Experimental Removal of Lake Trout in Swan Lake, MT: 2010 Annual Report

Photo courtesy of the Daily Inter Lake

Prepared for the Swan Valley Bull Trout Working Group

By:

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Background

The Swan Valley has historically been home to a stable, healthy bull trout population. However, in 1998 anglers began to occasionally catch adult sized (20-30 inch) lake trout from Swan Lake and the Swan River. This caused alarm because lake trout are not native and are notorious for rapidly expanding and dominating fish communities in lakes with *Mysis* shrimp, at the expense of bull trout and kokanee salmon. In 2003, the level of concern was compounded when biologists gillnetted juvenile lake trout from Swan Lake during standard low-intensity sampling efforts, indicating that wild reproduction was occurring. Since 2003, lake trout catch by anglers as well as during Montana Fish, Wildlife and Parks (FWP) biological sampling has continued to increase, indicating that the population is likely expanding. Research efforts since 2006 have focused on lake trout population demographics, and exploring potential techniques to reduce lake trout numbers while minimizing bull trout bycatch. Based on case histories from nearby waters, long-term management alternatives for this increasing lake trout population are necessary in order to maintain the popular bull trout and kokanee fisheries.

In June of 2009, FWP released an environmental assessment (EA) detailing plans for a three-year experimental removal of lake trout in Swan Lake. This 2010 annual report provides a summary of results from the second of three years of planned suppression. Measurable goals and specific success criteria outlined in the EA will be used to evaluate the feasibility and effectiveness of alternatives to control expansion of the lake trout population. Based on the results of this assessment and other relevant considerations, at the end of three years FWP, with recommendations from the Swan Valley Bull Trout Working Group (SVBTWG), will consider whether these actions are appropriate or if other changes are warranted in fisheries management of Swan Lake and the lake trout population.

Previous annual reports can be found at www.montanatu.org, under the “Swan Valley Bull Trout Working Group” link.

Accomplishments

The three-year experimental suppression project is comprised of two distinct netting events. The first event (Contract Netting) is aimed at removing juvenile and subadult lake trout throughout the two deep (>60’) basins of Swan Lake. This removal is carried out using small-mesh (1.5 – 3.0 inch stretch) gill nets, set by professional fisheries contractors over a three-week period beginning in late August. This netting is conducted during a time in which most adult bull trout are upstream in the Swan River drainage in preparation for fall spawning and also occurs during the period in which Swan Lake is fully stratified. Only habitat below the thermocline (>60’) is sampled, in order to reduce incidental bycatch of bull trout and other fish species which occupy shallower depths.

The second netting event (Spawner Netting) is directed at removal of adult lake trout during spawning and thus is targeted to directly affect further recruitment. This portion of

the project is carried out by SVBTWG members and takes place during the months of October and November. Large-mesh gill nets (3.5 – 5 inch stretch) are set during the nighttime and early morning hours, along spawning areas identified by telemetry work conducted from 2007-2009.

Contract Netting

Basin-wide netting in 2010 was again contracted with Hickey Bros. Fisheries of Baileys Harbor, Wisconsin. Similar to previous years, the boat was cleaned and disinfected following a Hazard Analysis and Critical Control Point Plan (HACCP) to minimize the risk of spreading aquatic invasive species. The boat was inspected by FWP personnel prior to entering Swan Lake to ensure proper cleaning procedures had been followed. Netting took place from 23 August to 10 September, 2010, taking a short break over the Labor Day holiday to avoid disrupting recreational use. A total of 10,021 lake trout from 6”-32” were removed during the Contract Netting period (Figure 1). All fish less than 22” in length were cleaned, packed on ice, and sent to local area food banks for distribution. Fish greater than 22” were not retained for food bank distribution because of human consumption guidelines related to mercury content. Those fish were either given to local wildlife rehabilitation centers or were returned as biomass to the bottom of the lake.

