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FISH AND WILDLIFE COMPENSATION PROGRAM

MIDDLE SHUSWAP WATERSHED

SALMONID ACTION PLAN

FINAL DRAFT

The FWCP is a partnership of:

BC hydro FOR GENERATIONS

British Columbia

Canada

Fisheries and Oceans Canada

Pêches et Océans Canada

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Shuswap River Salmonid Action Plan

1 INTRODUCTION

The Fish and Wildlife Compensation Program (FWCP): Coastal Region evolved from its origin as the Bridge-Coastal Restoration Program (BCRP), a program initiated voluntarily by BC Hydro in 1999 to restore fish and wildlife resources that were adversely affected by the footprint of the development of hydroelectric facilities in the Bridge-Coastal generation area. Footprint impacts include historical effects on fish and wildlife that have occurred as a result of reservoir creation, watercourse diversions and construction of dam structures.

In 2009, the program developed a strategic framework that guides overall planning for compensation investments (MacDonald 2009). The framework has guided the development of strategic plans for each watershed within the FWCP program area, which are in turn informing action plans that focus on specific priorities within each watershed (Figure 1).

This Salmonid Action Plan sets out priorities for the Fish and Wildlife Compensation Program to guide projects in the Shuswap River project area. It identifies actions to be undertaken above Mabel Lake in the Shuswap River in support of salmonid fish species. The plan builds on the FWCP's strategic objectives and the Shuswap River Watershed Plan (FWCP 2011). Action plans have also been developed for riparian and wetland areas and species of interest; and some actions may be complementary across the different plans.

The actions and priorities outlined in this plan have been identified through a multi-stage process involving BC Hydro, Fisheries and Oceans Canada (DFO), Canadian Wildlife Service (CWS), Ministry of Environment (MOE), local First Nations, and local communities. Initial priorities were developed through consultation with agency staff. These priorities were then reviewed and discussed at a workshop[1] to allow First Nations, public stakeholders, and interested parties to comment and elaborate on the priorities.

It is important to understand, however, that planning priorities within action plans may not translate immediately into funded projects. Limited program funding requires that priority-setting has to also be developed across the program as a whole, not just within action plans. The process of selecting which actions will be implemented in any given year will occur during the annual implementation planning cycle.

[1] Vernon, B.C. (18 May, 2010)

