Science Supporting Management of Yellowstone Lake Fisheries:
Responses to Frequently Asked Questions

Fisheries crews pull a trap net where captured lake trout are removed and cutthroats released

Trout Unlimited
Native trout restoration and the lake trout removal program being conducted in Yellowstone Lake in particular, have had strong support through the years, but more recently, a minor but vocal opposition has begun to emerge. Unfortunately, it appears that at least some of this resistance is based on rumor and misunderstanding. The purpose of this document is to provide answers to several of the more frequently asked questions concerning the lake trout suppression program in Yellowstone Lake and information about the current status of the program.

How have the fish communities in Yellowstone National Park changed through time?

Almost half of the streams and lakes in Yellowstone National Park did not support trout populations prior to the coming of European Americans. Stocking programs initiated by the U.S. Fish Commission in the late 1800s and early 1900s established populations of rainbow, brown, brook, and lake trout, as well as Yellowstone cutthroat trout, in most of the fishless waters. In some cases, nonnative fishes were introduced into waters where native cutthroat trout flourished. As a consequence, native cutthroat trout were often replaced by the introduced nonnatives, and hybridization between cutthroat trout and rainbow trout was common.

The goal of these introductions was to provide angling opportunities for visitors to the Yellowstone area. In this vein, these stockings were wildly successful. There was little concern for whether these interactions with native trout were harmful; the main goal was to provide fish for anglers. As nonnative trout expanded in Yellowstone National Park, the range of the native cutthroat trout contracted. Despite these introductions, Yellowstone cutthroat trout flourished in many parts of their native range within the Park, and until the 1990s, Yellowstone Lake supported the largest genetically pure population of Yellowstone cutthroat trout on earth.

Where did the lake trout in Yellowstone Lake come from?

Lake trout were first documented in Yellowstone Lake in 1994. Evidence from chemical patterns in the ear bones of lake trout captured during the late 1990s indicated that these fish were illegally introduced from a nearby lake during the 1980s. An early report by Park historian Hiram Chittenden asserted that lake trout were stocked in the Yellowstone River downstream of the lake around 1890. However, stocking records archived by the U.S. Bureau of Fisheries, which did the stocking at that time, and the U.S. Army Superintendent, who had responsibility for Park management, do not support Chittenden’s claim. Bureau of Fisheries records indicate that all of the lake trout plantings during that period were in Lewis and Shoshone lakes. Furthermore, there is no record that stocking of lake trout in Yellowstone Lake was even proposed by the Bureau of Fisheries or the U.S. Army.

If the Chittenden report was true and the meticulous record keepers were in error, it would mean that lake trout lived in Yellowstone Lake or the downstream Yellowstone River for about a century without being observed by anglers, rangers, or fisheries biologists. Although this is possible, it is highly unlikely. During the 1950s-60s, 250,000 to 300,000 cutthroat trout were being caught by anglers each year, rigorous creel surveys were conducted, and experienced guides were on the water with their clients almost every day, but there are no records of lake
trout being caught or observed. Further, fisheries biologists did not observe any lake trout when sampling fish with nets and traps. The evidence indicates that there was not a population of lake trout in Yellowstone Lake at that time, and the current population of lake trout is the result of a much more recent introduction.

How have lake trout affected the native cutthroat trout in Yellowstone Lake?

In relation to current management efforts, it does not matter when lake trout were introduced into Yellowstone Lake or from where they originated. What is important is the effect that lake trout have had on cutthroat trout in the lake since the late 1990s. Scientific evidence in the form of creel surveys conducted by the U.S. Fish and Wildlife Service and the National Park Service reveal that for the 15 years prior to the discovery of lake trout, the average landing rate by anglers on Yellowstone Lake was over one and a half cutthroat trout per hour of fishing. Subsequently, the landing rate for anglers steadily declined to less than one half of a fish per hour of fishing in 2006. Despite the very substantial lake trout suppression program in recent years, the landing rate of cutthroat trout has not exceeded one fish per hour since 2001.