The length frequency distribution of lake trout caught during the Contract Netting period was again skewed heavily toward smaller fish, as a result of targeting their location and fishing smaller mesh nets as the primary method. A strong year class of 9 to 11-inch fish was present in 2010, and comprised 75% of the catch during the Contract Netting period. The average soak time for each mesh panel was 8.1 hours, and the average depth of nets was 106 feet. The depth was maximized and duration of these net sets was minimized in an effort to reduce bycatch and associated mortality of non-target species. Bycatch of other fish species during the Contract Netting period can be found in Table 1.

Fishing effort during the 2010 Contract Netting period was similar to that of 2009. However, in 2010 an additional smaller mesh size (1.75” low profile) was added to the array of nets in an attempt to capture smaller fish. Lake trout catch per net was significantly higher overall in 2010 compared to 2009 (Figure 2). When examined by mesh size, lake trout catch per net was significantly higher for the 2” mesh in 2010, and is likely the result of the large cohort of fish between 9 and 11 inches. Lake trout catch per net for the 2.5” and 3” mesh decreased in 2010, suggesting that efforts in 2009 were effective in reducing the previous cohort of 9-11 inch fish. The addition of the 1.75” mesh resulted in increased catch of lake trout between 250 and 300 mm (10-12”). Overall, the 1.75” mesh was responsible for 17% of all fish caught during the Contract Netting period.

