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Hungry Horse Mitigation Flathead Lake

Annual Progress Report 2007
Project 9101901

by:

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INTRODUCTION

The Confederated Salish and Kootenai Tribes (CSKT) and Montana Fish Wildlife and Parks (MFWP) wrote the "Fisheries Mitigation Plan for Losses Attributable to the Construction and Operation of Hungry Horse Dam" in March 1991 to define the fisheries losses, mitigation alternatives and recommendations to protect, mitigate and enhance resident fish and aquatic habitat affected by Hungry Horse Dam. On November 12, 1991, the Northwest Power Planning Council (NPPC) approved the mitigation plan with minor modifications, called for a detailed implementation plan, and amended measures 903(h)(1) through (7). A long-term mitigation plan was submitted in August 1992, was approved by the Council in 1993, and the first contract for this project was signed on November 11, 1993.

The problem this project addresses is the loss of habitat, both in quality and quantity, in the Flathead Lake and River basin resulting from the construction and operation of Hungry Horse Dam. The purpose of the project is to both implement mitigation measures and monitor the biological responses to those measures including those implemented by Project Numbers 9101903 and 9101904.

Goals and objectives of the 1994 Fish and Wildlife Program (Section 10.1) addressed by this project are the rebuilding to sustainable levels weak, but recoverable, native populations injured by the hydropower system. The project mitigates the blockage of spawning runs by Hungry Horse Dam by restoring and even creating spawning habitats within direct drainages to Flathead Lake. The project also addresses the altered habitat within Flathead Lake resulting from species shifts and consequent dominance of new species that restricts the potential success of mitigation measures. Specific goals of this project are to create and restore habitat and quantitatively monitor changes in fish populations to verify the efficacy of our mitigation measures. The project consists of three components: monitoring, restoration and research. Monitoring, for example, includes a spring gillnetting series conducted annually in Flathead Lake and builds on an existing data set initiated in 1981. Monitoring of the experimental kokanee reintroduction was a primary activity of this project between 1992 and 1997. Lake trout, whose high densities have precluded successful mitigation of losses of other species in Flathead Lake, have been monitored since 1996 to measure several biological parameters. Results of this work have utility in determining the population status of this key predator in Flathead Lake. The project has also defined the baseline condition of the Flathead Lake fishery in 1992-1993 and has conducted annual lakewide surveys since 1998. The restoration component of the project has addressed several stream channel, riparian, and fish passage problems, and suppression of non-native fish. The research component of the project began in FY 2000 and measured trophic linkages between *M. relicta* and other species to assist in predicting the results of our efforts to suppress lake trout. Only Work Element A in the Statement of Work is funded entirely by Hungry Horse Mitigation funds. Additional funds are drawn from other sources to assist in completion of all remaining Work Elements.

WE B: Quantify relative abundance of bull trout and westslope cutthroat trout

We set six floating and six sinking gillnets in Flathead Lake in cooperation with Montana Fish, Wildlife and Parks during spring 2007. The data generated by this sampling program contributes to a long-term monitoring index of abundance of westslope cutthroat trout (Figure 1) and bull trout (Figure 2) in the Flathead system. This monitoring tool is intended to be one measure of the effect on native adfluvial trout of mitigation projects taking place throughout the basin. Capture rates during the period of sampling are highly variable and provide no clear evidence of a trend in abundance of either species since sampling began.

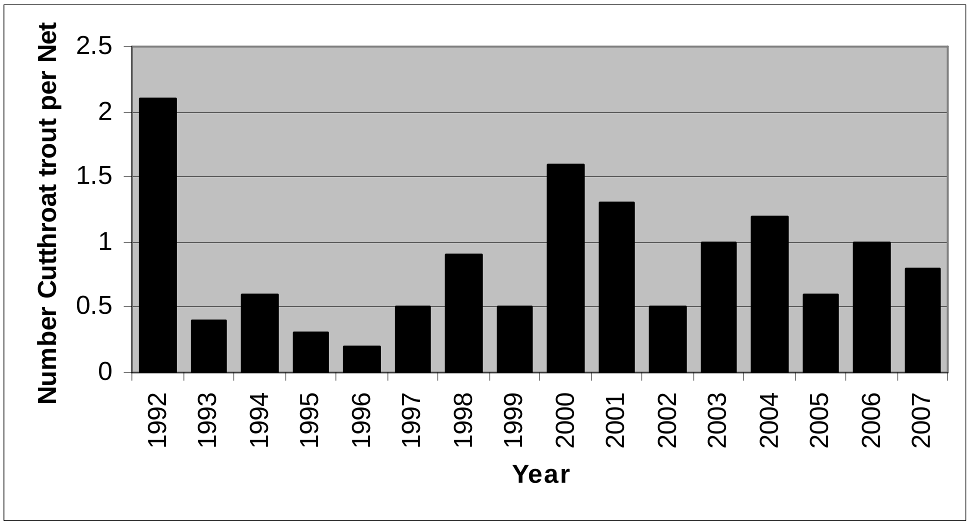

Figure 1. Number of westslope cutthroat trout caught per floating net during spring in Flathead Lake, 1992-2007.