Declines in the abundance of Yellowstone cutthroat trout that move upstream into tributaries to spawn provide further evidence of the negative effects of lake trout. In Clear Creek, where annual studies have been conducted since the 1940s, the number of cutthroat trout counted during the annual spawning migration dropped from 43,600 per year in the 1970s and 80s to 490 in 2006, the lowest in the 60-year period of record. Numbers of cutthroat trout spawners in other smaller tributaries have also declined, some to less than 10 fish. Cutthroat trout density declined to less than 10% of what it had been; instead of millions of cutthroat trout prior to lake trout, there were only tens of thousands.
Furthermore, observations by fisheries scientists of the stomach contents of almost 600 lake trout captured in the late 1990s underscore the predatory nature of lake trout. Scientists found that 95% of the diet of older (9 years and older), larger (greater than 23 inches) lake trout in Yellowstone Lake was composed of fish, and most of the fish were cutthroat trout. Furthermore, fish represented about 60% of the diet among lake trout 4 to 8 years old. This provides strong evidence that in the late 1990s, cutthroat trout were a major item in the diet of lake trout and that predation by lake trout was an important factor causing the decline of cutthroat in Yellowstone Lake. It is possible the cutthroat trout are less common in the stomach contents of lake trout caught since the cutthroat trout population had severely declined, and researchers from Montana State University are currently analyzing samples collected in 2013 to evaluate current diet structure.

Why are cutthroat trout uncommon in lake trout stomachs in Jackson Lake?

Jackson Lake has a native population of cutthroat trout and supports a population of introduced lake trout. Scientists have considered how it is possible for a cutthroat trout fishery to persist in the presence of lake trout. Stomach samples from lake trout sampled from Jackson Lake yield few cutthroat trout. This is likely because cutthroat trout in Jackson Lake and other lakes in the upper Snake River evolved with a much greater number of fish species than did the cutthroat trout in Yellowstone Lake. Consequently, the effects of a new predator in the lakes of the upper Snake River would be moderated by the greater variety of prey available. For example, in Heart Lake there were seven fish species in the lake prior to the introduction of lake trout. Fisheries biologists do not have estimates of the abundance of cutthroat trout in Jackson Lake before lake trout drifted downstream from Shoshone Lake (about 1910); however, historical photos suggest that substantial numbers of large cutthroat trout were being harvested from Jackson Lake in the early 20th century. That is very different from the recent fishery.
How has the presence of lake trout affected birds and mammals in the Yellowstone Lake ecosystem?
Prior to the introduction of lake trout, the cutthroat trout in Yellowstone Lake supported a complex food web that included grizzly bears, otters, bald eagles, white pelicans, and osprey. These days, ospreys are rarely observed around the lake. Moreover, scientific evidence suggests that grizzly bears that previously fed on cutthroat trout during the spawning migration into small streams around the lake are now feeding on elk calves. Lake trout do not substitute for the cutthroat trout that evolved in the lake because they spawn in the lake and spend most of their time in cold deep areas of the lake where they are not vulnerable to predation by birds and mammals.

How much does the lake trout program cost?
Currently, about $2 million are being spent annually on lake trout suppression in Yellowstone Lake, and much of the funding comes from private donors that want to restore the cutthroat trout population in the lake. However, this amount is relatively small compared to the money that has been lost to businesses in and around Yellowstone National Park as the cutthroat trout population in the lake collapsed following the introduction of lake trout. Estimates from the early 1990s indicate that the economic value of the Yellowstone Lake cutthroat trout fishery likely exceeded $10 million dollars annually. Furthermore, the social value of the fishery undoubtedly extends far beyond that. In the 1970s, 80s, and early 90s, about 142,000 angler days occurred annually on the lake. Fishing on the lake was often the key reason for families to visit the park from across the nation and around the world. Even non-anglers benefited from the cutthroat trout in the lake, and almost 350,000 visitors (10% of the park visitation in 1990 and 1991) visited Fishing Bridge and LeHardy Rapids to watch the thousands of cutthroat trout that moved through those areas on their annual spawning migration. These days you rarely see a person on Fishing Bridge because there are so few fish to watch.