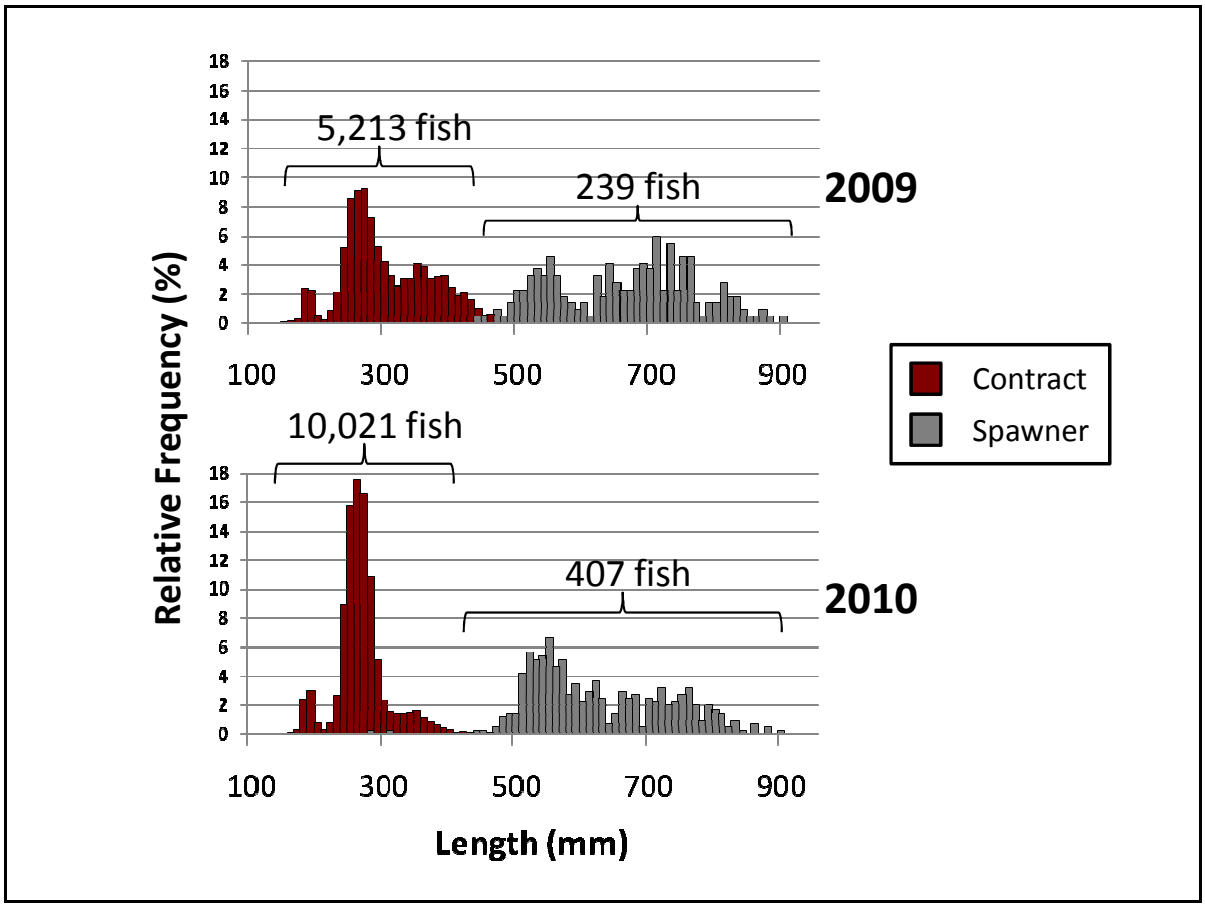


Figure 1: Relative length frequency of lake trout caught during both Contract and Spawner netting in 2009 and 2010.

Table 1: Bycatch of non-target fish species captured during both netting events in 2010.

Fish Species	Contract Netting Number of Fish	Spawner Netting Number of Fish
bull trout	212	87
kokanee	414	110
pygmy whitefish	63	0
mountain whitefish	28	5
longnose sucker	49	306
largescale sucker	0	109
northern pikeminnow	14	135
rainbow trout	5	7

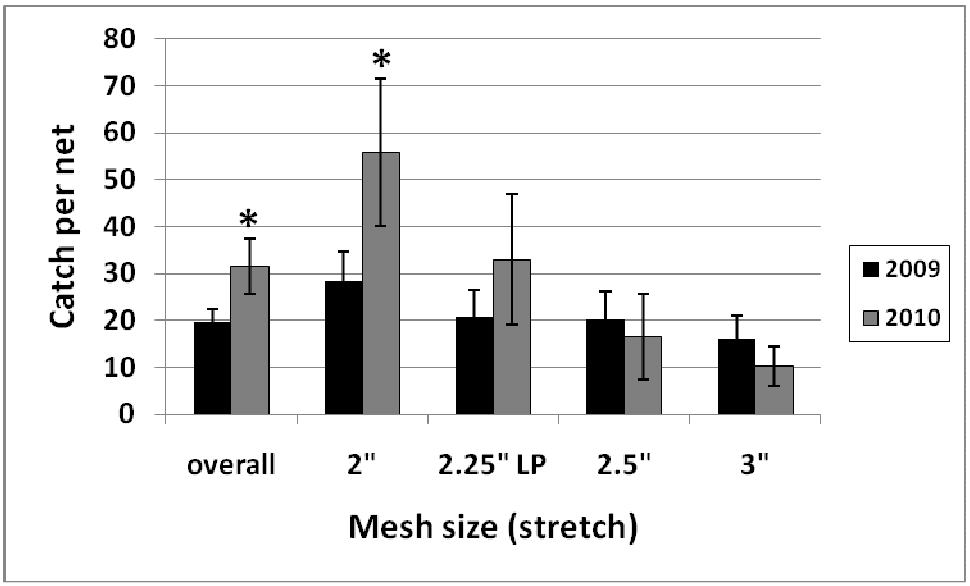


Figure 2: Lake trout catch per net for the Contact Netting period 2009-2010. Error bars represent 95% confidence intervals. Asterisks represent statistically significant changes in catch between years.

Bull Trout Bycatch

Bull trout bycatch during the 2010 Contract Netting effort was 299 fish. Despite the greatest amount of removal netting effort to date being deployed in 2010, this bycatch is similar to netting activities in 2008 and 2009 (Figure 3). Bull trout bycatch has remained consistent largely because netting efforts are focused in areas of the lake where bull trout numbers are low (primarily in waters deeper than 65-70 feet and especially in the north basin of Swan Lake) and an increasing use of smaller mesh nets which target juvenile lake trout. The ratio of lake trout (LT) to bull trout (BLT) captured in the contract netting has increased each year of the removal effort, from 16LT:1BLT in 2008, to 23LT:1BLT in 2009, and 33.5LT:1BLT in 2010. Beginning in 2009, the netting period was also moved to an earlier date (late August) to further minimize gill net encounters with adult bull trout, which are primarily residing upstream of the lake during the early fall in preparation for the spawning period. The timing of the 2010 netting replicated the 2009 effort.

