



SHUSWAP RIVER WATERSHED ACTION PLAN

REV: August 17, 2021

The Fish & Wildlife Compensation Program is a partnership between BC Hydro, the Province of B.C., Fisheries and Oceans Canada, First Nations and Public Stakeholders to conserve and enhance fish and wildlife impacted by BC Hydro dams.



The Fish & Wildlife Compensation Program is conserving and enhancing fish and wildlife impacted by construction of BC Hydro dams in this watershed. From left: Sugar Lake Dam and Wilsey Dam and powerhouse (Credit BC Hydro). Cover photos: Coho fry (Credit iStock), Western Painted Turtle (Credit Ben Meunier).



The Fish & Wildlife Compensation Program (FWCP) is a partnership between BC Hydro, the Province of BC, Fisheries and Oceans Canada, First Nations and Public Stakeholders to conserve and enhance fish and wildlife impacted by BC Hydro dams. The FWCP funds projects within its mandate to conserve and enhance fish and wildlife in 14 watersheds that make up its Coastal Region.

Learn more about the Fish & Wildlife Compensation Program, projects underway now, and how you can apply for a grant at fwcp.ca. Subscribe to our free email updates and annual newsletter at www.fwcp.ca/subscribe. Contact us anytime at fwcp@bchydro.com.



EXECUTIVE SUMMARY: SHUSWAP RIVER WATERSHED

The Fish & Wildlife Compensation Program is partnership between BC Hydro, the Province of B.C., Fisheries and Oceans Canada, First Nations and Public Stakeholders to conserve and enhance fish and wildlife impacted by BC Hydro dams.

This Action Plan builds on the Fish & Wildlife Compensation Program's (FWCP's) strategic objectives, and is an update to the previous *FWCP Watershed and Action Plans*. The Action Plan was developed with input from BC Hydro, Fisheries and Oceans Canada (DFO), Canadian Wildlife Service (CWS), Ministry of Environment (MOE), Ministry of Forests, Lands and Natural Resource Operations (FLNRO), participating First Nations, and local communities. It specifies actions that will conserve, restore and enhance fish and wildlife species and their habitats.

This Action Plan sets out Priority Actions for the FWCP that will guide funding decisions for FWCP projects in the Shuswap River watershed. The focus of the next five-year period will be Priority Actions identified for fish, wildlife and habitats in three broad ecosystem categories:

1. [Rivers Lakes & Reservoirs](#);
2. [Wetland & Riparian Areas](#); and
3. [Upland & Dryland](#).

These ecosystem categories are described in the Ecosystem Chapters, and proposed Priority Actions are captured in the [Action Table](#) at the end of this document. The Priority Actions are intended to support FWCP's strategic objectives of conservation, sustainable use, and community engagement. Priority Actions eligible for FWCP funding fall into one or more of the following action types:

- **Research and Information Acquisition** – These actions will collect information necessary to evaluate, review and implement subsequent conservation, restoration and enhancement actions. Examples include inventory, limiting factor assessments and other activities to address data gaps and information needs to complete other actions.
- **Habitat-based Actions** – These actions will conserve, restore, and enhance habitats. Examples include habitat creation, restoration, and enhancement, enhancing habitat connectivity, and invasive species management.
- **Land Securement** – These actions will contribute to the establishment of easements or covenants or the purchase of private land for conservation purposes.
- **Species-based Actions** – These actions will alleviate limiting factors for a species. Examples include restoration planning, captive breeding/rearing and reintroduction.
- **Monitoring and Evaluation** – These actions will monitor and evaluate projects supported by FWCP to understand the effectiveness of habitat- or species-based actions.

This Action Plan, and specifically the [Action Table](#), sets FWCP priorities for investments in compensation activities within the watershed. However, actions may not translate into funded projects. FWCP funding limitations require priority setting across the Coastal Region's 14 watersheds. The process of selecting which actions will be implemented in any given year will occur during the annual grant intake and project cycle. See fwcp.ca for more.

About our Action Plan

This Action Plan provides important background information about the watershed, including hydro development projects by BC Hydro, and conservation and enhancement projects funded by the Fish & Wildlife Compensation Program (FWCP). This Action Plan outlines our Priority Actions for fish and wildlife eligible for an FWCP grant.

