

Fish Projects

Funded in 2007 – 08



Ministry of
Environment



Kootenay Lake Fertilization & Monitoring

Objective & Rationale:

The construction of the Duncan (1967) and Libby (1973) dams blocked the natural flow of nutrients (mainly phosphorus and nitrogen) into Kootenay Lake causing decreased productivity of the system and reductions in kokanee and the abundance of Gerrard rainbow trout. The initial five year Kootenay Lake Experimental Fertilization Operations was completed in 1996 and the results indicated there was increased abundance of phytoplankton, zooplankton, and kokanee. Nutrient additions were decreased from 1997 through 2000 by sixty per cent and phytoplankton biomass and kokanee numbers declined.

Monitoring has shown that phytoplankton and kokanee abundance appear to track the fertilizer loading fairly closely (i.e. decreased fertilizer loading resulted in lower phytoplankton abundance and fewer in-lake kokanee). The nutrient additions from 2001 to the present were increased to the 1992 to 1996 loading rates and this has resulted in increased kokanee abundance and spawner escapement. Results in the past few years indicate the Gerrard rainbow trout escapement has increased and therefore there is a possibility of top down effects occurring.

Future Activities:

It is anticipated that nutrient addition and monitoring of Kootenay Lake will continue for the foreseeable future. The response of the Kootenay Lake ecosystem will continue to be monitored closely.

Benefits:

Major benefits to Kootenay Lake fish, particularly kokanee, bull trout and Gerrard rainbow trout. In addition, the economic interests of the region (marinas, resorts, etc.) depend heavily on sport fishing in Kootenay Lake and will benefit from healthy and abundant fish populations. There are additional benefits to wildlife (eagles, bears, etc) as a result of the increased lake productivity and kokanee escapement.

Output Targets for 2007 / 08:

1. Receive and distribute nutrients (in the form of fertilizer) (phosphorus and nitrogen) as per a specific loading schedule (between April 30 and September 30, 2007) arranged by the Operation Manager.
2. A target of suitable phytoplankton species composition as a food source for suitable zooplankton composition (specifically Daphnia which is the preferred food source of kokanee).
3. Maintain annual kokanee escapement to Meadow Creek Spawning Channel and the Lardeau River of greater than 750,000 adult kokanee (dependent on climatic factors and the ecosystem's response to nutrient additions). This number will vary depending on density dependent relationships in the Kootenay Lake ecosystem.

Arrow Lakes Reservoir Fertilization & Monitoring

Objective & Rationale:

The Arrow Lakes Reservoir has been strongly influenced by the construction of a series of three dams (Keenleyside (1967), Mica (1973), and Revelstoke (1984)). These dams have permanently changed the flow dynamics and nutrient loading of the reservoir, and influenced native fish populations by flooding and/or blocking migration to spawning and rearing habitat, altering water quality and decreasing reservoir productivity. Prior to nutrient addition, kokanee stocks had shown dramatic declines in both spawner escapement and spawner size in both the upper and lower Arrow Reservoir. After eight years of nutrient additions, there have been documented improvements in the food web of Arrow Lakes Reservoir, most notably increased phytoplankton biomass and higher densities of in-lake and spawning kokanee. In the initial five years of the project, the nutrient loading remained unchanged. As in the previous two years, results of chemistry samples and phytoplankton samples were used to determine adjustments to weekly nutrient additions. The nutrient additions were dispensed from the Shelter Bay Ferry (private runs) over a 15 km distance for 10 weeks (12 weeks were planned). The remainder of the nutrients were dispensed from the Galena Bay Ferry as in previous years.

Fisheries Program Delivery

Future Activities:

It is anticipated that nutrient addition in upper Arrow and monitoring of upper Arrow and lower Arrow will continue for the foreseeable future. The response of the Arrow Lakes Reservoir ecosystem will continue to be monitored closely.

Benefits:

Major conservation benefits to upper Arrow and likely lower Arrow fish populations, particularly kokanee, piscivores rainbow trout and bull trout. In addition, the economic interests surrounding the reservoir (marinas, sporting goods stores) which depend on sport fishing in Arrow Lakes Reservoir would benefit from healthy and abundant fish populations. Ancillary benefits to wildlife (eagles, bears, bats etc.) should as a result of increasing reservoir productivity and kokanee escapement to reservoir tributaries.