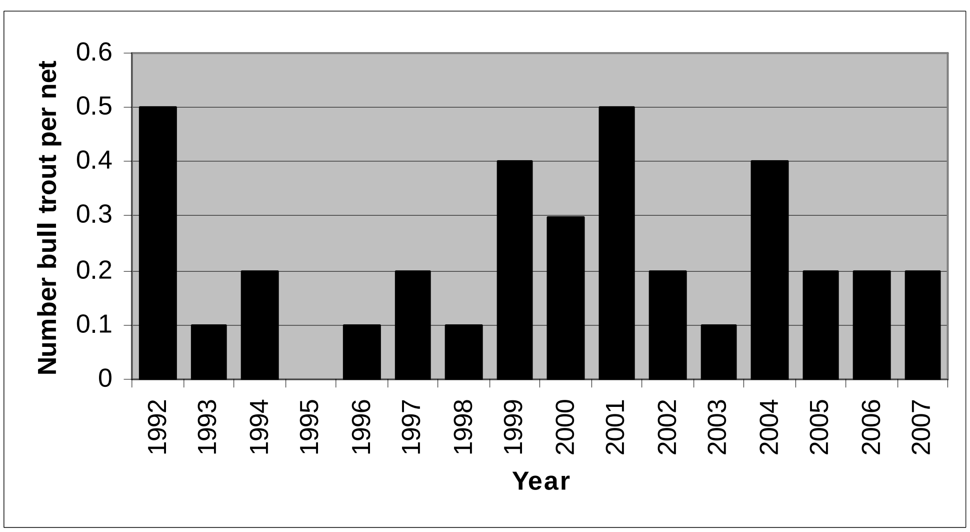

Figure 2. Number of bull trout caught per sinking net during spring in Flathead Lake, 1992-2007.

WE C: Quantify Flathead Lake Fishery

The creel survey is another tool to measure the effect on native adfluvial trout of mitigation projects throughout the basin. Its primary use though has been to monitor the harvest of lake trout which currently exert the greatest control over native adfluvial trout abundance. During 2007 we interviewed 862 parties of anglers and conducted 206 aerial and ground counts of anglers. The average length of lake trout caught by anglers was 526 mm TL (Figure 3) and age 8 fish were the most abundant year class in the catch (Figure 4).

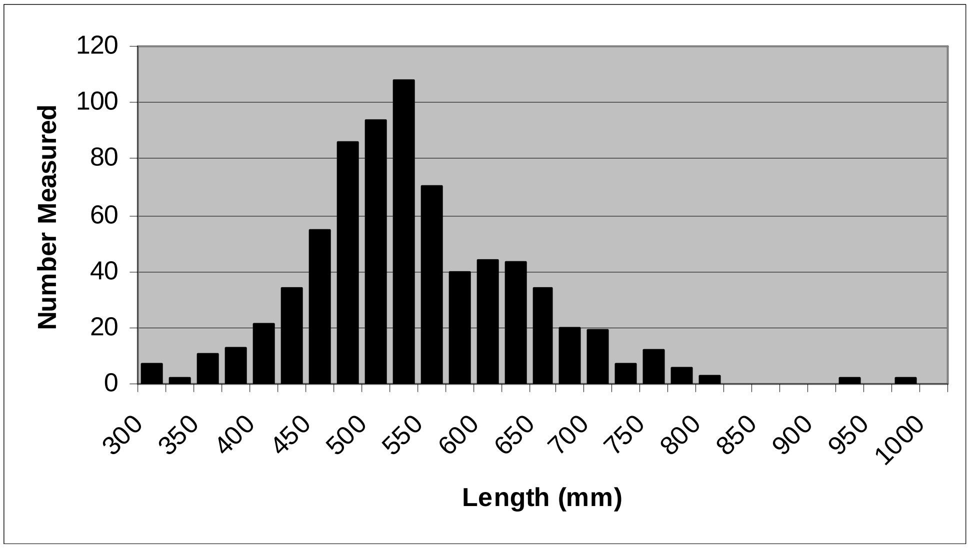

Figure 3. Lengths of lake trout measured during creel survey, July 2006 to June 2007.

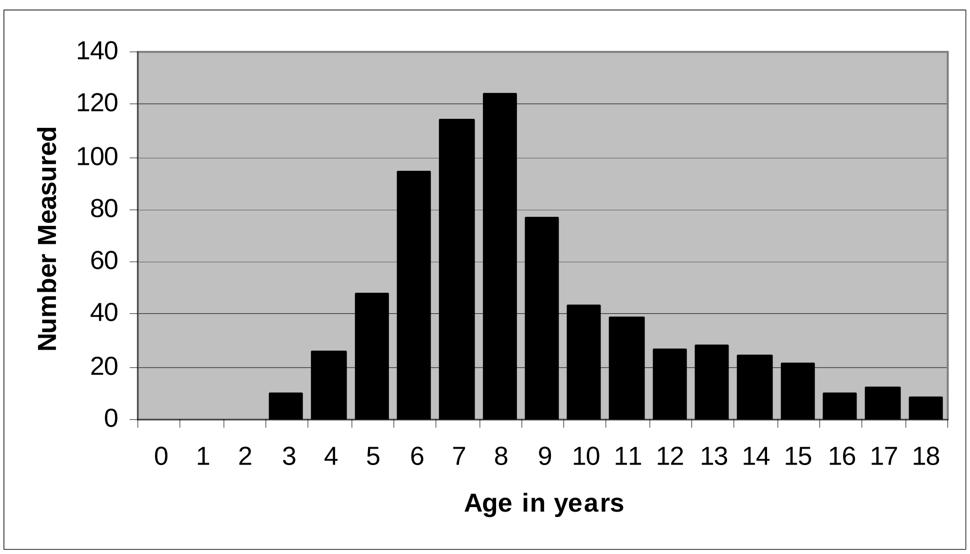

Figure 4. Ages of lake trout measured during creel survey, July 2006 to June 2007.