Reduction of bull trout mortality, while maximizing lake trout catch, requires a balancing act amongst timing, location and net set duration. By minimizing soak times we have been able to revive and release upwards of 60% of the bull trout captured. Survival of bull trout in the bycatch is also higher in the finer mesh sizes (under 1.5-inch square), where the fish are less likely to roll up and pin their gills, inevitably leading to suffocation even in short duration net sets. During the 2010 Contract Netting, we continued to utilize a Fraser Recovery Box, patterned after a design used to maximize revival of gillnetted Chinook salmon on the west coast. The box is a forced-ventilation chamber in which suffocated fish can be rapidly supplied with moving oxygenated and chilled water, further improving their likelihood of survival. Data on revived bull trout

are collected and will be used to evaluate delayed mortality and mitigation techniques (i.e. Fraser box, fizzing, etc.) as this project continues.

Sunset on the Contract Netting boat, showing Fraser Recovery Box in foreground.

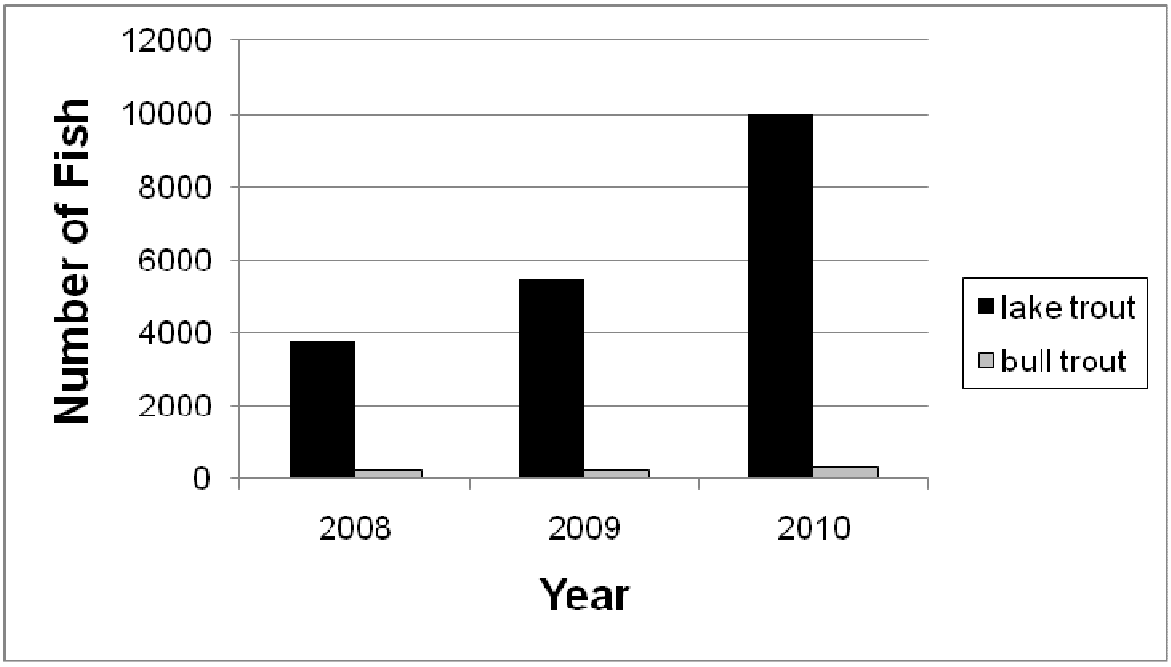


Figure 3: Lake trout catch and bull trout bycatch from contracted netting activities 2008-2010.