Output Targets for 2007 / 08:

1. Receive and distribute nutrients (in the form of fertilizer) (phosphorus and nitrogen) as per a specific loading schedule outlined by the Operation Manager.
2. Increase the trophic status from ultra-oligotrophic to oligotrophic based on literature values and nutrient loading data.
3. Maintain annual kokanee escapement to Hill Creek Spawning Channel and other tributaries to both upper and lower Arrow at 450,000 (dependent on climatic factors as well as the ecosystem's response to nutrient addition).

Objective & Rationale:

The objective of this task is to ensure biological support for the fisheries component of FWCP. Program staff are involved in updating ongoing task forms, preparing new task forms and assisting the public with project submissions. FWCP biologists assist the Fisheries Technical Committee (FTC) in preparing the Fisheries Budget submission to the Steering Committee (SC). Staff time spent in the preparation of Operation & Project Plans is charged to this task. The nature of the budget preparation process is iterative and time consuming and is reflected in this task.

This task also includes FWCP staff time to attend FTC and SC Meetings and respond to action items that arise from those meetings. This task also covers time spent attending courses, conferences, workshops, liaison with other agencies, answering public inquiries, reviewing expenditure reports and general administrative tasks. Staff time spent on managing the implementation of specific operations and projects will be charged against those individual operations and projects.

Future Activities:

Annual work planning & budget preparation, ongoing training & development, safety meetings and audits, contract preparation & management and public interactions.

Benefits:

A core team of professional biologists to provide in-house fisheries expertise to ensure adequate planning and support for the development and delivery of FWCP fisheries projects and operations. The budget process is time-consuming, however the additional up-front detailed planning and assignment of roles and responsibilities for task delivery results in more effective and efficient implementation of tasks.

Output Targets for Fisheries Program Delivery:

1. Prepare ~ 15 task forms and budget summary
2. Prepare ~ 10 letters of agreement, tenders &/or requests for proposal (RFP)
3. Prepare annual operation plans
4. Public interaction
5. Responding to all public requests for information
6. Respond to agency requests for information (MoE, BCH, DFO)
7. Presentations at 3 public meeting/workshops
8. Complete safety and other training as required
9. Track budget status for fisheries projects throughout fiscal year

Fisheries Small Works & Project Development

Objective & Rationale:

Project development involves obtaining necessary background information, approvals from landowners and agencies, and planning to identify and implement enhancement projects on an ongoing basis. It also may include identification of appropriate partners, and evaluation of past enhancement projects. Professional services would be expected to include engineering, surveying and geo-morphologist expertise as well as technical assistance for staff, and possibly contracted studies if necessary.

A number of small tasks requiring staff time and limited funds have been identified as potential projects. Some of this work involves community volunteers, but there is a need for field support for staff biologists in order to allow it to be accomplished. The work to be accomplished during the 2007/08 fiscal year may include Deer Creek weir removal, Murphy Creek spawning channel maintenance, and highway culvert passage assessment / improvement. Some degree of flexibility will be necessary to allow staff to make best use of opportunities and available time over the year.

Future Activities:

Continued planning, implementation and evaluation of fisheries restoration projects.

Benefits:

Adequate planning and long-term development of fisheries projects. A combination of staff/volunteer time and limited funds can allow many useful small projects to be accomplished. Use of volunteers increases public awareness of the FWCP and its parent agencies, and provides good opportunities for informal public education and information exchange.

Output Targets for 2007 / 08:

1. Completion of 3 technical reports
2. Implementation of 5 small works projects

Upper Columbia Sturgeon Culture at Kootenay Sturgeon Hatchery

Objective & Rationale:

White sturgeon are an important component of fish biodiversity in the Columbia River. The white sturgeon population in the Canadian portion of the Columbia River is suffering from recruitment failure, primarily as a result of hydroelectric facilities and their impact on sturgeon habitat, changes to discharge regime and water clarity. This population is now considered vulnerable to extinction unless there is some intervention. A pilot Columbia River white sturgeon conservation hatchery culture program operated at Hill Creek Hatchery from December 1, 2000 to March 31, 2003. The culture of Upper Columbia white Sturgeon has been transferred to the Kootenay Sturgeon Hatchery.

The objective of this program is to hold, rear and spawn adult white sturgeon captured in the Upper Columbia River and hatch eggs and raise up to 12,000 yearlings. The juvenile sturgeon are held in the hatchery for 1 year and released back into the Columbia River system.

Future Activities:

It is expected that this program will continue for the foreseeable future

Benefits:

Recovery of the upper Columbia white sturgeon population.