We estimated that 46,017 lake trout were harvested in 2007, and that total pressure equaled 161,330 angler hours. We also estimated the harvest during 2007 of 119,471 lake whitefish, and 80,199 yellow perch.

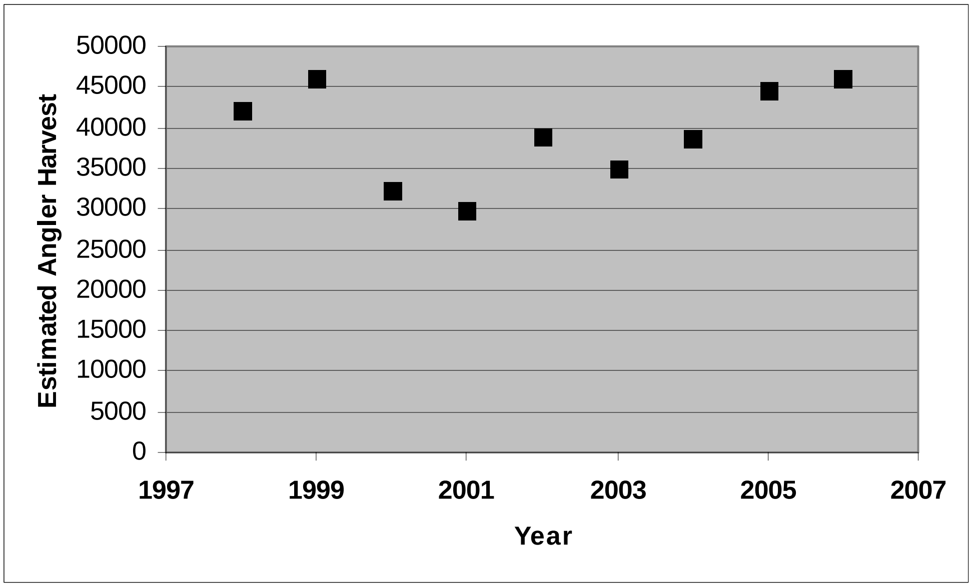

Figure 5. Estimates of annual harvest of lake trout, Flathead Lake, July 1998 to June 2007.

WE D: Analyze biological parameters of lake trout

A fairly uniform decline in survival between age 8 and 16 is evident, representing a mortality rate of 0.27 as computed by the Robson Chapman method (Figure 6).

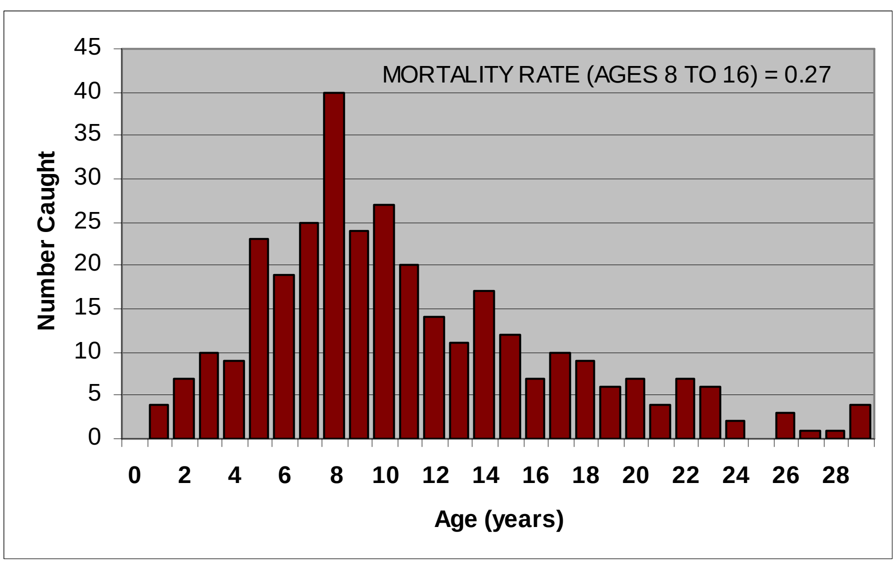

Figure 6. Estimated age structure of Flathead Lake lake trout derived from gillnetting samples, 2007.

WE E: Analyze biological parameters of lake trout biology
All the standard metrics that we monitor indicate that the current harvest of lake trout is insufficient to reduce the population and that the population continues to be large enough that it is clearly limited by available resources (declining condition and growth rate and increasing length at maturity).