Spawner Netting

Removal of the adult component of the lake trout population, in efforts to directly affect further recruitment of lake trout cohorts, remains an important aspect of this three-year removal project. Beginning in 2009, efforts were made to net adult lake trout throughout the entire spawning period. Because this was the first year of this effort, several important considerations emerged. These included our need to better determine timing of the lake trout spawning period, optimal locations of nets set for spawning lake trout and ways to minimize bycatch of other fish species. Netting along predetermined spawning sites proved to be effective, with 239 mature lake trout captured over 16 nights in 2009. The majority of the 2009 catch was made up of adult male lake trout (84%), which are suspected to spend more time in proximity to the spawning grounds, and suggested that netting activities during the peak of the spawn may have been insufficient to capture a greater proportion of the females. Therefore, netting efforts during the spawning period in 2010 were increased. In order to increase netting effort, while maximizing efficiency, we contracted with The Hickey Brothers Fisheries for the use of their gillnetting boat during the 2010 Spawner Netting. SVBTWG members performed all netting duties under the guidance of the fishing vessel captain.

Netting for spawning adult lake trout began on 28 September 2010, after sonic telemetry surveys determined that several adult lake trout were gathered near predetermined spawning areas. A total of 405 lake trout were caught and removed during the 2010 Spawner Netting period. Similar to 2009, the majority of the lake trout caught were male (70%). However, a near doubling in the percentage of mature female lake trout caught in 2010 suggested that netting efforts during the peak of the spawn were more effective (Figure 4). Spawning lake trout ranged in size from 20 to 36 inches, with many fish greater than 24 inches (610 mm) in length (Figure 1). Of the fish 20-24 inches long, the vast majority were mature males. The length frequency of lake trout caught during the 2010 Spawner Netting period appears to have shifted toward smaller fish, suggesting that efforts in 2009 were effective in removing a considerable portion of the larger spawning fish and that new spawning cohorts are still being recruited. The Spawner Netting period ended on October 29, after catch rates had decreased substantially and few or no fish were caught on consecutive evenings.

The removal of 121 female lake trout in 2010, the vast majority of which were still bearing their full complement of eggs, has the potential to reduce year-class strength in future cohorts. Cox (2010), in his M.S. research conducted on Swan Lake in 2008, calculated an average fecundity of 8,464 eggs per female. If 121 females had a similar average fecundity, they could produce 1.02 million eggs, most of which were removed from the system in 2010.