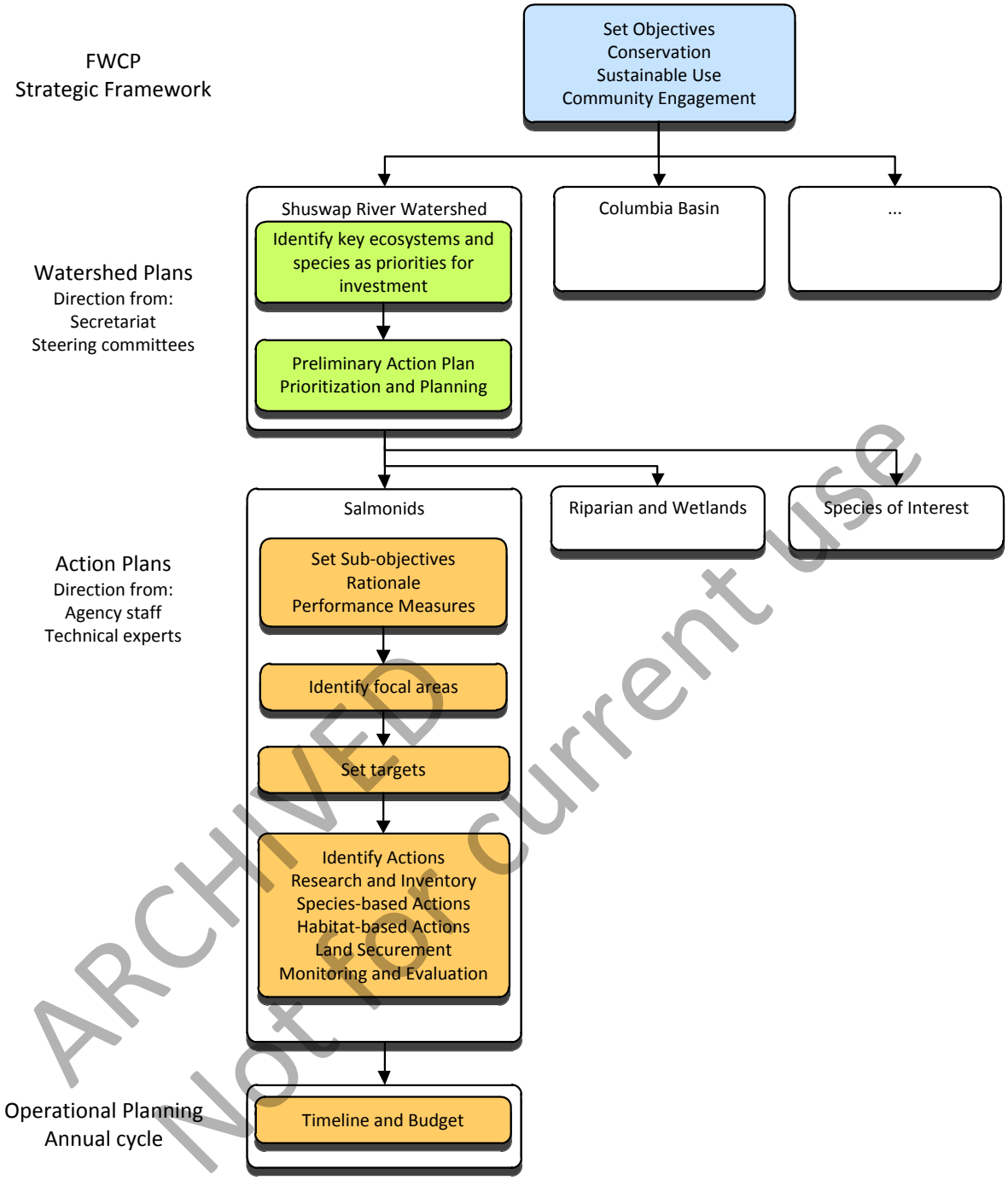

Figure 1. Relationship between the Salmonid Action Plan and higher level planning and objectives.

2 OVERVIEW CONTEXT

The middle Shuswap River is located upstream of Shuswap Falls in the dry interior of British Columbia, near the town of Lumby (**Figure 2**). The basin area above Shuswap Falls is 1,969 km^2, with elevations ranging from 450 m to 2,680 m. The Shuswap River basin is climatically within the southern interior region of BC, which is affected by both continental and modified maritime conditions. Temperatures are also affected by continental air from the south (warm) and from the north (cold). Runoff is dominated by snow melt from the surrounding mountains. The November to January period has the highest precipitation, with an average of 120 mm/month, and as much as 250 mm/month (BC Hydro, 2005).