WE F: Complete plan for piscicide treatment of Skidoo Creek

This work was suspended during 2007 to allow for supportive activities to begin such as obtaining staff training in the use of piscicides and development of a programmatic Environmental Assessment.

WE G: Monitor success of fish planting program

We maintained our program of interviewing a pre-selected group of anglers to confirm their satisfaction with the planting program. The Rainbow Pond program continues to receive unanimous approval, while the Pablo Reservoir program received mixed ratings from the anglers. We will intensify our evaluation of the Pablo Reservoir program in the future to determine if it is qualifies as a suitable planting location.

WE H: Research shoreline erosion processes.

During 2007 we continued to monitor erosion rates at three sites around Flathead Lake. We also used matching funding from public and private sources to install wave gauges at two additional sites in order to correlate erosion rates with season and intensity of wave ambient wave energy.

WE I: Design beach restoration at Salish Point

We cost-shared BPA funding during 2007 to design a beach at Salish Point on Flathead Lake to replace a legacy of industrial lakeshore degradation. Salish Point consists of a failing wooden seawall that is losing its ability to retain the fill material that was placed behind it many years ago (Figure 7). The fill material is of unknown origin and may contain pollutants that must be kept from entering the lake. We did not consider complete removal of the fill material because that would be prohibitively expensive, and because the public has developed well-established uses of the site that it is undesirable to terminate.

The beach design aligns the beach front to minimize the angle of wave approach and therefore to reduce the tendency to transport gravel from east to west. The alignment of the beach will be oriented parallel with the 2882-2884 depth contours.

Figure 7. Failing wooden seawall at Salish Point on Flathead Lake.

The Salish Point beach is designed as a “pocket beach” in which it will act as a single unit with hard controls at the east and west ends of the beach. This approach prevents the transport of any gravel off-site, regardless the size of storm that may occur, and it ensures that there can be no off-site impacts from this specific action. The two fishing piers, constructed at the east and west ends of the beach, are solid concrete features that provide anchor points that fix the endpoints of the Salish Point beach.

The average depths of the lakebed below full pool elevation at the base of the seawall are four feet. The transition to a beach is best illustrated by overlaying the lakebed transects with reference beach transects (Figure 8). The resulting profile mimics the reference beaches measured in nearby shoreline areas (Figure 9).

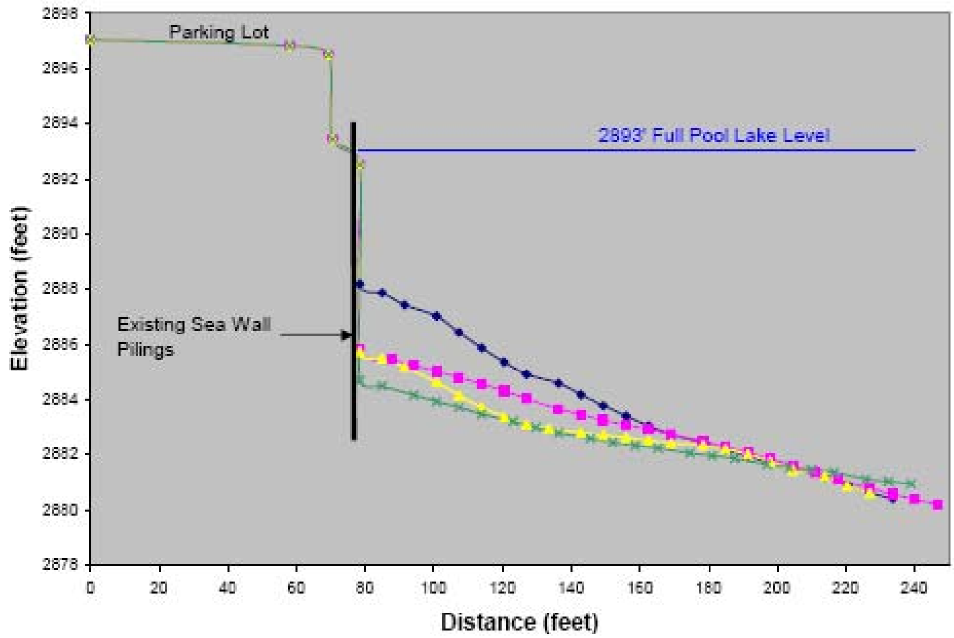

Figure 8. Profiles of four transects measured at Salish Point (data: Mark Lorang).