Anyone interested in applying for an FWCP grant should review our Priority Actions (see [Action Table](#)) and develop a grant application that aligns with a Priority Action(s).

[Contact us](#) to discuss our grants, Priority Actions and how we can help you develop your grant application. [Subscribe](#) and we will keep you posted about our grants and the projects we fund. Learn more at fwcp.ca

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SHUSWAP RIVER WATERSHED BACKGROUND

Introduction

The FWCP Action Plans provide strategic direction for each region based on the unique priorities, compensation opportunities, and commitments in the region and they reflect FWCP's vision and mission. The Action Plans describe the strategies and Priority Actions to support FWCP objectives. Please refer to the Action Plan Overview for more information on the process that was followed to develop Action Plans. The structure of this Action Plan is shown in Figure 1.



Figure 1: Structure of FWCP Action Plan Overview and Action Plan components.

Setting

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 1969 km², with elevations ranging from 450 m to 2680 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).

The Shuswap River project was completed in 1929 by West Canadian Hydroelectric Corporation. The project consists of two dams, Sugar Lake 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 Wilsey project is run-of-river, with very little storage.

Both the Secwepemc and Okanagan Nations have stated interests in the Shuswap River Watershed. The [Provincial Consultative Areas Database](#) system can provide a list of communities within these two Nations as well as contact information for these communities (see Note).¹

¹ Note: by identifying those Nations in the Shuswap River Watershed as determined by the Provincial Consultative Areas Database system, FWCP is not making a determination on title and rights or the interests of any First Nations. FWCP's understanding is that the Provincial Consultative Area Database is not intended to create, recognize, limit or deny any aboriginal rights, including title, that First Nations may have. No information provided by FWCP shall be used to prejudice any claims stated by the interested First Nations.

The watershed has a diverse group of users. Communities within the watershed include Cherryville, Lumby, Enderby, Kingfisher, Ashton Creek, Splat'sin Indian Band Reserve Lands, Grindrod and Mara. There is a small year-round community that resides on Sugar Lake, which grows dramatically during the summer. There are several provincial parks (e.g., Greenbush Lake, Monashee, Echo Lake, Dennis-Bonneau, Graystokes, Silver Star, Mabel Lake, Skookumchuck Rapids, Shuswap River Islands, Enderby Cliffs, Upper Violet Creek, Wap Creek) and ecological reserves (e.g., Upper Shuswap River, Vance Creek, Mara Meadows, Kingfisher Creek) in the watershed. The area is a very popular recreational area; activities in the watershed include camping, hiking, biking, skiing, boating, fishing, horseback riding, snowmobiling, hunting, canoeing, and kayaking.