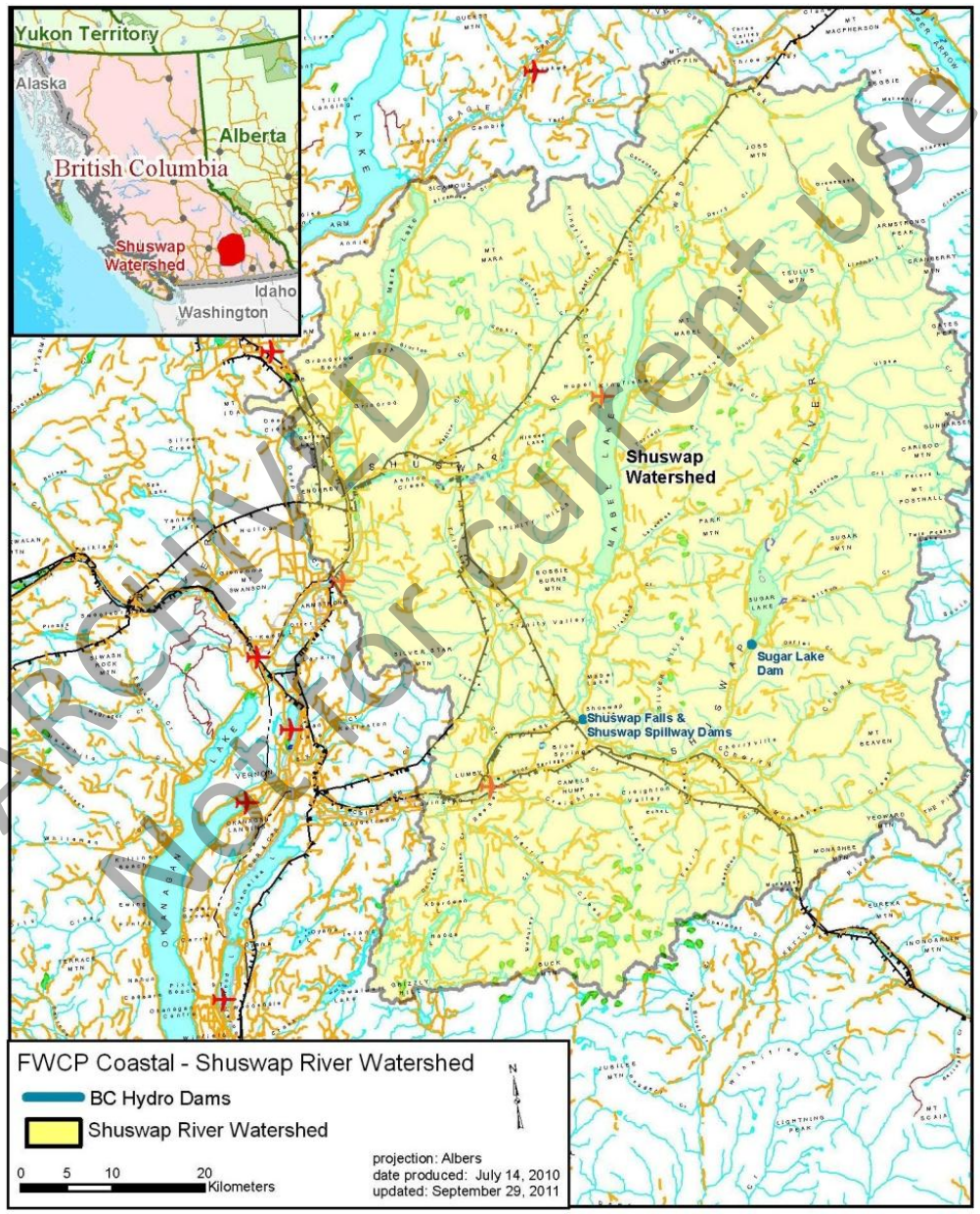

Figure 2. The Shuswap River hydropower project.

The Shuswap River watershed is in the Shuswap Nation territory. The closest provincial park is on Shuswap Lake some 80 km downstream of Wilsey Dam, and the largest nearby communities are Lumby, Enderby and Armstrong. There is a small community that resides on Sugar Lake.

The Shuswap River project was completed in 1929 by West Canadian Hydroelectric Corporation. The project consists of two dams, Peers Dam, which impounds the Sugar Lake Reservoir, and Wilsey Dam at Shuswap Falls. The dams are separated by 31 km and power is generated only at Wilsey Dam. The project is run-of-river, with very little storage.

2.1 FISH AND FISH HABITAT IN THE SHUSWAP RIVER

Historical information on fish and fish habitat in the middle Shuswap River is limited. Most of the information in this section is taken from Bridge-Coastal Fish & Wildlife Restoration Program (2003).

Anadromous runs of salmon had access to the middle Shuswap River, though there is some uncertainty about how far upstream each species migrated. Shuswap Falls, at the current site of Wilsey Dam, acted as a partial barrier to upstream movement and it pink salmon were probably restricted to areas below these falls. Chinook and coho likely regularly migrated upstream of the falls, though their run size is unknown. Brenda Falls, at the current site of Peers Dam, was less than 3 m high and was probably passable. Nevertheless, the best spawning and rearing areas were probably between Shuswap Falls and Brenda Falls. Sockeye salmon may also have used the middle Shuswap River, though Sugar Lake was the only lake habitat available for rearing so the run size was likely small.

Interior Fraser salmon stocks were substantially affected by two large slides in 1913 and 1914 at Hells Gate in the Fraser Canyon, which created a barrier to upstream fish migration. Fishways built in 1945 and extended in 1956 improved fish passage, but stocks took many years to rebuild. The effects of the Hells Gate slides is thought to have contributed to underestimating the productivity of some fish stocks during evaluation of hydro-development in the watersheds.

Rainbow trout and kokanee are important resident salmonids in the middle Shuswap. Both species are targeted by anglers in the area, and kokanee are also a significant prey species for other fish. Mountain whitefish are present in the middle Shuswap River and tributaries. Other fish species recorded in the watershed include cutthroat trout, burbot, largescale sucker, longnose sucker, bridgelip sucker, northern pikeminnow, peamouth chub, redside shiner, prickly sculpin, slimy sculpin, and longnose dace.

2.2 IMPACTS AND THREATS

Fish and Wildlife habitat and species have been significantly altered due to the construction of the dams, the development of hydro-power, and alterations in the hydraulic regimes of the systems. The following summary of the primary footprint impacts is derived from:

- Bridge-Coastal Restoration Program: Revised Strategic Plan, Volume 2: Watershed Plans, Chapter 12: Shuswap River (December 2003;
- Shuswap River Water Use Plan Consultative Committee Report (December, 2003); and
- Findings in the Community Workshop (Vernon, 18 May, 2010).

Hydro-related Impacts — The impacts that occurred are based on location in the watershed as follows:

Peers Dam and Sugar Lake Reservoir.

1. The dam flooded 7 km of mainstem and 4 km of tributary channels, as well as their associated riparian areas.
2. The dam inundated 1,564 ha of lake habitat including a spawning area at Sugar Lake outlet, and 653 ha of riparian and upland habitat.
3. Drawdown of Sugar Lake Reservoir (7 m) reduces littoral productivity and connection to riparian areas.
4. Peers Dam footprint caused a loss of instream, riparian and upland habitats.
5. Peers Dam blocked migration of resident river species and may have blocked migration of anadromous fish as well.
6. Entrainment occurs at Peers Dam, but effects are unquantified.

Shuswap River between Peers and Wilsey dams.

7. Rapid flow alterations are thought to have negatively affected benthic insect production.
8. Peers Dam reduced recruitment of gravel and large woody debris to this section of the Shuswap River.
9. Loss of carcasses at the lake outlet spawning area have reduced nutrient inputs to the river.
10. TGP may be elevated by spills at Peers Dam, but magnitude is unknown.

