Yellowstone National Park
Yellowstone Native Fish Conservation Program 2015-2018
Wyoming, Montana, Idaho

Yellowstone Center for Resources
National Park Service
Department of the Interior

Yellowstone Native Fish Conservation Program

2015 - 2018

(NPS PHOTO - D. STAHLER)

Summary

Yellowstone National Park is home to 150 lakes and 2,650 miles of flowing waters supporting 12 species or subspecies of native fish including Arctic grayling, mountain whitefish, and westslope and Yellowstone cutthroat trout. Historically 40% of park waters were inaccessible to fish due to natural waterfalls and watershed divides. Between 1889 and the mid-1950's over 300 million fish were stocked in park waters, leading to extensive establishment of non-native populations throughout the park. In the decades following these introductions, non-native rainbow, brown, lake, and brook trout have had significant detrimental effects on the abundance of native fish throughout the park through hybridization, predation, and displacement.

Yellowstone's native fish support natural food webs, contribute significantly to the local economy, provide unparalleled visitor experiences, and define much of the park's 20th century historical context. As a result, the National Park Service (NPS) has undertaken actions to reverse decreasing trends in native fish populations and associated losses of ecosystem function. A parkwide Native Fish Conservation Plan, completed in December 2010, continues to be implemented with the goal of restoring the ecological roles of native species such as fluvial (i.e., river-dwelling) Arctic grayling and westslope and Yellowstone cutthroat trout, while ensuring sustainable angling and viewing opportunities for visitors (figure 1.)

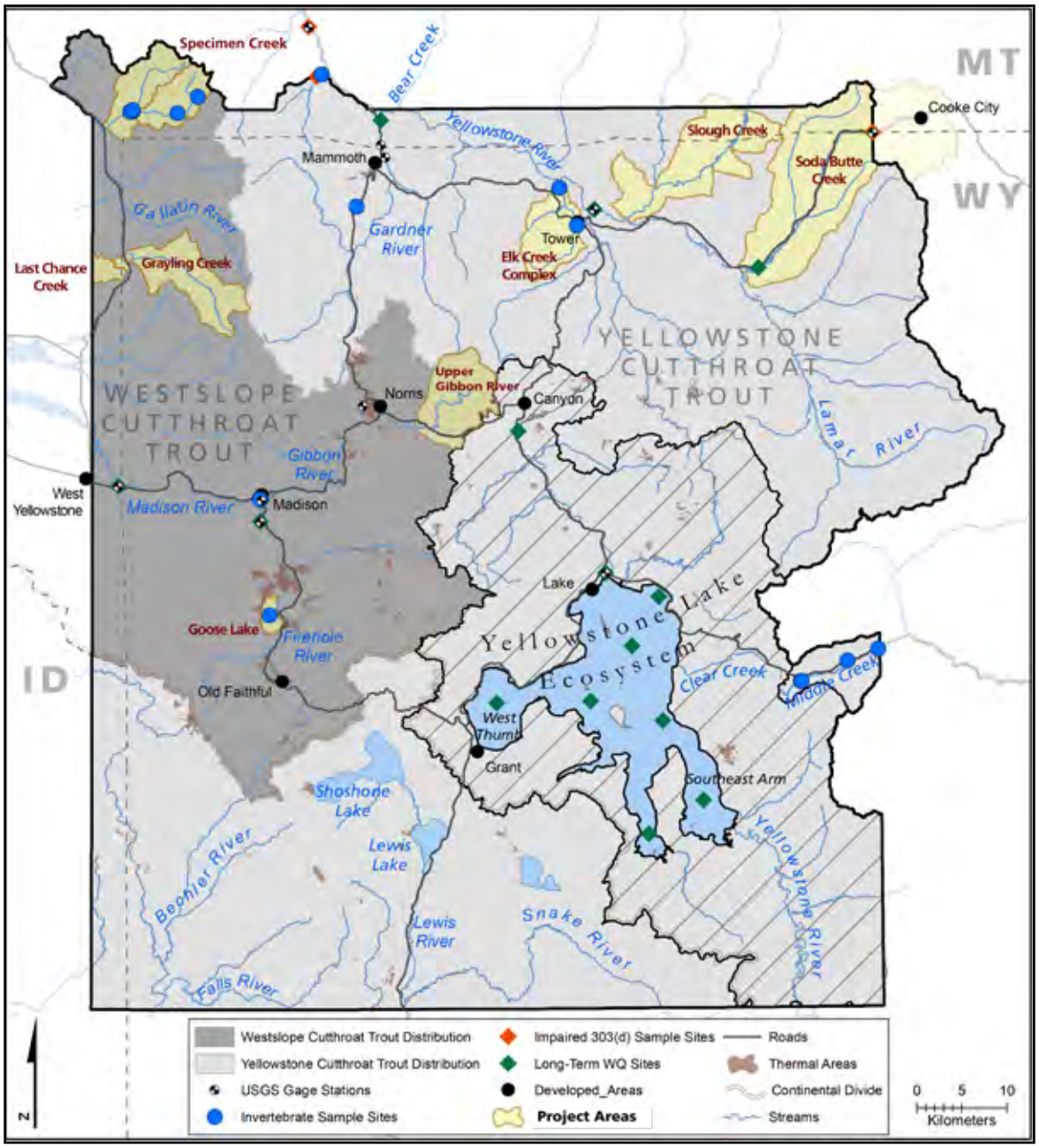

Figure 1. Park wide map with 2015-2018 project areas highlighted in yellow.

Actions to Restore Yellowstone Lake

Lake trout were first detected in Yellowstone Lake in 1994 with the first of these fish caught in the West Thumb region of the lake. Since then, the population has grown lake-wide to robust, self-sustaining levels having severe negative impacts on the native Yellowstone cutthroat trout population. In recent years NPS staff, along with contracted fishermen, have worked to suppress lake trout numbers in Yellowstone Lake primarily through the use of a large-scale gillnetting program. To date removed over 3.1 million lake trout. Despite recent successes, abundance levels remain high and suppression is critical.