Are lake trout being suppressed everywhere?
Lake trout are not inherently bad fish. Tens of millions of dollars are being spent to restore, conserve, and protect lake trout in the upper Midwest and other portions of their native range in North America. Furthermore, there are many people who thoroughly enjoy lake trout and seek out places to fish for them. However, the National Park Service in Yellowstone National Park is not alone in efforts to suppress lake trout where they have been introduced outside of their native range and native fish populations were subsequently threatened. For example, there are suppression programs in Idaho (Lake Pend Oreille and Upper Priest Lake) and Montana (Swan Lake and numerous lakes in Glacier National Park). The bottom line is that lake trout are a good sport fish, but in the wrong place in many waters of the western U.S. because of their negative influence on native fishes.

A scientific study is underway to track the movements of the lake trout, especially to their spawning beds where lake trout eggs can be destroyed.
Visitors to Yellowstone came from all over the world to angle for these fish, or to just observe their annual spawning runs.

Are there other factors contributing to the decline of cutthroat trout in Yellowstone Lake?

Although the evidence clearly points to lake trout predation as the primary cause of the decline of cutthroat trout, it is not the only factor affecting cutthroat trout in Yellowstone Lake. Natural disturbances, such as drought and fire, affect the cutthroat trout population. Additionally, the invasive parasite that causes whirling disease, may also affect the cutthroat trout population.

Drought conditions can reduce the ability of cutthroat trout to migrate upstream into tributaries to spawn and affect the numbers of fry that are hatched. This mechanism affected cutthroat trout reproduction during the drought of the late 1990s and early 2000s, but there is no evidence of declines in reproductive success and subsequent abundance of fish in the lake of the magnitude observed over the last two decades in Yellowstone Lake.

Some are concerned about the potential effects of fire. Research conducted on five major fishing streams in Yellowstone National Park following the 1988 fires failed to find any long-term negative effects on trout populations. In fact, evidence from across the West suggests that even when fish populations are wiped out of small streams following catastrophic fires, they rebound when fish migrate from surrounding streams, and populations usually reach pre-fire levels within 2 years. After the 1988 fires burned a quarter of the Yellowstone Lake watershed, there were no changes in cutthroat trout growth, and spawning streams around the lake are not choked with ash and fine sediments.

Whirling disease is another threat to cutthroat trout. Studies in the mid-2000s indicated that up to 20% of the juvenile and adult Yellowstone cutthroat trout in Yellowstone Lake were infected, but infection was not uniform throughout the watershed. The organism causing the disease was found in two tributaries and the Yellowstone River downstream from the lake, but the Yellowstone River upstream of the lake and 13 other
The balance of an entire ecosystem has been upset by the cutthroat decline. River otters are just one of a variety of species that depended on the cutthroats.

spawning tributaries tested negative for the parasite. Risk of infection was highest in the Yellowstone River and Pelican Creek. Although few cutthroat trout fry were observed in the lower portions of the Pelican Creek in the mid-2000s, cutthroat trout that reside in the creek year round are common in the headwaters despite high densities of the parasite. Recent evidence from a study in 2012 suggests that, like other areas in the West, the prevalence of whirling disease in Yellowstone Lake has declined in recent years. Whirling disease does occur in the cutthroat population in the Yellowstone Lake drainage, but its impact pales in comparison with the effects of lake trout predation.

What is the long-term outlook for cutthroat trout in Yellowstone Lake?

Based on the most recent evidence concerning cutthroat trout restoration efforts, scientists on the Lake Trout Suppression Scientific Review Panel are optimistic that the lake trout suppression program is gaining ground, reducing the density of lake trout, and leading to an increase in cutthroat trout abundance. Lake trout may never be completely removed from Yellowstone Lake, but the Panel believes that the National Park Service goal of restoring the Yellowstone cutthroat trout population to levels approaching those observed in the late 1980s and early 1990s is achievable. Suppression activities may always be a part of the management of Yellowstone Lake, but as lake trout numbers begin to decline, it appears that less expensive suppression techniques that target vulnerable portions of the lake trout life cycle may be substituted for current netting strategies that are necessary when lake trout abundance is high. In the long term, Yellowstone cutthroat trout in Yellowstone Lake can be restored and returned to their important roles within the greater Yellowstone ecosystem. That is an important achievement for the National Park Service and all who visit Yellowstone Park.
The Yellowstone cutthroat trout is an integral part of a larger ecosystem. With the cutthroat decline, the entire ecosystem is suffering.

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