11. Wilsey Dam headpond flooded about 1 km of mainstem Shuswap River habitat.

Wilsey Dam and Downstream

12. Wilsey Dam footprint led to loss of instream, riparian and upland habitats.
13. Wilsey dam blocked access for anadromous salmonids (Chinook, sockeye and possibly coho) to at least 20 km of spawning and rearing habitat above Shuswap Falls, as well as blocking resident river species.
14. Wilsey Dam reduced recruitment of gravel and large woody debris to this section of the Shuswap River, most notably downstream to Bessette Creek.
15. Diversion to the powerhouse dewaters 180 m of stream channel immediately downstream of Wilsey Dam during low flows.
16. Dredging of the headpond at Wilsey Dam has caused downstream siltation and degrading of water quality through increased BOD. Sand deposition in the headpond may have improved spawning habitat.
17. TGP may be elevated by spills at Wilsey Dam, but magnitude is unknown.
18. Entrainment occurs at Wilsey Dam, but effects are unquantified.
19. Altered flow regime has contributed to stranding of fish and dewatering of incubating eggs.

Non-Hydro Impacts — Other impacts on fish populations in the Shuswap River watershed include historic effects of fish harvest, logging, public access and road construction. The slides in the Fraser River at Hells Gate in 1913 and 1914 negatively affected anadromous fish passage into the Shuswap watershed. Fish passage at Hells Gate was established in 1945 and extended in 1956; however, fish stocks took a long time to recover. Urban development has not been a significant factor in the area.

2.3 LIMITING FACTORS

The main limiting factors for salmonids vary among species and include useable habitat, access to habitats (i.e., passage) and nutrient limitations. The limiting factors include natural and human-induced aspects, and the latter include both hydropower and other developments.

The factors are summarized here for the Shuswap River below Sugar Lake:

1. **Habitat Area**: Former spawning, rearing and overwintering areas are permanently lost by dam footprint, reservoir drawdown and flooding, diversions, or dam and generating station operations; or from non-hydro

sources. Limited spawning habitat is likely the most important factor affecting the productivity for Chinook, and sockeye in the system; while rearing habitat appears limiting for rainbow trout.

2. **Habitat Quality**: Physical habitat below dams is altered by reduced recruitment of gravel and large woody debris. Bank erosion is also a concern in some areas, and affects habitat through sedimentation.
3. **Reduced access**: Wilsey Dam blocks access to formerly useable habitat above Shuswap Falls for Chinook, sockeye and possibly coho. Altered flow regimes affect passage conditions in some locations downstream of dams.
4. **Low nutrient load:** River productivity is low due to a loss of fish (specifically Chinook) carcasses in the reaches between Peers Dam and Wilsey Dam.

2.4 TRENDS AND KNOWLEDGE STATUS

HABITAT TRENDS

A detailed account of habitat impacts from hydropower development is provided in Bridge-Coastal Fish & Wildlife Restoration Program (2003) and is summarized in Section 2.2. In addition to present and historic hydropower impacts there are diverse impacts in the watershed from forestry and linear development.

Changes in operations agreed to by BC Hydro as a part the Water Use Plan (BC Hydro 2005) have likely improved habitat conditions downstream of Peers and Wilsey dams. The WUP is expected to optimize the use of water for the benefit of fish, including optimizing the availability of spawning and rearing habitat for resident and anadromous fish species, and minimizing negative impacts associated with plant outages below Wilsey Dam.

Since 2000 several restoration projects have been undertaken by BCRP and community partners and close to 1 million dollars has been invested in enhancing fish and wildlife in the area. Habitat has been created in Duteau Creek smolt pond (2002, and upgraded in 2009), Proctor Channel (2003), Ireland Creek side channel (2003) and Maltman off-channel pond (2005). Slope stabilization of the Huwer Bank was conducted in 2007 to reduce erosion and sedimentation in the downstream areas. Fish habitat has been further enhanced through the provision of groundwater in low flow periods from the Huwer aquifer complex (2006). More recently, side channel restoration work has also been conducted in Lower Creighton Creek, and stream complexing is being done in Bessette Creek.

STOCK TRENDS

Chinook — Shuswap River Chinook are a high priority for DFO. They spawn naturally in the system below Wilsey Dam and DFO maintains a hatchery to augment the population. DFO has released adult Chinook above Wilsey in some years, an action that resulted in successful spawning and fry rearing in this section

of river. It is believed that Chinook historically accessed areas above Wilsey Dam and are the principal species around which fish passage at the dam was discussed during construction.

Coho — Coho are present in the system and may have accessed areas above Wilsey Dam prior to construction.

Pink — Pink salmon occur in the Shuswap River below Wilsey Dam.

Sockeye — Sockeye are present in the system below Wilsey Dam, and have a stable population. There are few obvious restoration opportunities for this species. Sockeye is of particular importance to First Nations.

