diseases are presently lacking or difficult to apply to wild populations. A vaccine against some respiratory diseases in bighorn sheep is under development, but inoculating free-ranging animals is not an easy task. Developing techniques for preventing or managing disease outbreaks is an ongoing challenge for wildlife disease researchers.

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