Lake Trout Suppression Netting

Suppression of lake trout in Yellowstone Lake is a high priority for Yellowstone National Park. Nearly two million dollars are spent on suppression annually and this effort is projected to continue for several years. In 2018, between three and six gillnet boats were fishing on Yellowstone Lake six days a week from late May through mid-October. Contractors and NPS crews removed over 297,000 lake trout from the Yellowstone Lake population in 2018, 25% less than were netted in 2017 (figure 2.)

Over the last few years, sustained removal efforts have led to a population level decrease in lake trout abundance in Yellowstone Lake. Modeling estimates a continued decrease in total lake trout biomass present in the lake each year since the high seen in 2012 (figure 3); estimated abundance of lake trout 6 years and older has decreased 70% over that same time frame; and larger, older lake trout are becoming more difficult to catch each year. This is critical because it is the older, larger lake trout which represent both the highest reproductive potential for the population and cause the most predation on the cutthroat trout population. Despite these very encouraging trends, the lake trout population remains robust and a significant threat to the Yellowstone cutthroat trout population, necessitating a continued strong suppression program.

Lake Trout Telemetry

Targeting known spawning locations has resulted in high numbers of adult lake trout removed. Tracking tagged lake trout has helped identify 14 lake trout spawning sites in Yellowstone Lake. Continued telemetry will assist in discovering locations spawning lake trout may pioneer. Insight into movement, holding, staging, and spawning habits of lake trout will be useful in the current suppression efforts and will also provide information for novel suppression techniques. Over 600 lake trout were surgically implanted with acoustic transmitters from 2015 through 2018. Tracking resulted in 1,995 detections of 254 individual lake trout in 2016, 2,685 detections of 379 individuals in 2017, and 1,232 detections of 262 individuals in 2018. Kernel density estimation was used to analyze lake trout locations (figure 4.)

Analysis identified 12 lake trout staging areas throughout Yellowstone Lake with the highest concentrations of lake trout in the West Thumb. Tracking in 2018 again suggested some of the same sites.

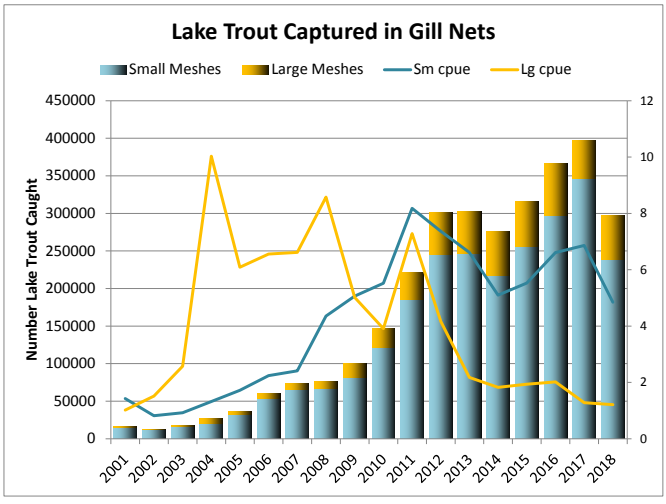

Figure 2. Number of lake trout removed (bars) and catch-per-unit of effort (lines) from the Yellowstone Lake population using gill nets, 2001-2018. Blue represents the smaller mesh sizes used (1, 1.25, and 1.5-inch bar) which tend to catch juvenilles. Gold represents all larger mesh sizes used, ranging from 1.75-inch to 2.5-inch, which tend to catch mature lake trout.

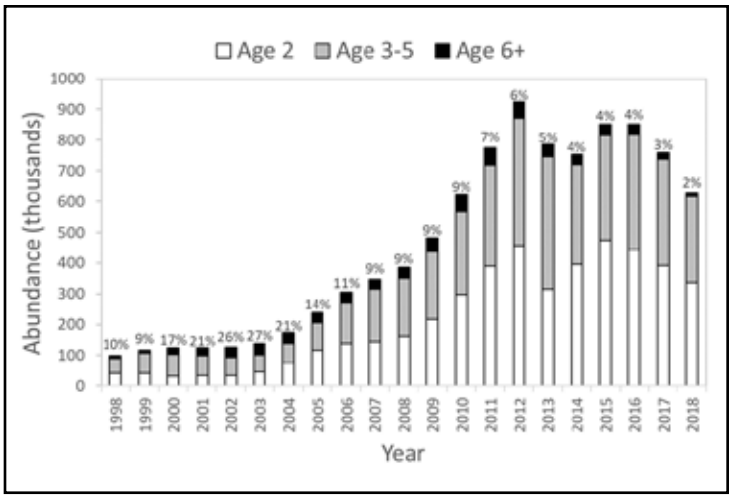

Figure 3. Estimated lake trout abundance present in Yellowstone Lake by age class at the beginning of field operations, 1998-2018. Estimated numbers of ages 2, 3-5, and 6+ have declined 26%, 33%, and 72%, respectively, those seen in 2012 at the peak of lake trout abundance. Declines are primarily due to the intensive gillnetting program the park has implemented during those years.

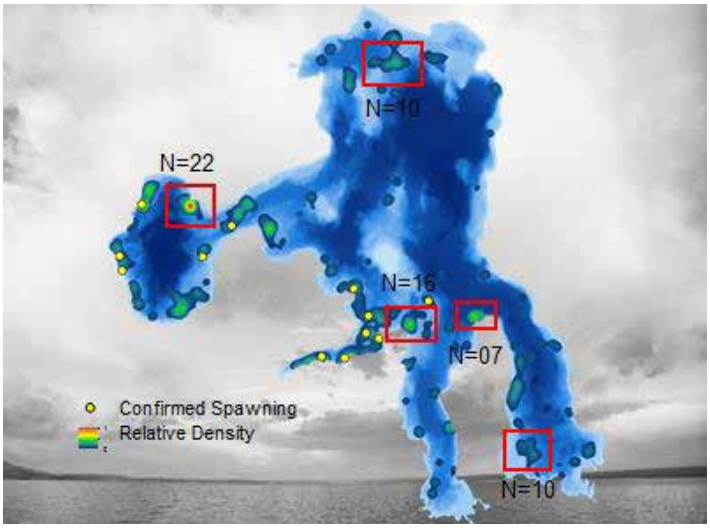

Figure 4. Lake trout spawning locations identified via telemetry and kernel density analyses for Yellowstone Lake. Yellow dots represent confirmed spawning locations, possible spawning locations are represented by red boxes with number of tagged fish (N=) present.