Bull trout — Bull trout are present in the system between Sugar Lake and Wilsey Dam. Bull trout are blue-listed provincially, and are a high priority for MOE. Relatively little is known about their population status, distribution and opportunities for restoration.

Kokanee — The kokanee population is currently stable below Wilsey dam. Spawning occurs primarily in the mainstem and Bessette Creek.

Rainbow trout — Both piscivorous and insectivorous rainbow trout occur in the middle Shuswap. Most spawning occurs in Duteau Creek, a tributary of Bessette Creek. Rearing habitat appears to be the main limiting factor. Rainbow trout are a high priority for MOE. Little is known about their population status, distribution and opportunities for restoration.

KNOWLEDGE GAPS

Several knowledge gaps have been highlighted by agencies and stakeholders:

- The primary limiting factor for Chinook is thought to be spawning habitat, but information is lacking regarding restoration opportunities above Wilsey Dam. This is true for other species also.
- Little is known about limiting factors for kokanee and rainbow trout.
- A major knowledge gap is the extent to which passage at Wilsey Dam limits overall salmonid production in the middle Shuswap River. For example, fish passage would almost certainly increase access to habitat, but it is unclear how this would affect overall productivity and whether increased restoration efforts downstream would effect the same overall improvement.
- Certain areas of the Shuswap have been well surveyed, including areas around Mabel Lake and the Lower Shuswap below Wilsey Dam. Good inventory mapping is lacking in the middle Shuswap, particularly between Sugar Lake and Wilsey Dam. However, a collation of all mapping efforts should be conducted prior to conducting new surveys as there may be existing information from sources such as BC Transmission Corp. or forestry companies.

3 ACTION PLAN OBJECTIVES, MEASURES AND TARGETS

Clear and realistic management objectives are necessary to guide information acquisition and prioritize management actions. Priority actions and information needs will change as both improvements to the system are realized and information is gained. The current plan reflects the information available and values expressed by stakeholders (FWCP partners, First Nations and local communities) through reports, interviews and regional workshops held between 2009 and 2011.

3.1 OBJECTIVE AND TARGET SETTING

The following terminology is used in this report.

Objectives:	Objectives are high-level statements of desired future conditions (outcomes), consistent with FWCP partner mandates and policies.
Sub-objectives and Status Indicators:	Sub-objectives are detailed statements of desired future conditions within objectives, from which status indicators can be derived and alternative management actions evaluated. Sub-objectives and indicators provide the details necessary to translate policy into actions and to evaluate their consequences. They may be arranged hierarchically within objectives, and usually indicate conditions necessary to attain the objective to which they refer.
Measures:	Measures are specific metrics whose values indicate the degree to which desired future conditions have been achieved. They can be either qualitative or quantitative. There is a preference to develop the latter where possible for ease of monitoring.
Targets:	Targets are the values of measurable items that indicate the attainment of a desired condition. In the current context these may be expressed as a single value or as a range to acknowledge the inherent variability of ecosystems.
Actions:	Management actions, plans or policies for achieving the objectives.

Objectives are the “ends” or the outcomes we ultimately care about. Actions are the “means,” or the things we do to achieve them. This report focuses on describing the actions required to achieve the objectives in relation to Salmonid species and fish in general. Actions relating to specific species or habitats may also be related to actions in other Action Planning documents such as the Riparian and Wetlands or Species of Interest plans.

3.2 OBJECTIVES FOR THE SHUSWAP RIVER

Management objectives are common to all locations in the middle Shuswap River, although the species of interest vary among locations and thus the list of indicators and targets may differ.

This section briefly summarizes the objectives, sub-objectives and status indicators. While the objectives are expected to remain stable over time, the indicators and targets may evolve as management priorities for agencies shift, or new information becomes available.

There are two management objectives for salmonids in the Shuswap River:

1. Conservation – Ensure a productive and diverse aquatic ecosystem,

2. Sustainable Use – Maintain or improve opportunities for sustainable use.

Supporting these objectives are sub-objectives that break each into its key components and provide further clarity.

***Objective 1.* Ensure a productive and diverse aquatic ecosystem.**

Rationale — This objective addresses overall ecosystem integrity and productivity and directs compensation activities to developing productive, useable aquatic habitats. Where cost-effective opportunities exist, compensation works will be aimed at aiding multiple fish species.

There are two sub-objectives, which divide salmonids into anadromous and resident species, since priorities tend to fall along these lines in different locations in the Shuswap watershed.

1. Maximize the viability of anadromous salmon,
2. Maximize the viability of resident salmonids.

The sub-objectives are supported by the following status indicators:

1. Anadromous salmon
    a. Chinook salmon
    b. coho salmon
    c. sockeye salmon
    d. pink salmon

2. Resident salmonids
    a. rainbow trout
    b. bull trout
    c. kokanee

The indicators focus on species of greatest management concern. There is a tacit assumption that these are to some extent true indicator species and that meeting targets for these species will support conservation of other fish species.