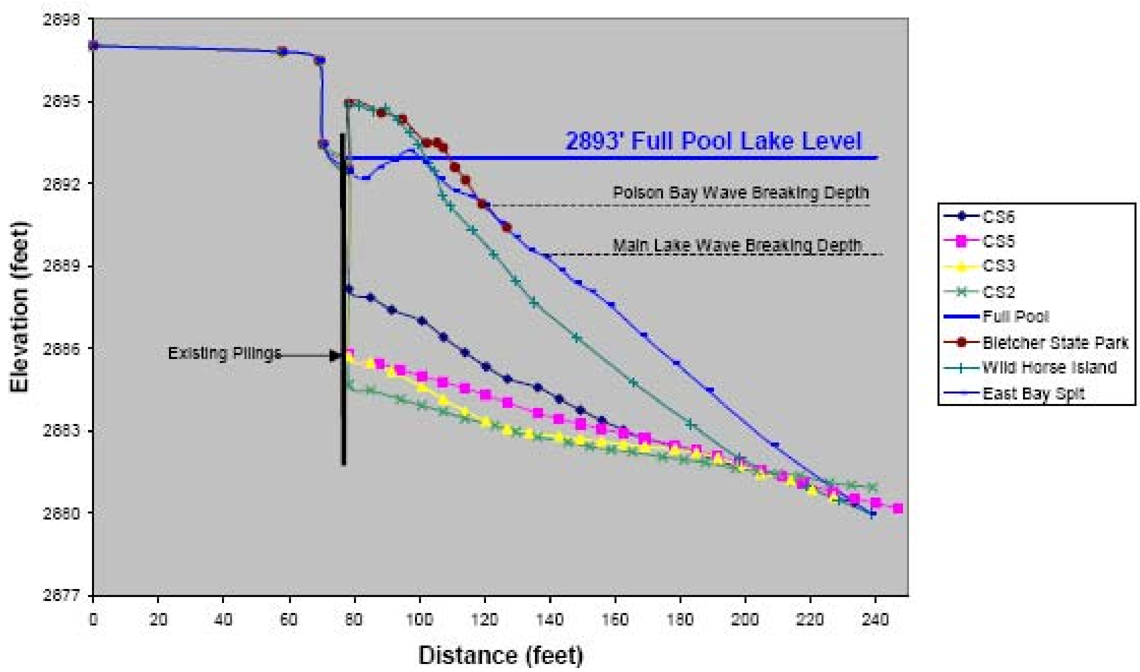

Figure 9. Comparison of reference beach slopes with existing lake bed slopes at Salish Point (data: Mark Lorang).

Application of this profile will result in a stable beach slope that has been shown to withstand the wave climate present in South Bay. The beach will consist of three zones, each characterized by unique slope and particle size (Figure 10). The upper zone will have a slope similar to that present at nearby Boetcher Park and will consist of similar sized gravel. This zone will receive the full pool storm waves in Polson Bay, and will receive waves that break lakeward of the existing seawall and that swash to a point 30 feet inland of the existing seawall. The exposed gravel of the beach will be the most dynamic part of the beach as timing between storms and lake levels change resulting in a continual reworking of the beach gravel into continually changing step/crest profiles.

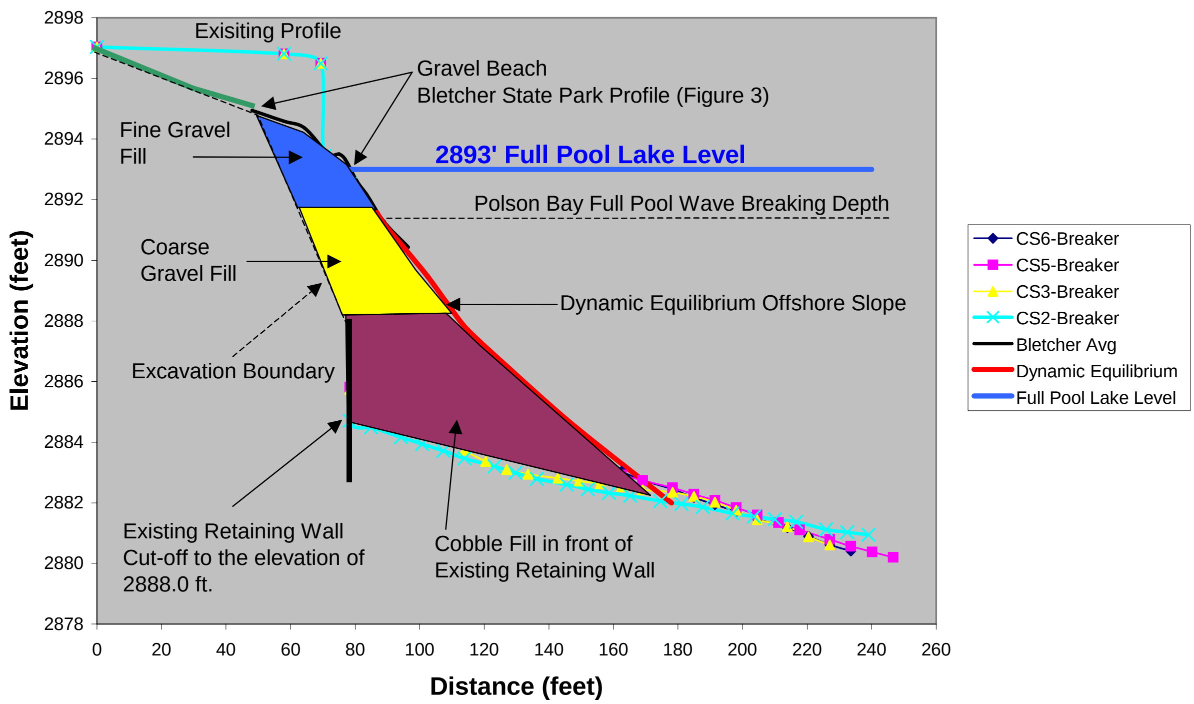

Figure 10. Salish Point beach profile divided into three zone of unique slope and particle sizes.