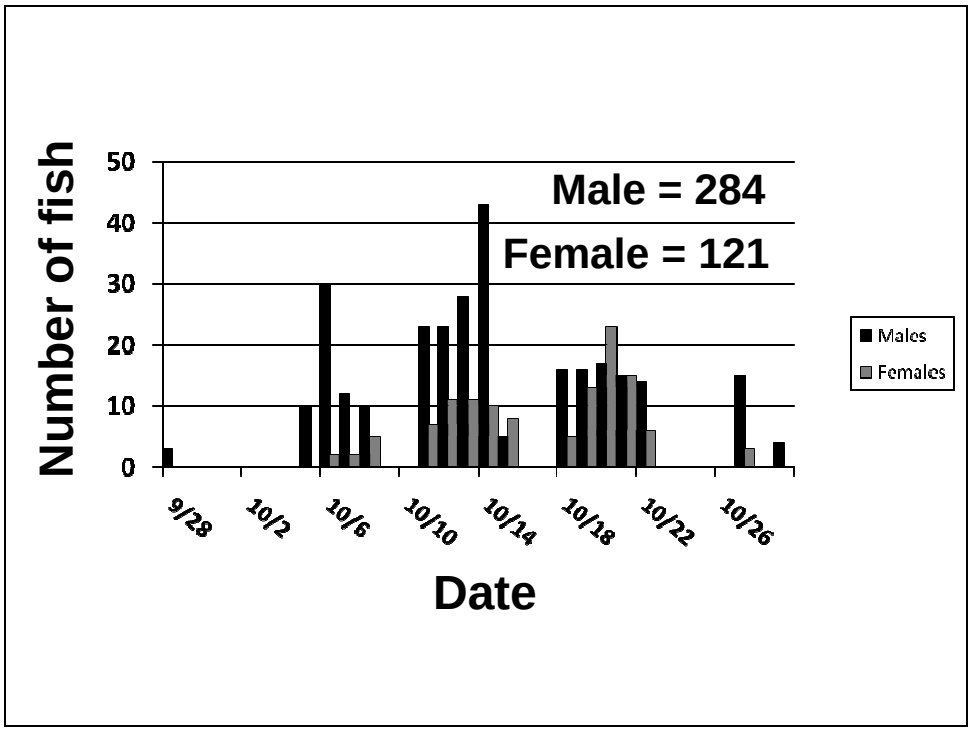


Figure 4: Lake trout catch throughout the Spawner Netting period in 2010.

Bycatch during the Spawner Netting period was low again in 2010 (Table 1). Similar to 2009, mitigation measures such as short duration soak times and on-board recovery tanks were implemented to reduce bull trout bycatch mortality. Bycatch of bull trout during Spawner Netting in 2010 increased compared with the 2009 effort, with 87 bull trout being caught. However, the mortality rate of inadvertently captured bull trout was considerably less in 2010 (41%, n=36) than it was in 2009 (60%, n=16), suggesting that the increased efficiency associated with utilization of the charter vessel aided crews in their ability to quickly retrieve bull trout from the nets and either release them or place them in the recovery tank. Further efforts to minimize bull trout bycatch mortality will continue in the final year of this study. Bycatch of other fish species continues to be low during the Spawner Netting period, however, bycatch of kokanee did increase compared to the 2009 effort in both the Contract and Spawner netting.

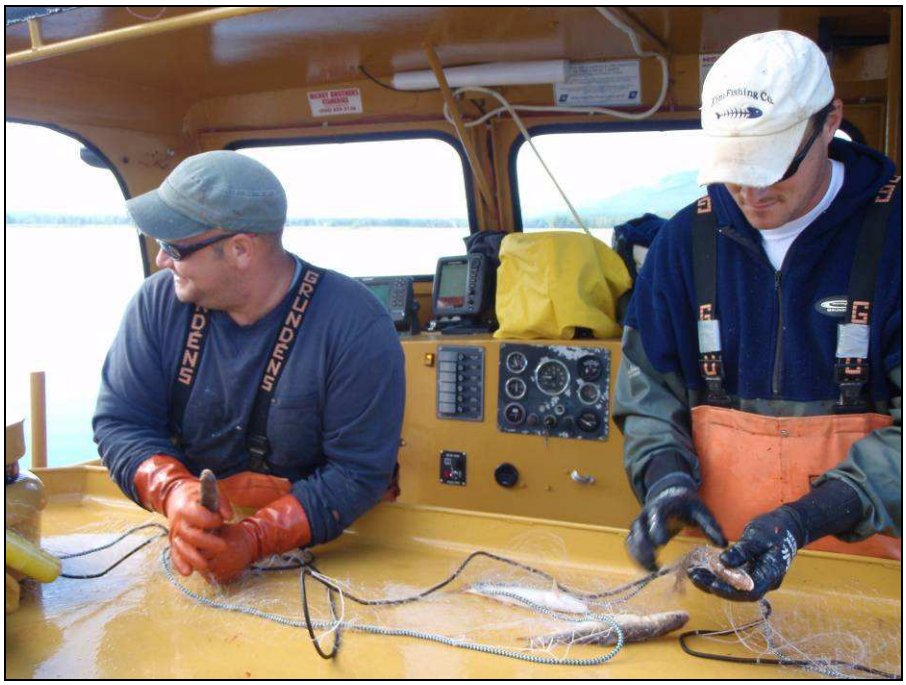
Evaluation Criteria

This three-year removal project in Swan Lake was initiated to evaluate the efficacy of gill nets as a management tool to control the expansion of the lake trout population while minimizing the impact of these non-native fish on the bull trout and kokanee fisheries. Criteria to evaluate our actions were outlined in the EA, and will continue to be monitored in each of the three years of the study. Because 2010 represents the second of these years, little inference can be made with regard to the overall effect we have had on the fish populations. However, insight into the effectiveness of our netting efforts does exist.