There are different priority species in different parts of the Shuswap watershed. Projects need not focus solely on these species, but they are the species of greatest interest to most stakeholders. From a conservation perspective, the priorities are as follows.

Chinook, coho, rainbow and kokanee are the priority species for restoration in the middle Shuswap. There are conservation concerns with Interior Fraser coho in general, so efforts to enhance habitats and population abundance is important. Chinook are a priority in the Shuswap due to widespread interest in the species and the existing opportunities for habitat restoration. Both piscivorous and insectivorous rainbow trout occur in the system, and are important sport fish. Kokanee are important as a prey species for other fish and as a sportfish. Bull trout are a conservation concern, though little is known about their status in the middle Shuswap and management efforts are not focused on them at this time. Sockeye and pink salmon are also important; however, there appears to be limited opportunity for restoration.

Measures — Measures for the sub-objectives relate to the long-term viability of indicator fish populations, and may include distribution, population structure, abundance, and size or age distribution. At this time, the focus will be on abundance. Compensation activities may focus on improving habitat, but success will ultimately be assessed with measures of abundance. Abundance is currently measured through escapement estimates, snorkel swims, and Water Use Plan monitoring activities. Where necessary, additional monitoring may be required for the compensation program to assess progress under this objective.

Targets — Species targets were determined by DFO and MOE and are indicated in Table 1.

Table 1. Species management targets by location in the Shuswap system.

Location	Species	Target (5 year average)
Shuswap upstream of Wilsey Dam	Bull Trout	no target
	Rainbow	no target
Shuswap below Wilsey Dam	Coho	1,000 smolts/km
	Chinook	10,000 naturally spawning adults
	Rainbow (includes both piscivorous and insectivorous)	No target (Habitat Conservation Trust Fund project to help set target)
	Sockeye	75,000 spawners (interim target).
	Pink	no target
	Bull Trout	no target
	Kokanee	70,000 adult in middle Shuswap and Bessette Creek

Objective 2. Maintain or improve opportunities for sustainable use.

Rationale — This objective reflects the important sustainable use benefits that can be derived from healthy fish populations. Many salmonid species are the focus of First Nations, commercial and recreational fisheries. Consequently, any actions aimed at achieving objective 1 also support this sustainable use objective. Although there are no direct actions for improving sustainable use at this time, it is conceivable that projects aimed at generally improving opportunities or increasing the participation in the fisheries could be identified by the program partners in the future.

As additional context, it should be noted that fisheries management agencies have an overall responsibility to manage the fisheries resource at a level of abundance and distribution to support First Nations' traditional uses and rights. These responsibilities are dealt with through the ongoing process of decision-making, which is not a formal part of this FWCP plan. In addition to this, First Nations' interests in overall conservation and sustainable use benefits have been incorporated into the development of this plan.

Measures and Targets — There are no specific measures or targets required at this time, aside from those associated with objective 1.

As part of their overall management responsibilities, DFO uses information such as abundance trends and escapement estimates to regulate angling and commercial harvest. MOE collects information on angler days, catch per unit effort, and number of fishing licences sold in the region, which informs decisions related to angling regulations.

4 ACTION PLAN

4.1 OVERVIEW

The Action Plan has many individual actions, which are presented in Section 4.2. Some actions support multiple sub-objectives, which in turn support multiple objectives. Figure 3 provides an overview of the link between actions and objectives.