Contract netting crews targeted 34 aggregations seen during the summer (June-August) of 2017. Targeted areas had higher catch rates indicating targeting known locations of acoustically tagged lake trout as an effective strategy for increasing the efficacy of lake trout suppression.

Alternative Suppression Methods

We are continuing to research alternatives to gillnetting that will augment lake trout suppression in Yellowstone Lake. Recent alternatives that hold promise focus on lake trout embryos and impacting their spawning sites. Lake trout spawn over rocky areas in the lake and often return to the same locations year after year. Considerable effort over the last few years using telemetry, SCUBA divers, and remote operated vehicles (ROVs) confirmed 14 spawning sites in Yellowstone Lake which comprised only 28 acres of the 84,288 total acres of Yellowstone Lake. Yellowstone staff, researchers at the Montana Cooperative Fishery Research Unit, and Montana State University have experimented with numerous strategies designed to cause lake trout embryo mortality including electrical shock, suction dredging, chemical application (salt and rotenone), tarping, sedimentation, fish carcasses (figure 5) and fish carcass analog pellets. Research in 2016-2017 focused on eliminating lake trout embryos at two of these spawning sites with the use of shredded fish carcasses. Shredded fish carcasses were very effective at causing lake trout embryo mortality, even to eggs buried 20 cm into the substrate at the lowest concentration of fish carcass material applied. Research continued using carcass analog pellets in 2018, with similar success. We will continue to expand and modify these lake trout removal methods with the hope that we will be able to greatly reduce invasive lake trout in Yellowstone Lake.

Yellowstone Lake Monitoring & Adaptive Management

In August, fisheries staff conducted monitoring in Yellowstone Lake to assess Yellowstone cutthroat trout and lake trout length structure and population abundance via standardized gillnetting (figure 6). For the past four years cutthroat trout numbers caught have gradually increased from 1,010 fish in 2015 to 1,347 in 2018. The length structure of the population has also been shifting. From 2015 to 2017 the population was dominated by two main sizes classes: juvenile fish between 170-250 millimeters (6.5-10 inches) and adult fish between 500-600 millimeters (19-24 inches, figure 7). In 2018 a large size class of trout from 270-420 millimeters (11-17 inches) was observed. The large number of young trout entering the population is a good sign the population is beginning to recover; the increased number of mid-sized trout in 2018 indicates more young fish are surviving predation, and the continued presence of large adult cutthroat trout is also a good sign as these fish are sexually mature and capable of contributing young cutthroat trout to the Yellowstone Lake population. The average number of cutthroat trout caught per 100 meters of net has gradually increased during the last

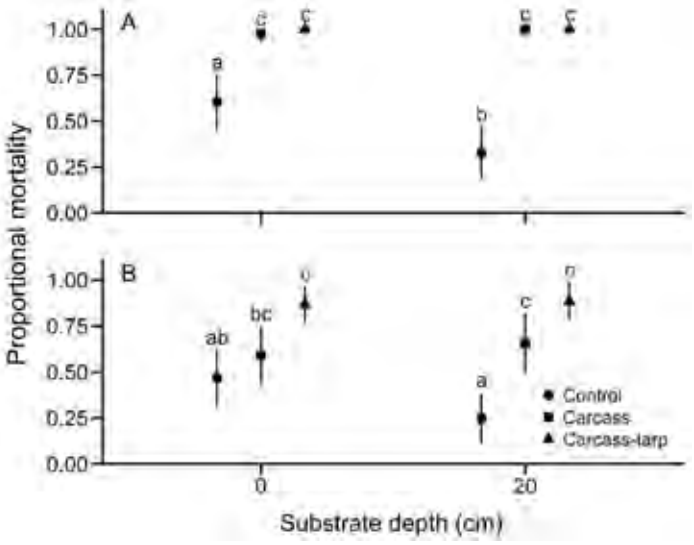

Figure 5. Proportional lake trout embryo mortality (mean ± 95% CI) at 0 cm (substrate surface) or 20 cm in the substrate in control sites (circles), carcass treatment sites (squares), or carcass-tarp treatment sites (triangles). Experiments were conducted in autumn 2016 for 16 days at Thomas Bank (panel A, n=6) and for 26 days at Carrington Island (panel B, n=3), Yellowstone Lake, Yellowstone National Park. Same letters indicated no statistical difference.