Output Targets for 2007 / 08:

1. Transport and hold up to 10 female and 10 male white sturgeon spawners, targeting provision of up to 8 female spawners
2. Collect and fertilize approximately 20,000 eggs from each of up to 8 families
3. To the extent possible with existing hatchery facilities, raise approximately equal numbers from as many of the families produced, targeting a release of up to 16,000 white sturgeon
4. Two release timings will be used, with approximately 30% late fall and 70% spring
5. Release sizes of 30 grams per fish will be targeted
6. Release into the Columbia River will occur at locations prescribed by the Upper Columbia White Sturgeon Technical Working Group
7. All juveniles are to be PIT-tagged and scute-marked prior to release

Hill Creek Spawning Channel Operation

Objective & Rationale:

This project has been ongoing since the early 1980s for compensation of kokanee and rainbow trout spawning lost as a result of construction of Revelstoke Dam. Funding covers basic operation, maintenance and evaluation of the Hill Creek Spawning Channel including programs to monitor kokanee fry emigration, and adult kokanee escapement. Operation of Hill Creek Spawning Channel is delivered via contract.

Egg-to-fry survival was very poor in 2004 and 2005 but was good in 2006. Due to 2 years of failure, a number of new monitoring initiatives (turbidity, intra-gravel dissolved oxygen, over-winter fry survival) have been started and are included as part of the ongoing project package. The budget also includes an amount to repeat an electronic counter trial to monitor the rainbow trout spawners. A large weir to properly fit the channel was not available for the 2006 trial. DFO has also requested that an options analysis be prepared on ways of reducing turbidity during scarification.

The budget includes two options: scarification option, and gravel screening option. Screening is more costly than scarification but more effective in removing fines. The option chosen could depend on the egg-to-fry survival determined in early June 2007, and inter-gravel dissolved oxygen measurements taken throughout the winter.

Future Activities:

Hill Creek Spawning Channel will continue to operate for the foreseeable future as compensation for lost spawning habitat. Options for improving sediment management in the channel are currently being investigated.

Benefits:

Operation, maintenance and evaluation of the Hill Creek Spawning Channel helps sustain upper Arrow Reservoir kokanee abundance, which provides a forage base for bull trout and rainbow trout. Recent monitoring has shown that the channel also produces substantial numbers of rainbow trout and some bull trout. Healthy fish stocks provide angling opportunities and ancillary economic benefits.

Output Targets for 2007 / 08

1. Kokanee egg deposition target of 12 million
2. Kokanee egg-to-fry survival rate better than 30% resulting in production of 4 million kokanee fry
3. Report quantifying rainbow trout spawner numbers and size distribution
4. Scarification of spawning gravel
5. Release conifers 2 hectares
6. Options analysis report on ways of reducing turbidity during scarification
7. Reports on fry production, adult spawner enumeration and egg deposition, scarification

Meadow Creek Spawning Channel

Objective & Rationale:

Loss of spawning habitat for an estimated 2.8 million kokanee occurred following the construction of Duncan Dam. BC Hydro built Meadow Creek Spawning Channel in 1967 as compensation for the lost natural kokanee production. The operational tasks associated with the spawning channel have been funded by FWCP for a number of years and facility maintenance such as gravel scarification and settling pond cleaning are required annually. By agreement, MoE personnel operate the facility during spawning and fry migration periods. Escapement monitoring to Meadow Creek and nearby reaches of the Lardeau River is undertaken each year to measure trends in stock abundance. Channel fry production is also monitored each spring to evaluate the over winter survival of incubating eggs.

Major maintenance and upgrades are also required periodically, and can include channel modifications; gravel, weir, bridge refurbishing; rip rap replenishment; hazardous tree removal and flood protection improvements. Preliminary modifications to the upper portion of the John Creek diversion canal occurred in 1999 with the construction of a small sediment deposition basin. Funding was secured in 2006 to complete the directional fence portion of the project and materials are currently on site. The preferred contractor was unavailable to complete the project when the weather was suitable so the final binwall installation/concrete pour is expected to occur in 2007. Turbidity monitoring associated with mechanical gravel scarification has occurred

since 2003 and is projected to continue indefinitely at the request of Fisheries and Oceans Canada (Columbia River Section) habitat biologists. A technical summary of the 2003 through 2006 monitoring data is required along with remedial options that would meet governments 25.0 mg/l above ambient development guideline for suspended solids.

Future Activities:

This facility will continue to operate at the current level of activity for the foreseeable future. Maintenance and repair activities vary annually and depend greatly on the prevailing environmental conditions.