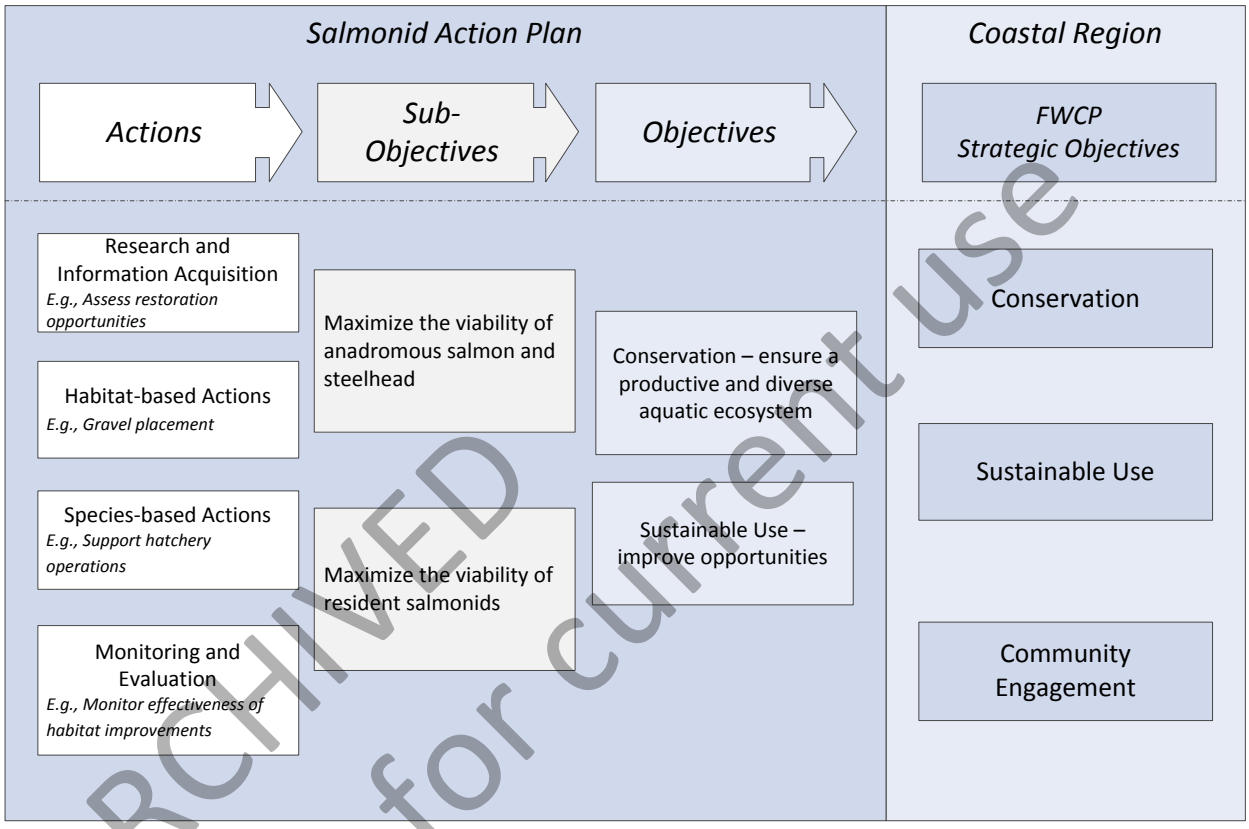

Figure 3: Relationship between actions, sub-objectives and objectives in this Salmonid Action Plan and the FWCP strategic objectives in the Stave River Watershed Plan.

4.2 COMPONENTS

This section presents the main actions identified under each sub-objective (Table 2 and Table 3) along with the supporting rationale for why the actions are required and what they will achieve. Actions are organized under five broad categories: Research and Information Acquisition, Habitat-based Actions, Species-based Actions, Land Securement and Monitoring and Evaluation. Also provided are priority ratings to guide investment planning efforts. Actions are assigned priorities from 1-3. Note that low priority actions are not included in the table.

Sub-objective: Maximize the viability of anadromous salmonids.

Table 2. Actions for anadromous species in the Shuswap River with associated priorities.

Actions	d/s of Wilsey Dam	tribs d/s of Wilsey	Wilsey to Peers	u/s of Peers Dam	multiple species	Anadromous				Resident		
						Chinook	Coho	Pink	Sockeye	Bull trout	Kokanee	Rainbow
Research & Information Acquisition - *Assessments*												
Assess fish passage for Wilsey Dam, including - determine if the dam is a limiting factor in salmonid productivity - determine upstream habitat potential for Chinook, coho, and sockeye. - determine downstream habitat restoration potential with a view to looking at benefits upstream or downstream action. - assess effects of increased passage on resident fish (e.g., rainbow trout) Any assessment must adhere to the Fish Passage Decision Framework.	1*				x							
Develop water management strategy for downstream of Wilsey Dam, including: - assess opportunities for watering areas with groundwater, with a focus on over-wintering and rearing of coho. - develop water management plans for Bessette and Duteau creeks to ensure adequate water for fish to benefit multiple species. - address concerns regarding outplanting of coho into Bessette Creek and the impact on rainbow trout. - assess habitat constraints during critical low flow periods (Aug-Oct).	2	1*			x		x					x
Evaluate sockeye/kokanee interactions	2								x		x	
Develop an integrated habitat restoration plan for the Shuswap system, and ensure compatibility with WUP implementation and monitoring. Proponent should discuss project scope with program staff before submitting a proposal.	3				x							
Habitat Based Actions - *Restoration*												
Develop and/or improve side-channel access and habitat (e.g., across from the Huwer Farm).	1				x							
Riparian improvements including bank stabilization, fencing, armouring, and re-vegetation. Potential locations include three sites with BCTC transmission towers - approach BCTC for co-funding.	1				x							
Maintain existing constructed habitat enhancements for all salmonids.	1				x							
Removal of failed road crossings to increase fish access to tributary habitats, especially for coho and rainbow.		1	2				x					x
Gravel placement for spawning areas.	3				x							
Land Securement - Habitat Acquisition												
There are possible opportunities where land securement may address fisheries management objectives.	3	3			x							
Monitoring & Evaluation - *Effectiveness monitoring*												
Assess efficacy of previous habitat enhancements undertaken by the program.	1		1	1	x							
Assess adult returns and out-migrating smolts as a measure of overall fish production in relation to specified targets.	2				x							

* particularly important projects

Rationale.— To support targets for anadromous salmon a number of actions are proposed. Many actions focus on improving habitat for different species and life stages, but there is much we don't know biologically and physically about the species and habitats of interest, so actions also include collecting information to help evaluate and implement compensation options and assessing performance of implemented restoration activities.