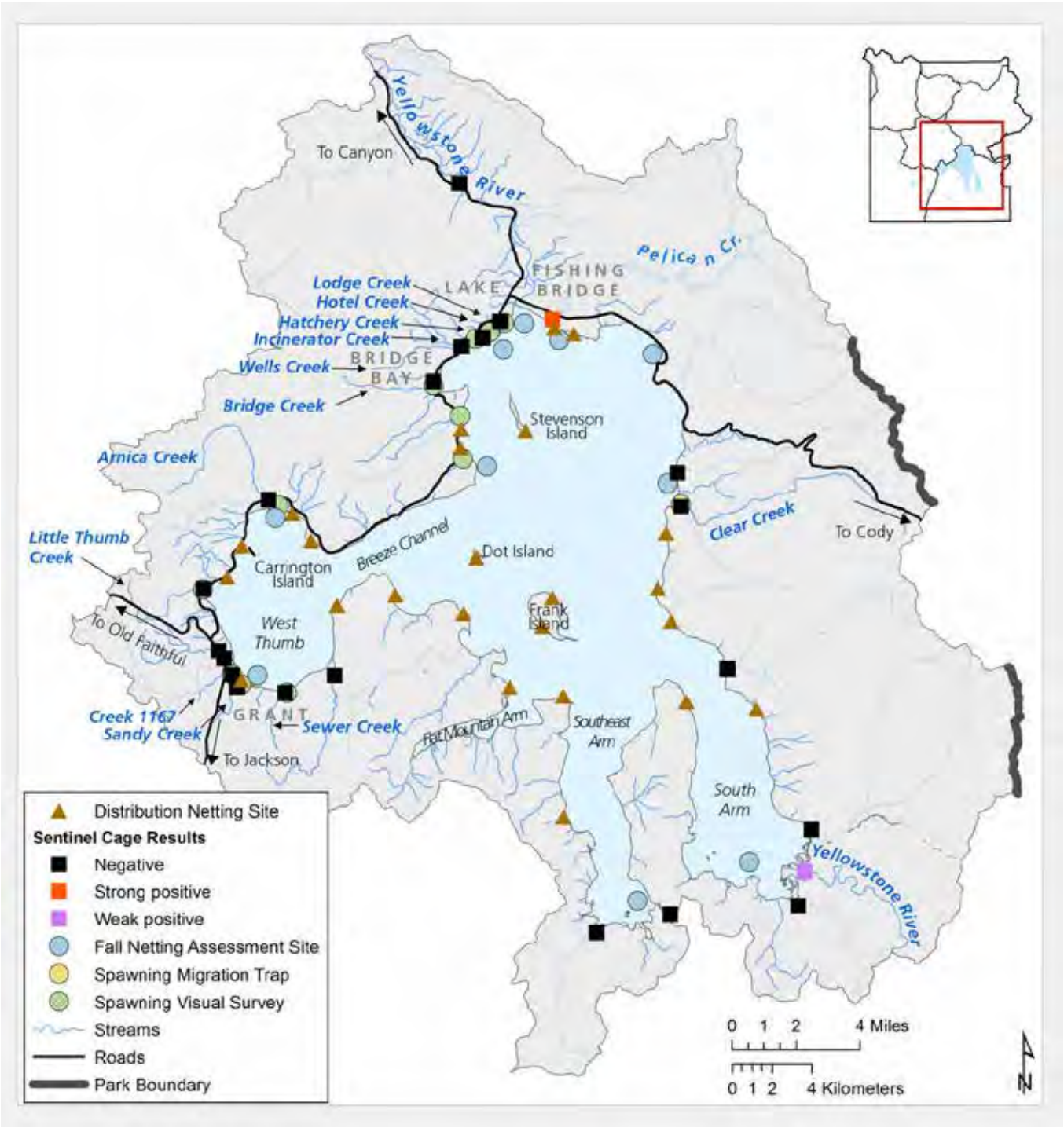

Figure 6. Location of streams visually surveyed for spawning cutthroat trout and distribution netting sample sites within four regions of Yellowstone Lake. Whirling disease testing locations are also noted.

four years; 19.4 cutthroat trout per 100 meters of net per night in 2015 to 26.4 cutthroat trout per 100 meters of net per night in 2018 (figure 8).

Lake trout length structure over the past four years has also remained relatively stable, with two main size classes dominating the population: lake trout between 200-300 millimeters (8-12 inches) and lake trout between 360-420 millimeters (14-17 inches) with both size classes consisting mainly of juvenile fish that are sexually immature (figure 9). In addition, we have seen a gradual reduction in large, mature lake trout over 420 mm (17 inches). Numbers of lake trout caught remained relatively constant from 2015 to 2017 with ranges between 461 lake trout (2015) and 331 lake trout

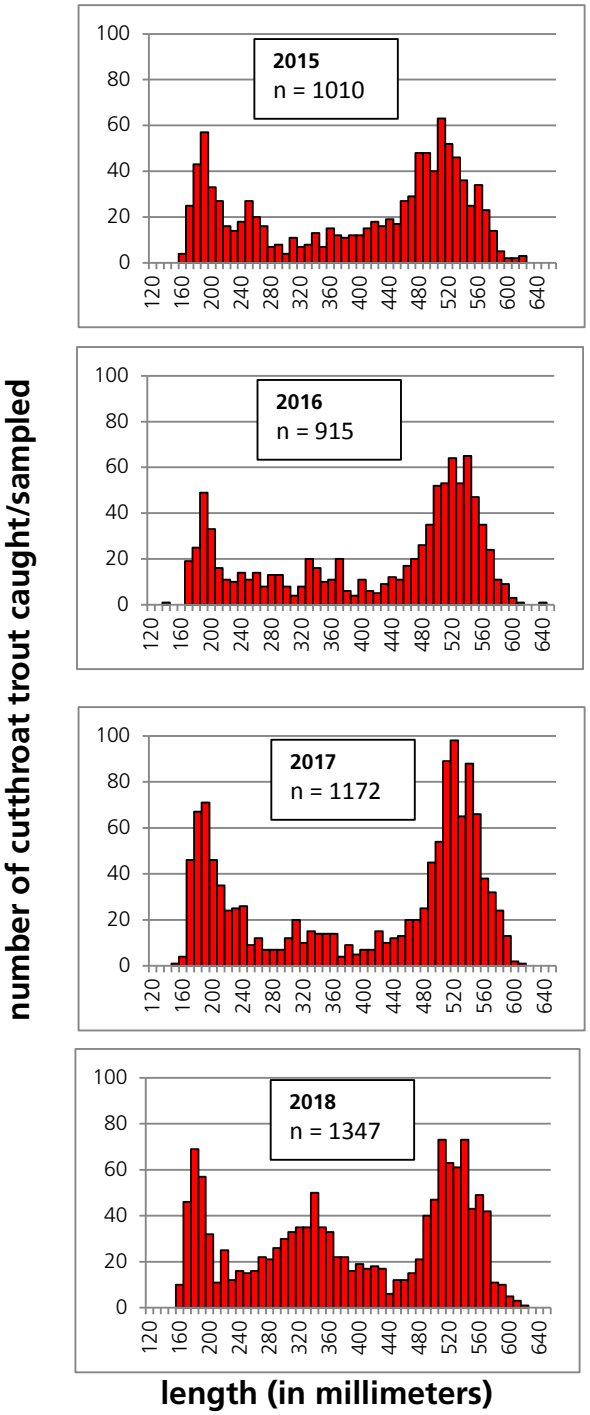

Figure 7. Length-frequency of cutthroat trout collected during distribution netting on Yellowstone Lake with total number of trout (n), 2015-2018.