The middle portion of the beach will have a slope similar to that present at the reference beach at Wildhorse Island, and will consist of coarse gravel. This zone will form a well-developed dynamic beach step at the breaker depth of Polson Bay. This morphological feature will form as a product of major storm wave action during subsequent full-pool seasons and hence provide increasingly greater protection from future storms.

The lower portion of the beach will be exposed to direct breaking storm waves during the drawdown periods, presenting a risk of undermining if not addressed. For this reason the beach slope will be extended for 80 ft lakeward of the seawall and the lowest elevations will consist of large cobble to provide a strong foundation that will not move.

The lower portion of the beach will be constructed first and consists of about 4000 cubic yards of six inch and greater cobble. The middle portion of the beach consists of about 3000 cubic yards of between two and four inches diameter coarse gravel. The upper portion, that extends above full pool elevation of 2893 ft., consists of about 2000 cubic yards of gravel that is less than 1 inch in diameter.

WE J: Operate radio advisory broadcast

We applied for an FCC operating license and identified a new site for placing the radio equipment because a suitable building was found that would that provided improved access and security for the radio equipment.

WE K: Hell Roaring Creek restoration

Hell Roaring Creek is a direct tributary to Flathead Lake entering in East Bay. Developers of the land at the confluence with the lake removed riparian vegetation in winter 2005 during preparation for development. A 20 year flood event (Figure 11) occurred the next spring that caused the denuded channel to "unravel", incising up to four feet (Figure 12) and widening by about 300 percent (Figure 13).

Figure 11. Hell Roaring Creek during declining limb of peak discharge, June 2005.

Figure 12. Channel incision and riparian tree collapse following peak discharge event in Hell Roaring Creek, June 2005.

Figure 13. Hell Roaring Creek at low flow and after flood damage, December 2007.

CSKT sought remedial measures from the developers, resulting in a settlement that placed the riparian corridor in Tribal ownership and the tribes assumed responsibility for reconstructing the degraded channel (Figure 14). Reconstruction was challenging because of the need to prevent future channel migration onto neighboring properties. This circumstance required the construction of a Rosgen B-type channel with low sinuosity and numerous step-pools to accommodate the valley slope (Figure 15 and 16).

Figure 14. Hell Roaring Creek during channel reconstruction, December 2007.

Figure 15. Hell Roaring Creek soon after channel reconstruction, May 2008.


Figure 16. Hell Roaring Creek soon after channel reconstruction, May 2008.

WE L: Timber road removal in Camas and Mill watersheds

We began the programs of road-removal during 2007 to address the seriously altered watershed condition in Camas and Mill creeks. Both streams support important and isolated populations of westslope cutthroat trout. The watersheds are characterized by high densities of legacy roads dating back to the mid-1900's. We conducted coordination activities with the Tribal Forestry Department for both watersheds and identified for removal over the next five years a total of 32 miles in the Camas Creek watershed and slightly over 100 miles in the Mill Creek watershed. During 2007 we removed, by full recontouring, nine road segments within the Camas watershed totaling 11.5 miles. The full costs averaged about $2,500 per mile of road recontoured and revegetated, with BPA's cost share equaling less than $1,000 per mile.

WE M: Jocko River riparian fence

We were not able to finalize any of our on-going coordination efforts with landowners during 2007 for fencing of riparian areas.

WE N: Conduct mark/recapture estimate

In 2007 we began our efforts to develop a cost-effective method to estimate the size of the lake trout population in Flathead Lake. We wish to determine the size of the population to able to scale the effort that will be required to reduce the population. Our goal to date has been to increase harvest of lake trout annually as a means to ultimately achieve the reduction in population. Because the population is so large, even with annual increases in harvest it may take an unreasonable period of time to achieve a population reduction. Knowledge of the population size enables us to know the magnitude of harvest that will achieve the reduction.

We chose the mark-recapture method to estimate the population size and began the process in 2007 to mark fish that we captured by angling and by gillnetting. We incorporated the marking process in the ongoing fall gillnetting schedule and also collected fish from anglers during the Fall Mack Days event for marking. Marked fish also served double-duty of providing additional interest in the fishing contests as we awarded from $100 to $500 (non-BPA funding) for recaptured fish with tags. By utilizing the fishing contests we completely eliminated the cost of recapturing fish and were able to generate a recapture sample size that would have been unreasonably expensive to obtain by conventional means.

We used 2007 as a test-year to begin determining tagging survival rates and the feasibility of using fishing contests as the recapture method. In the month prior to the spring fishing contest we captured 78 lake trout by angling and marked and released them. Over the next two months 7,905 lake trout were caught in the contest, all of which were examined for marks, and two were determined to be marked, representing a two percent recapture rate. We did not generate a population estimate from this work because too many assumptions were violated, especially the small number of fish marked. In the summer of 2007 we marked 10 additional lake trout making a total of 86 marked fish at large after deducting the two removed in the spring contest and for simplicity sake assuming zero mortality over the time period (Figure 17). Between September 28th and November 11th five tagged lake trout were identified among the 14,415 lake trout harvested in the fall fishing contest, representing a five percent recapture rate. These sample sizes are also insufficient for valid estimation of population size.