Benefits:

This facility is required to sustain Kootenay Lake kokanee which are the primary prey species for both bull trout and Gerrard rainbow trout. Kokanee carcass decomposition also benefits the natural nutrient levels in the lake in addition to providing seasonal forage for other aquatic, terrestrial and avian predators. The facility is recognized for its wildlife viewing potential and also operates as the provincial source of kokanee eggs for the Freshwater Fish Society of BC.

Output Targets for Meadow Creek Spawning Channel for 2007 / 08:

1. Egg-to-fry survival rate better than 35%
2. Produce 15 to 20-million kokanee fry annually
3. Annual deposition of 40 to 50 million eggs in the spawning channel

Footprint Impact Assessment: Fish

Rationale & Results:

The FWCP is conducting a project to evaluate the footprint impacts of BC Hydro's developments within the Columbia Basin by estimating changes in habitat, primary productivity, and fish and wildlife populations resulting from dam construction. It will provide a better understanding of the amount and significance of these impacts to the ecosystem, as well as assist the FWCP to develop, prioritize and monitor compensation projects. The results will help guide future FWCP planning. This review does not consider impacts due to dam operations, which are addressed in the BC Hydro-led Water Use Planning (WUP) process.

The task has been divided into the following 5 steps:

1. Review of information sources and recommended approach - completed
2. Habitat Mapping: Digital map of impacted habitats - completed 2005
3. Workshop to ID impacts and metrics - completed Jan. 5 & 6, 2005
4. Quantification of habitat losses, done by SRM in 2005 – part of cost covered by WLAP quantum (Chirico); still ongoing.
5. Reporting, summary and recommendations - aquatic productivity assessment should be completed by the end of fiscal 2006/07 (AIM Ecological Consultants Ltd.

Funding to complete chapters on Introduction, Species Interactions (wildlife/fish), Fragmentation, and Synthesis/Conclusions is requested in this task.

Future Activities:

Additional activities may flow from the report if a re-evaluation of priorities is indicated by the study.

Benefits:

Clarifies and quantifies dam footprint impacts and identifies compensation options and performance measures to monitor the effectiveness of compensation activities. Identifies the costs of compensation activities and monitoring programs that will support requests for additional funding of compensation activities.

Output Targets:

A report that quantifies the impact of BC Hydro dams on the fisheries and wildlife resources of the Columbia Basin and recommends a range of compensation options to mitigate impacts and the associated unit costs of implementing and evaluating the effectiveness of compensating activities.

Natural Bull Trout Production in Arrow Lakes Reservoir

Objective & Rationale:

Bull trout populations in Arrow Lakes reservoir appear to be stable based on creel data but until recently there has been no attempt to monitor changes in population abundance or spawner numbers for the reservoir. This task follows up on recommendations from the Arrow Lakes Fish Summary report (Sebastian et al. 2000) and the Arrow Lakes Bull Trout workshop in November 2002 regarding the priority need for information on natural production of bull trout in the reservoir. The objectives of the task are: (1) to identify the significant contributor streams to natural recruitment of bull trout in the ALR for protection and possible restoration, and (2) to develop a relatively inexpensive method to monitor population trends (spawner and juvenile numbers) as a performance measure for fertilization and other compensation initiatives.

Feasibility studies from 2004 to 2006 identified a suite of suitable tributaries and recommended techniques for assessing spawner/redd numbers and juvenile abundance. This task is to provide funding to continue bull trout redd counts in 2007, and to develop a better understanding of the life history (i.e., age of emigration from tributaries) using otolith microchemistry. Temperature monitoring in selected tributaries will be included.

One of the challenges of the project is that the larger rivers, which probably contribute the largest share of juveniles, are glacial in summer and difficult to sample using conventional methods such as snorkeling. However, in some years (e.g. 2006) late autumn sampling works well for these drainages.

Future Activities:

A relatively inexpensive long-term monitoring program should be implemented for Arrow Lakes bull trout. Modifications to the plan will be necessary as new information becomes available.

Benefits:

Population monitoring of predator fish is an important performance measure for fertilization and other compensation activities. In combination with other trend data it will provide a better understanding of trophic interactions and fish population dynamics in the Arrow ecosystem. Determination of bull trout natural production sources and limitations will provide information to protect critical habitats and may foster restoration initiatives. Failure to identify core spawning and rearing habitats could result in loss or degradation from other development, leading to population declines in spite of fertilization.

Output Targets:

Report summarizing all years of population assessment with a best judgement of the streams most important for bull trout production in the ALR and recommendations for a cost-effective monitoring program or other necessary research.