(2016). In 2018, lake trout catch dropped to a nine-year low with 233 fish. Average number of lake trout caught per 100 meters of net has gradually decreased during the last four years; 3.9 lake trout caught per 100 meters of net per night in 2015 down to 1.9 lake trout caught per 100 meters of net per night in 2018 (figure 10). Decreasing numbers of mature lake trout caught is a good indication that the suppression efforts

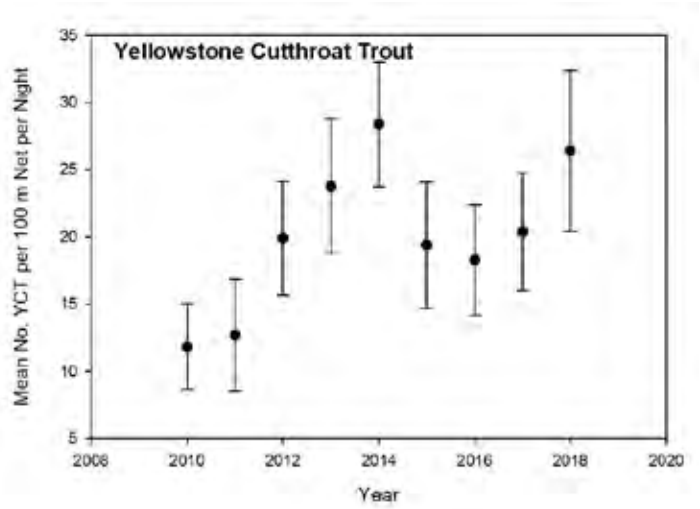

Figure 8. Mean number of cutthroat trout caught per 100 meters net per night during distribution netting on Yellowstone Lake, 2010-2018. Bars delineate 95% confidence intervals.

from the lake trout removal program are having a negative effect on the overall population.

Scientific Panel Reviews

A panel of expert fishery scientists reconvened in April 2018 for continued review of the program and to update recommendations to the park for future suppression actions. Overall, the panel recognized continued progress toward program goals and reiterated the importance of maintaining current levels of suppression effort for at least another seven years. They noted continued removal of older, larger lake trout is critical in the next few years. The panel supported experimentation with alternative suppression techniques using a rigorous experimental design, provided NPS maintained the current level of effort. The park is planning a similar review for May 2019.

Restoration of Streams and Lakes

Over the past four years, Yellowstone National Park has continued to take action to restore and preserve native fish in several streams and lakes. These actions include suppression or complete removal of harmful non-native species. These efforts are resulting in increased habitat being occupied by native fishes through Yellowstone National Park (table 1.)

Gibbon River Climate Change Adaptation Project

The upper Gibbon River is a high elevation aquatic system capable of providing suitable habitat for sensitive, cold water species such as westslope cutthroat trout and fluvial (stream-dwelling) Arctic grayling. The upper Gibbon River

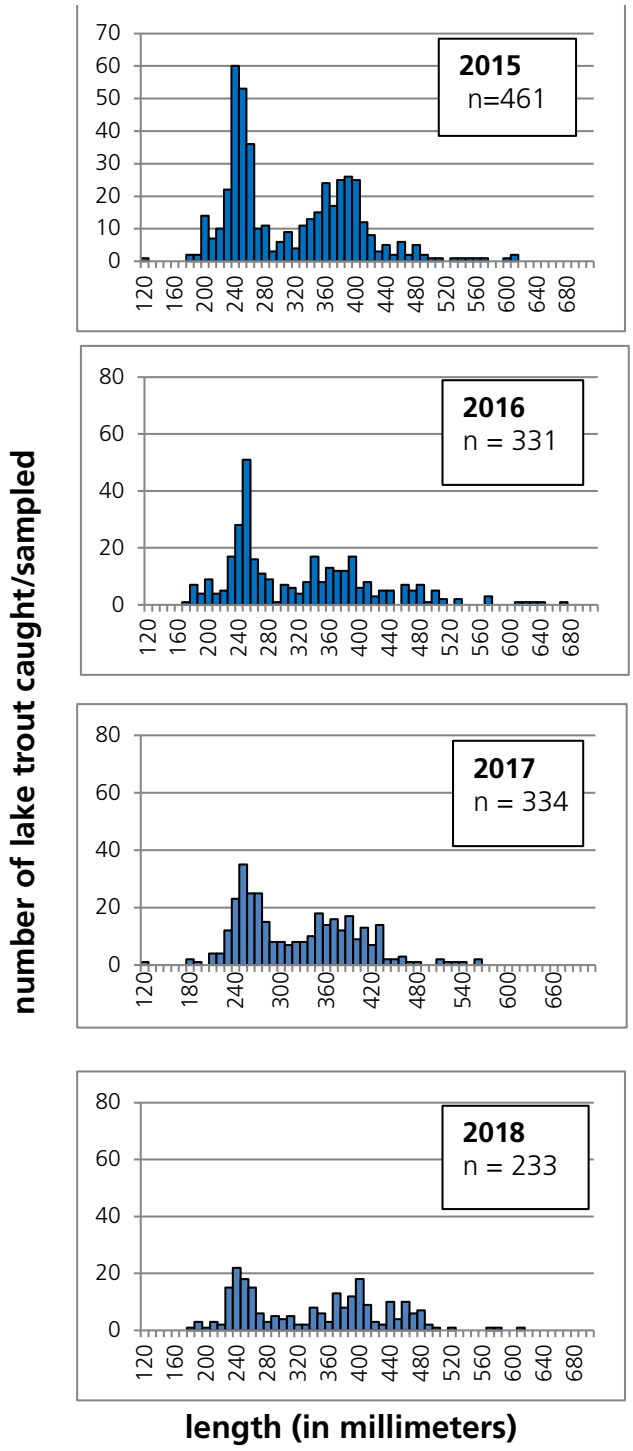

Figure 9. Length–frequency of lake trout collected during distribution netting on Yellowstone Lake with total number of trout (n), 2015-2018.