With the knowledge obtained in 2007 we will expand the marking program in 2008 to generate two more population estimates that will have greater utility for management than those generated in 2007. We will also continue to test whether the fish captured by gillnetting have a survival rate after tagging and release that is different than those captured by angling.

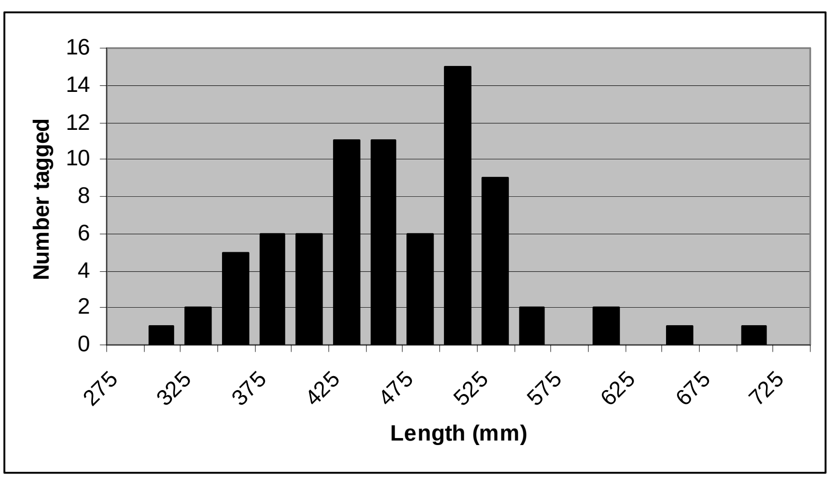

Figure 17. Lengths of lake trout marked for recapture during spring 2007.

WE O: Construct perimeter fence on Adams property

This work was not completed in 2007 because of scheduling problems.

WE P: Construct perimeter fence on Bogage property

This work was not completed in 2007 because of scheduling problems.

WE Q: Construct perimeter fence on Vulles property

This work was not completed in 2007 because of scheduling problems.

WE R: Remove road on Vulles property

We have reconsidered the necessity of removing the road and have therefore postponed the project for future consideration.

WE S: Complete design of passage barrier on Magpie and Seepay creeks

Magpie Creek and Seepay Creek are two direct third-order tributaries to the lower Flathead River. Both streams maintain perennial flow in their upper reaches, but close to where they enter the Flathead River they flow across large alluvial fans and infiltrate into stream substrates after spring runoff. Past genetic sampling indicated that both streams contain populations of pure westslope cutthroat trout *Oncorhynchus clarki lewisi* and the two drainages likely support two of the largest pure westslope cutthroat trout populations remaining on the reservation. However, the complete distribution and abundance of westslope cutthroat trout in the drainages was historically unknown, as comprehensive surveys had never been done. Because of this, over the last few years we worked to completely define fish populations in these drainages.

Through these surveys we have determined that each stream has several kilometers of habitat occupied by westslope cutthroat trout. Magpie Creek also has introduced brook trout in low to moderate numbers and Seepay Creek only supports westslope cutthroat trout. Based on our work to date we concluded that the best opportunity for preventing the loss of these populations from hybridization with rainbow trout or competitive interactions and replacement by brook trout (in Seepay Creek, where westslope cutthroat trout exist in allopatry) is to construct barriers on these streams. After the barriers are in place, our plan will be to remove brook trout in Magpie Creek.

During 2007 we indentified potential barrier locations, developed a scope of work, and hired a contractor to conduct a feasibility study to determine if barriers could be constructed in the downstream ends of these systems. The contractor was hired to evaluate our proposed barrier locations and determine if they were suitable for fish barriers, and then undertake conceptual design of a barrier at the preferred location(s). Three design criteria were identified that the barriers would need to satisfy:

- The barrier should function to exclude a rainbow trout with a maximum length of 22 inches at flows up to the 25-year flow event;

- The barrier should be located in the most downstream locations as practicable, preferably in the intermittent stream reaches; and
- The barrier should be designed to remain stable at flows up to the 100-year event.

In 2008 we will initiate NEPA work, conduct public outreach, undertake final designs, and start obtaining necessary permits. We hope to build at least one barrier in 2009.

WE T: West Magpie Creek perched culvert removal

We were unable to complete coordination with the Tribal Forestry Program to be able to complete this project in 2007.

WE U: Complete survey of Jocko River westslope cutthroat trout

We began a study to assess the distribution and rate of hybridization in westslope cutthroat trout *Oncorhynchus clarki lewisi* populations in the Jocko River drainage. We are conducting this work to determine the status of westslope cutthroat populations in the drainage and to help answer several questions that will help guide management decisions. Primary questions we are attempting to answer with this work are:

1) What is the spatial pattern of *Oncorhynchus* spp. and their hybrids in the Jocko River drainage?
2) What is the temporal pattern of change in genetic makeup at previously sampled sites?
3) Where are hybrids originating (e.g., upstream, downstream, tributaries) from in the drainage and can we manage populations to limit the spread of hybridization?
4) Can information on genetics and run timing be used to make management decisions such as where and when selective or volitional fish passage would be used at existing fish ladders?
5) Should fish passage be maximized by allowing unimpeded volitional passage at fish ladders and handling facilities?
6) What is the conservation value of existing hybrid populations and,
7) should systems be managed to limit further input of rainbow trout genes in populations that are only slightly hybridized?