Compensation requires increasing present biological productivity to offset hydro development-related declines in productivity. There are myriad ways to compensate for fisheries impacts, and some work better for some species than

others and some may be more suited to certain physical settings. To make informed choices on implementing the most cost-effective projects requires understanding what is possible and the costs and benefits of different approaches. More detailed options assessments are required in some circumstances so that costs and projected benefits can be better understood when prioritizing among potential projects. This would aid priority setting both within and among waterbodies within the Shuswap system.

FWCP (BCRP) and other programs have completed a number of habitat enhancements in the middle Shuswap. Restoration work has focussed on the reaches below Wilsey Dam. Further opportunities remain, including increased groundwater channels for pool habitat and bank stabilization, amongst others. There are other restoration opportunities, such as enhancing connectivity by removing failed culverts to enhance access to tributaries. There is limited opportunity for enhancing sockeye and pink productivity, so actions in this plan do not specifically address these species at this time.

There is strong local support for developing a fish ladder and increased fish passage at Wilsey Dam. BC Hydro has a decision framework for evaluating the establishing fish passage on current dams (BC Hydro 2008), and the agencies, community groups, First Nations and BC Hydro may need to work through this decision process for the Shuswap system. Part of the evaluation should be a study to determine potential risks and benefits for anadromous and resident salmonids.

Many of the activities that enhance the status of salmonid species and improve ecological integrity of their habitats may also benefit sustainable use, including First Nations fisheries, angling and other uses. BC Hydro funding has not typically been directed at funding of hatchery operations, but program partners have a responsibility for sustainable use of fish resources and will therefore consider sustainable use issues under the compensation program.

Monitoring is a cornerstone of good resource management because it provides information on present status and trends and allows post-implementation assessment of management decisions and programs. Fundamentally, monitoring provides direction on adjustments that may be necessary. There are multiple elements related to anadromous salmon that require monitoring. Realistically, monitoring will likely focus on abundance of different life stages of sportfish and species of concern, and the level of effort will likely vary among locations and species. Results of monitoring should feed directly into compensation program evaluation and help revise objectives and targets, where necessary. Special care will be required to ensure that implementation and monitoring of FWCP: Coastal projects complements that of the Water Use Plan. There has been a stated desire to develop methods for long-term (sustainable) monitoring for salmonids (e.g., rainbow, kokanee, etc), including adult escapement and juvenile production.

Sub-objective: Maximize the viability of resident salmonids.

Table 3. Actions for resident species in the Shuswap River with associated priorities.

Actions	d/s of Wilsey Dam	tribs d/s of Wilsey	Wilsey to Peers	u/s of Peers Dam	multiple species	Anadromous				Resident		
						Chinook	Coho	Pink	Sockeye	Bull trout	Kokanee	Rainbow
Research & Information Acquisition - *Assessments*												
Assess factors limiting rainbow trout productivity, including harvest, food supply, and juvenile production in tributaries. This action applies to both piscivorous and insectivorous populations.	1*											x
Assess habitat availability and determine restoration opportunities for resident fish (e.g., rainbow trout in Duteau and Bessette creeks, off-channel areas downstream of Wilsey Dam for kokanee, habitat availability between Sugar Lake and Wilsey Dam in the mainstem and Cherry and Ferry creeks).	1*		1		x							x
Identify and assess aquatic species at risk in the Middle Shuswap.	1		1	1	x							
Assess connectivity of habitats, with a particular focus on kokanee	1										x	

* particularly important projects

Rationale.— The rationale for proposed actions related to resident salmonids is similar to that discussed above for anadromous salmon, and some of those proposed projects will benefit resident fish also. The primary actions required for resident salmonids is to develop a better understanding of present stock status and possible restoration options for different species. For example, population status and opportunities for habitat improvements require assessments of bull trout, rainbow trout and kokanee.

4.3 UNSUPPORTABLE PROJECTS

DFO and MOE have indicated they would not support the following projects.

- BC Hydro has implemented operational changes under the Shuswap Water Use Plan, which are expected to improve conditions for fish and other resources. There are concerns that some restoration works could confound results from studies underway to evaluate aspects of the WUP. FWCP partners support the WUP and its associated monitoring studies and recognize the need to avoid confounding WUP monitoring results.
- Projects related to fish passage at BC Hydro facilities must adhere to the Fish Passage Decision Framework for BC Hydro Facilities (BC Hydro 2008), including requirements for evaluation of specific prerequisite biological studies.
- Habitat enhancement projects (e.g., improving fish passage at natural barriers, modifications to specific habitats) may require agency review, and in some cases prerequisite biological studies, to evaluate risks and benefits.

5 REFERENCES

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