includes 34.1 kilometers (21.2 miles) of streams, three large lakes (Ice, Wolf, and Grebe lakes) totaling 94 hectacres (232 surface acres) with extensive tributary networks. This high elevation refuge is isolated by Virginia Cascades, an 18 meters (60 feet) cascading waterfall located near Norris Junction. In 2015-2016 we conducted extensive mapping surveys of all tributary streams, seeps and springs, as well as collected aquatic invertebrates for species composition and abundance. During August and September 2017, we chemically treated the three lakes and upper portions of the project area to remove all fish. In October 2017, young westslope cutthroat trout and fluvial Arctic grayling were introduced to Wolf Lake and westslope cutthroat trout were introduced into Grebe Lake. During August 2018 we treated the lower portions of the project area between Little Gibbon Falls and Virginia Cascades to remove non-native brook trout. Also in 2018, westslope cutthroat trout were introduced into Wolf Lake and Arctic grayling fry were stocked into tributary streams surrounding Grebe Lake. During the next few years, we will continue to chemically treat the lower portions of the project area to remove brook trout and continue to stock fish into the upper portions of the drainage.

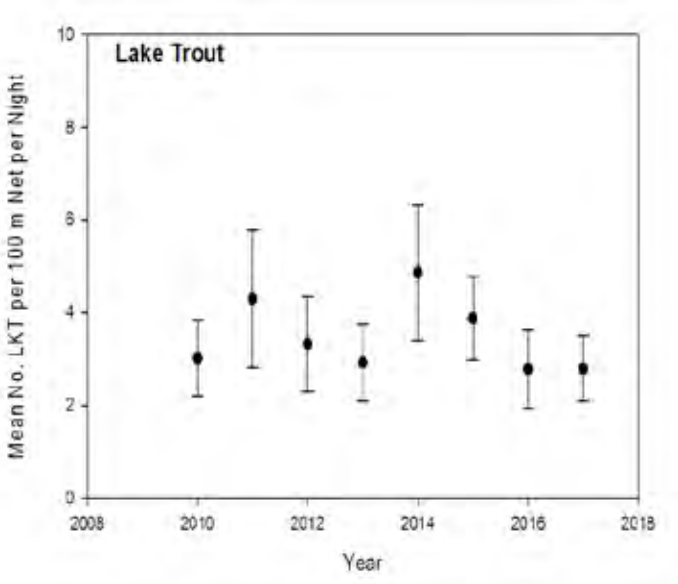

Figure 10. Mean number of lake trout caught per 100 meters net per night during distribution netting on Yellowstone Lake, 2010-2018. Bars delineate 95% confidence intervals.

Table 1. Waterbodies under restoration and corresponding size of restoration area.

Stream Name	Stream (miles)	Lake (acres)
East Fork Specimen	8	7
Goose	2.8	42
Grayling	35	--
Upper Gibbon	21.2	232
Total	67	281

Native Fish Reintroductions to Restored Streams and Lakes

Reintroduction of native fish throughout Yellowstone National Park continues to be a high priority for park fisheries managers. From 2015-2018 reintroduction efforts focused on Yellowstone cutthroat trout, westslope cutthroat trout, and fluvial Arctic grayling. These introductions were completed through the stocking of fry-staged individuals, genetically pure juvenile fish obtained from hatcheries, as well as remote site incubators stocking of eggs (Table 2).

Preservation of Cutthroat Trout in Northern Yellowstone

Slough Creek - In Slough Creek, rainbow/cutthroat trout hybrids had been found with increasing frequency leading up to 2012. Since then, angling and electrofishing removal efforts have decreased the percentage of rainbow and hybrid trout in Slough Creek. In 2012, the percentage of non-native trout captured in the first and third meadows was 14% and 4%, respectively. In 2017, those percentages decreased to just 0% and 2% (figure 11). In 2018, those percentages decreased to 0%. These results demonstrate electrofishing and angling have been an effective combination in decreasing the percentage of rainbow and hybrid trout in this drainage. Construction of a barrier to upstream fish migration was also completed in 2017. This barrier will prevent the continued immigration of rainbow and hybrid trout into the upper meadows of Slough Creek.

Table 2. Total number of eggs and fish (Yellowstone cutthroat trout (YCT); westslope cutthroat trout (WCT); and Arctic grayling (GRY) introduced into project areas from 2015 to 2018.

Location	Years	Eggs	Fish
Elk Creek	2015-2018	YCT: 2,000	YCT: 1,170
Grayling Creek	2015-2018 2015-2017	WCT: 58,873 GRY: 150,000	WCT: 943 GRY: 60,000
Goose Lake	2012-2014 2018		WCT: 15,000 GRY: 18,049
Grebe Lake	2017 2018		WCT: 10,000 GRY: 120,000
Wolf Lake	2017-2018 2018		WCT: 44,000 GRY: 15,000
Ice Lake	2018		GRY: 3,112

Soda Butte Creek - Soda Butte was chemically treated to remove non-native brook trout upstream of Ice Box Falls in 2015 and 2016. The project was jointly conducted by the NPS, U.S. Forest Service, Montana Fish, Wildlife & Parks, and Wyoming Game & Fish Department. In 2017, extensive electrofishing surveys and environmental DNA (eDNA) testing was conducted throughout the treatment area. No brook trout were discovered during electrofishing surveys, but brook trout DNA was detected in 11 of the 79 sites tested for DNA. Because of the peculiar distribution of sites that tested positive for brook trout DNA, second and third rounds of eDNA sampling were conducted. No brook trout DNA was detected in the latter two rounds of sampling. It is believed that the first round samples were contaminated either in the field or in the laboratory. Monitoring of the treatment for brook trout and Yellowstone cutthroat trout recovery will continue in 2018.