To begin answering these questions, we initiated a spatially explicit, systematic sampling approach to examine the genetic makeup of *Oncorhynchus* spp. in the Jocko River drainage. We have been collecting tissue samples from fish captured in fish ladders and handling facilities at two major irrigation diversions that have acted as partial or complete barriers to fish passage in the upper Jocko River drainage. In addition we started collecting tissue samples from a screw trap in the lower drainage in an effort to characterize the genetic makeup and ecology of fluvial *Oncorhynchus* spp migrating between the Jocko and Flathead rivers. Collectively, this information will be used to direct and prioritize management decisions (e.g., fish passage, construction of fish barriers, fish removal projects).

During 2007 we worked on defining the distribution of hybrids and the population structure of westslope cutthroat trout in the Jocko River drainage. To do this we sampled fishes and collected tissue samples throughout the drainage and worked with the Conservation Genetics Laboratory at the University of Montana to begin genotyping the samples. We also collected over 1,000 tissue samples from fish moving upstream through fish ladders at two irrigation diversions in the upper main-stem Jocko River drainage. In the upcoming year we will continue sampling fishes at the ladders, sample at additional sites to determine population status, and resample some additional historic sites to determine temporal changes in genetic status. We are also working on a metapopulation model to help guide decisions about fish passage and to assist in examining the individual- and population-level consequences of hybridization in the Jocko River drainage.

WE V: Analyze results of genetic survey of Jocko River

In 2007 we focused on project objectives and data collection. While extensive quantities of data were gathered during 2007, it is premature to prepare a summary or draw conclusions. Initial conclusions will be drawn during 2008, with project completion and final conclusions scheduled for 2010.

WE W: Install pipeline in diversion ditch from Valley Creek

The Valley Creek drainage historically provided spawning and rearing habitat for native bull trout, a federally threatened species and a species of special consideration by the Confederated Salish and Kootenai Tribes. Numerous changes in the Valley Creek channel and drainage basin have resulted in a shift in species residing in the creek and an overall reduction in carrying capacity of the creek. Habitat restoration in the Valley Creek watershed is intended to provide the conditions to facilitate restoration of this life history strategy.

The Morin ditch is a secretarial ditch originating on the South Fork of Valley Creek. The ditch flows for approximately one mile until it rejoins Valley Creek above its confluence with the Jocko River. The first 3,500 feet of the ditch lies on the side of a mountain bedded in pervious parent material. As such, water loss in the ditch is extensive, contributing to frequent breaches, which introduce fine sediments into Valley Creek. Because of ditch inefficiencies, irrigators must divert substantially more water than is necessary for irrigation. Thus, in the summer and fall, when stream flows are low, the Morin ditch may take up to 75% of stream flow in order to provide enough water to the irrigators down the canal. This results in extremely low flows in Valley Creek and elevated stream temperatures, creating unsuitable habitat for native trout, particularly bull trout.

This project involved the purchase and installation approximately 3,500 feet of 12” pipe in the Morin ditch to eliminate leakage and land disturbance associated with open ditch maintenance. Anticipated indirect benefits include overall more suitable habitat conditions such as lower stream temperatures, improved riparian condition, channel morphology and spawning conditions.

The installation of the Morin Ditch pipeline and all of its necessary components was completed in November of 2007 (Figures 18 through 21). Memorandums of Agreement (MOAs) were completed with all primary water users. The MOAs stipulate season of use and coordination with the Tribal Fisheries Program regarding stream flows to insure that fisheries values are protected. The diversion structure and headgates will allow water users to regulate flow in what was previously an unregulated ditch. With the construction of a reliable diversion structure, we were able to achieve use restrictions which will further increase stream flows at critical times.

Figure 18: Plan view of the Morin ditch pipeline diversion structure.

Figure 19: Pipe installation within irrigation ditch from Valley Creek, 2007.

Figure 20: Outlet of pipe back into open irrigation canal.

Figure 21: Valley Creek and diversion structure looking downstream.

The total cost of this project was about $67,151. In addition to BPA's share, cost-share funding was provided by the Tribal Lands Incentive Program and the USFWS Partners for Fish & Wildlife Program.

WE X: Write plan for irrigation siphon on Finley Creek

This project was postponed during 2007, and will be re-scheduled in the future with other than BPA funds.

WE Y: Publish lake trout growth rate article

A skeletal draft of the manuscript was prepared during 2007. Substantial work remains in data analysis and verification of estimated ages derived from otolith cross-sections. Analysis will continue during 2008, with further refinement of the manuscript and potential submittal for publication in 2009.

WE AB: Work with Project 200200300 on acquisitions and easements

We conducted numerous land owner contacts during 2007. Several of those contacts became potential deals for 2008, although no deals were closed during 2007.   We worked with three landowners negotiating for conservation easements or acquisition on about 500 acres of riparian lands on the Jocko River, 56 acres on Mission Creek, and 122 acres on Post Creek. We also coordinated with Montana Fish Wildlife and Parks to ease or acquire lands on the Flathead River and Elk Creek.