Although the overall catch during the 2010 Contract Netting period was considerably higher, data suggest that this is likely due to a large cohort of juvenile lake trout recruiting to the mesh sizes included in our array of nets. Lake trout catch per net increased significantly in nets comprised of 2.0" (stretch) mesh, which predominantly catches age-3-4 lake trout. Because actions to reduce further recruitment of lake trout (i.e. Spawner Netting) were not initiated until 2009, it is not surprising to see this increase, as the majority of these fish had not yet been subjected to any type of suppression. However, decreased catch per net in the 2.5" and 3.0" mesh sizes, which select for fish approximately 350 and 425 mm in length, respectively, suggest that gill nets have been an effective tool in reducing the age 4 and 5 cohorts of juvenile lake trout.

Data continue to be collected to support other indices outlined in the EA. These include lake trout relative weight and length of spawning lake trout, both statistics that can be useful in helping to determine our overall effectiveness. Though 2010 is only the second year in which Spawner Netting has been initiated, a shift in the length frequency of captured adult lake trout suggests that the 2009 effort has been effective in removing a considerable portion of the larger mature fish.

Bull trout and kokanee redd counts, as well as mysis densities continue to be examined to evaluate the effect our actions have on their abundance. If our lake trout removal efforts are successful, changes in these indices may occur, however a lag time is likely.



Professional fisheries contractors Tyler Long and Jack Tong remove lake trout from gill nets on Swan Lake.

USFS employee Roger Lindahl measures lake trout prior to cleaning them for the Food Bank.

2011 Plans

The final year of this three-year project will follow the same schedule as was completed in 2009 and 2010. Contract netting will begin the last week in August, and will continue into the beginning of September, breaking for the Labor Day holiday. Though most sonic transmitters deployed in previous years have expired, some live transmitters exist. Sonic telemetry will resume upon completion of the Contract Netting to further refine our knowledge of lake trout spawning sites. Spawner Netting will again be accomplished by SVBTWG members, beginning the last week of September. Refinement in our knowledge of the timing of the spawning period has allowed us to again charter the R/V Trygg from the Hickey Brothers to increase efficiency during the peak of the spawn. Few other changes in both netting events from 2010 strategy are anticipated.

Monitoring of the other aquatic organisms will also continue in the Swan Lake system. Annual *Mysis* sampling will occur in early June, bull trout redd counts will happen in October, and kokanee redd counts will be completed in early December. Additionally, spring gill net monitoring will be conducted in Holland and Lindbergh Lake, located in the headwaters of the Swan drainage. Lake trout have never been detected in Holland Lake, however lake trout have been caught in the Swan River near the vicinity of Holland Creek, and the possibility of them invading Holland Lake is a considerable threat. Lake trout were captured in routine gill net monitoring in Lindbergh Lake in 2009. These fish are likely the result of the expanding population in Swan Lake and represent a significant threat to the Lindbergh Lake bull trout population. This newly established lake trout

population will continue to be monitored and the implications it has on the overall Swan system will continue to be evaluated.

Other Relevant Information

Swan Lake continues to be one of the few places in Montana where anglers can fish for bull trout. Additionally, anglers make Swan Lake their fishing destination for abundant kokanee salmon and northern pike. Year-long angler creels were conducted in 1984 and 1995, and assisted fisheries managers by estimating the annual catch and harvest of these fish species. However, several changes have occurred since the last creel. These include the listing of bull trout under the Endangered Species Act and the discovery of lake trout (both occurring in 1998). A year-long creel survey was initiated by FWP in 2009 and concluded in May 2010. Results of this creel survey are currently being analyzed and will be published in a subsequent report. This creel survey will be compared to previous creels to establish a baseline of angler effort and success. This information will be useful for evaluating future changes in the fishery.

References

Cox, B.S. 2010. Assessment of an invasive lake trout population in Swan Lake, Montana. Master's thesis. Montana State University, Bozeman.