Elk Creek Complex - The Elk Creek Complex was treated with rotenone annually from 2012 to 2014 to remove non-native brook trout from the system. Electrofishing surveys conducted following each treatment revealed low numbers of brook trout remained in the system until autumn of 2014. Reintroduction of genetically pure Yellowstone cutthroat trout began in October 2015, with the transfer of approximately 300 fish of varied age classes from Antelope Creek. An additional 370 cutthroat trout were stocked in the spring of 2016 and in 2017 over 2,000 eyed eggs from

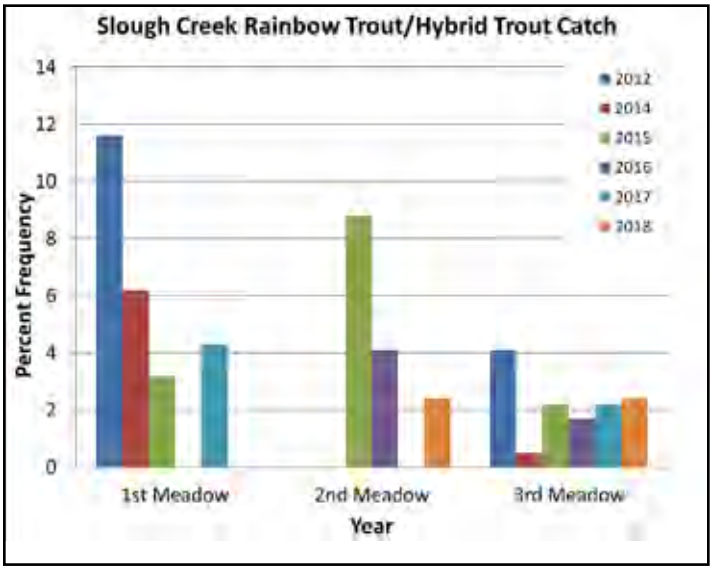

Figure 11. Slough Creek rainbow trout/hybrid percent frequency. Note: Second meadow not sampled until 2015; no rainbow trout/hybrids were sampled in the second meadow in 2017 and the first meadow in 2018.

Pebble Creek were stocked using remote site incubators. In 2018 an additional 500 fry were stocked from Pebble Creek. Monitoring will occur in future years to track recovery efforts.

Lamar River Preservation Efforts

From 2015 through 2018, the NPS and Montana State University worked collaboratively to assess spatio-temporal differences between Yellowstone cutthroat trout, rainbow trout, and hybrids of the two in the Lamar River watershed. This was accomplished through the genetic assessment of all trout sampled in the watershed and monitoring movement of individual fish. Over the course of the project, a small tissue sample for genetic analysis, was taken from over 1,500 trout. Of these trout, 136 were implanted with radio tags to monitor their movements throughout the drainage. An additional 1,482 trout were outfitted with tags to monitor movement into and out of tributary streams.

Levels of hybridization varied throughout the drainage. Genetically pure Yellowstone cutthroat trout were located throughout the drainage with the exception of Buffalo Fork Creek, upstream of Granite Falls. Upstream of the falls, only rainbow trout or slightly hybridized trout (mostly rainbow trout) were found. The percentage of rainbow trout or rainbow trout genetic admixture declined with distance from Buffalo Fork Creek. Rainbow/hybrid trout numbers declined sharply upstream of Lamar River Canyon, indicating that the canyon may be a deterrent to upstream fish migration. One hybrid trout was found upstream of Cache Creek, at the confluence of the Lamar River and Miller Creek. This is the furthest upstream a rainbow/hybrid trout has been detected.

Radio-tagged trout were located twice weekly during the spawning season (April–August) and once weekly for the rest of the year when possible. Yellowstone cutthroat trout spawned later (June 17 compared to May 27) and migrated greater distances than (Yellowstone cutthroat trout mean = 13.91 killometers, rainbow trout/hybrid mean = 6.18 killometers) rainbow or hybrid trout. No spawning rainbow trout/hybrid trout were found at a distance greater than 37 killometers (22.9 miles) from Buffalo Fork Creek, and the majority of rainbow trout/hybrid trout migrated to Buffalo Fork Creek to spawn. These movement patterns indicate Buffalo Fork Creek is a major spawning tributary and likely a major source of non-native rainbow trout in the Lamar River watershed.

Genetic analysis of trout combined with movement data, indicate Buffalo Fork Creek is the main source of rainbow/hybrid trout in the Lamar River drainage. Currently, the NPS, U.S. Fish & Wildlife Service, and Montana Fish, Wildlife & Parks are working together to determine the best management practices to protect the native Yellowstone cutthroat trout in the Lamar watershed.

Fish Health Assessments

Disease assemblage, prevalence, and distribution in Yellowstone National Park have varied over the years. Bacterial pathogens and viral infections have the potential to cause drastic negative effects on Yellowstone's fish assemblages, therefore continued monitoring of these diseases is a priority for Yellowstone National Park.

Sampling for the Presence of Parasitic Kidney Disease and Other Pathogens

Disease testing was conducted on the Lamar, Madison, Lewis, Snake, and Gallatin rivers for the presence of bacterial pathogens (enteric redmouth, furnculosis, and bacterial kidney disease) and viral infections (omfectopis je,atp[poetoc mecrpsos, infectious pancreatic necrosis, and viral hemorrhagic necrosis). Testing was also conducted on parasitic diseases such as whirling disease and parasitic kidney disease (PKD.) All rivers tested negative for bacterial and viral pathogens. The Madison, Gallatin, and Lamar rivers tested positive for whirling disease. All rivers tested positive for PKD with the exception of the Lamar River.

Whirling Disease Status in Yellowstone Lake

Of the streams tested, Pelican Creek continues to be the only stream with consistently high levels of whirling disease infection reported. Basin-wide lake samples continue to show variability from year to year with the prevalence of infection ranging from 19.6% in 1999-2001, 10% in 2012, and most recently 16.5% in 2017. However, the numbers of infected Yellowstone cutthroat trout samples found in the lake indicate higher instances of occurrence in the northern section of Yellowstone Lake comprising nearly half of all infected fish sampled in 2017. Basin-wide lake samples continue to show variability from year to year indicating the epi-center of the infection to be Pelican Creek, while the overall prevalence within the Yellowstone Lake ecosystem continues to remain relatively stable (figure 12). The continued restriction of the spatial extent of whirling disease within spawning streams should mitigate the effect of this disease on the Yellowstone Lake cutthroat trout population.

Public Involvement

Volunteer Angler Report Card Trends

Angling remains a popular pastime for those visiting, living near, or working in Yellowstone National Park. There was an

average of 44,983 (43,951-46,144) special use fishing permits issued to the four million visitors each year from 2015 to 2018. With this permit, anglers also receive a volunteer angler report card. This card is an opportunity for anglers to share their fishing observations and opinions with fisheries managers in Yellowstone National Park.

The general fishing season in Yellowstone National Park, opens on Memorial Day weekend and lasts until early November. In 2018, an estimated 42,881 anglers caught 362,364 fish and kept 19,925, releasing 94% of fish caught. Anglers spent a total of 179,175 days fishing in Yellowstone National Park, which is less than recent years.

Anglers fish for and catch native cutthroat trout above all other fish species present. Native fish (cutthroat trout, Arctic grayling, and mountain whitefish) comprised 56% of all fish caught. Cutthroat trout comprised 52% of the total angler catch in 2018. Rainbow trout were the second most frequently caught fish at 15%, followed by brown trout 14%, brook trout 6%, and lake trout 8%.

Fly Fishing Volunteer Program

During the years 2015-2016, 40-46 volunteers per year contributed between 1,566 and 1,866 hours to the park's fisheries program catching between 270 and 290 fish. Volunteer anglers focused on collecting samples for cutthroat trout genetics, with the goal of quantifying the distribution of pure and hybridized fish throughout the Lamar river drainage. As in previous years, the volunteer fishermen offered high praises for the opportunity to contribute to native fish conservation in the world's first national park, and would be glad to participate again.

Projects by Graduate Students

During reporting years 2015-2018, the following graduate students assisted the park Fisheries Program with research efforts.

Graduate Student: Jacob Williams

(Master of Science)
Committee Chair: Dr. Christopher Guy, USGS Cooperative Fisheries Research Unit, Department of Ecology, Montana State University
Title: Mobile Tracking of Lake Trout in Yellowstone Lake
Status: Graduated 2018

Graduate Student: Nate Thomas

(Master of Science)
Committee Chair: Dr. Christopher Guy, USGS Cooperative Fisheries Research Unit, Department of Ecology, Montana State University
Title: Evaluation of Suppression Methods Targeting Non-Native Lake Trout Embryos in Yellowstone Lake, Yellowstone National Park, Wyoming
Status: Graduated 2017

Graduate Student: Alex Poole

(Master of Science)
Committee Chair: Dr. Alexander Zale, USGS Cooperative Fisheries Research Unit Leader, Department of Ecology, Montana State University
Title: Evaluation of Embryo Suppression Methods for a Non-Native Lake Trout Population in Yellowstone Lake, Wyoming
Status: Graduated 2018

PhD Student: Kurt Heim

(Doctor of Philosophy)
Committee Chair: Dr. Thomas McMahon, Department of Ecology, Montana State University
Title: Rainbow Trout Invasion of the Lamar River Watershed, Yellowstone National Park; Life History and Genetics Research to Preserve Native Cutthroat Trout
Status: Graduated 2019

Graduate Student: Colleen Detjens

(Master of Science candidate)
Committee Chair: Dr. Alexander Zale, USGS Cooperative Fisheries Research Unit, Department of Ecology, Montana State University
Title: Use of eDNA to Estimate Abundance of Spawning Yellowstone Cutthroat Trout in Tributaries to Yellowstone Lake.
Status: Analyses and Writing ongoing

Graduate Student: Andriana Puchany

(Master of Science candidate)
Committee chair: Dr. Alexander Zale, USGS Cooperative Fisheries Research Unit, Montana State University
Title: Assessing the Status of Reintroduced Arctic Grayling and Westslope Cutthroat Trout Populations in Yellowstone National Park
Status: Field studies, analyses, and writing ongoing

Graduate Student: Michelle Briggs

(Master of Science candidate)
Committee chair: Dr. Lindsey Albertson, Department of Ecology, Montana State University
Title: Effects of Lake Trout Suppression Methods on Benthic Macroinvertebrates in Yellowstone Lake
Status: Field studies, analyses, and writing ongoing

Graduate Student: Dominique Lujan

(Master of Science candidate)
Committee chair: Dr. Lusha Tronstad, Invertebrate Zoologist, Wyoming Natural Diversity Database, University of Wyoming
Title: Effects of Lake Trout Suppression Methods on Nutrient Cycling and Lower Trophic Levels in Yellowstone Lake, Yellowstone National Park, Wyoming
Status: Field studies, analyses, and writing ongoing

PhD Student: Hayley Glassic

(Doctor of Philosophy candidate)
Committee chair: Dr. Chris Guy, USGS Cooperative Fisheries Research Unit, Department of Ecology, Montana State University
Title: Response of Yellowstone Lake Ecosystem to Lake Trout Suppression via Carcass Deposition
Status: Field studies, analyses, and writing ongoing

Michelle Briggs, Dominique Lujan, and Hayley Glassic.

For a complete list of our publications, please visit: go.nps.gov/yellfish

Suggested citation: Koel, T.M., J.L. Arnold, P.E. Bigelow, C.R. Detjens, P.D. Doepke, B.D. Ertel, and D.J. MacDonald. 2019. Yellowstone National Park Native Fish Conservation Program Report 2015-2018. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, WY, USA, YCR-2019-04.