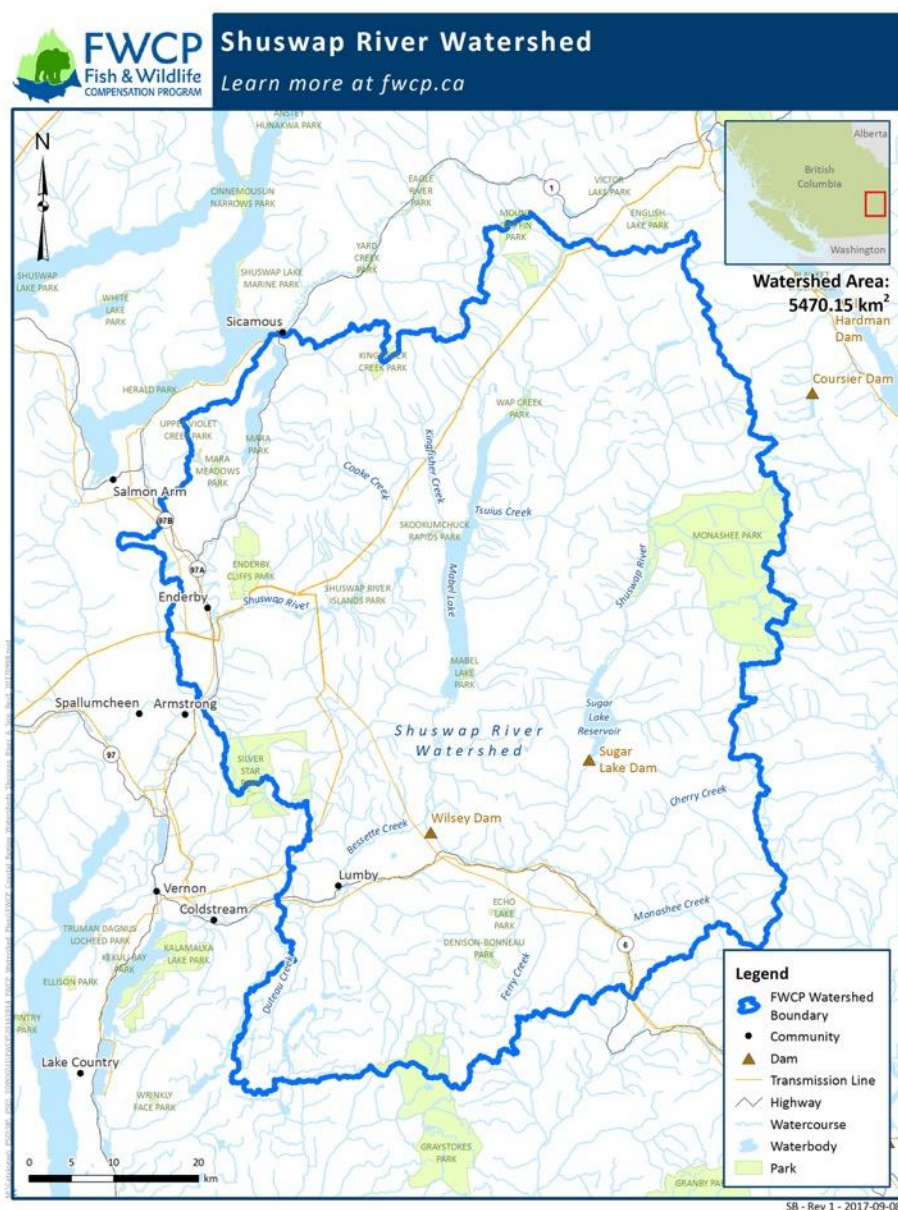


Figure 2: The FWCP Shuswap River Watershed boundary.

Land Ownership in the Shuswap River Watershed

Land ownership in the Shuswap River Watershed is a mix of private and Crown lands. The valley bottoms are almost exclusively privately owned with little Crown land. BC Hydro has large land holdings in the Middle Shuswap including

most of the edges of either side of the river Forest harvesting is extensive and includes logging of Crown land by large companies, individual woodlot managers and community forest license holders as well as logging of private land. A *Biodiversity Conservation Analysis for North and Central Okanagan Region* (Okanagan Collaborative Conservation Program, 2013) is a possible resource for land ownership mapping. Proponents need to ensure proposed activities and access requirements do not conflict with local land ownership and, where necessary, provide the status of project/land owner discussions in the proposal.

Footprint Impacts and Threats

Dam construction, hydropower development, and alterations in the hydrologic regime of the system have resulted in considerable changes to habitats and the fish and wildlife populations that rely on them. These impacts extend both upstream and downstream of Wilsey Dam into the watershed. In the case of wildlife species, impacts can extend beyond the Shuswap River watershed.

Hydro-related Impacts

Inundation: Reservoir impoundment from Sugar Lake Dam expanded the existing Sugar Lake from 1,564 ha to 2,217 ha, flooding a spawning area at Sugar Lake outlet and 653 ha of riparian and upland habitat. Sugar Lake Dam also flooded 7 km of mainstem and 4 km of tributary channels, as well as their associated riparian areas. The Wilsey Dam headpond flooded about 1 km of mainstem Shuswap River habitat.

Habitat Loss: The impoundment of Sugar Lake flooded 23 km of shoreline, 653 ha of grasslands and woodlands, as well as 7 km of mainstem (65 ha of channel habitat) and 4 km of tributary and riparian areas. Dams have stopped or reduced downstream gravel recruitment, potentially reducing available spawning habitat. A small reduction in large woody debris for rearing habitat has occurred at the outlet of Sugar Lake where the debris boom captures lake drift logs. Large Woody Debris downstream of Sugar Lake remains similar to pre-dam construction levels and the spillway weir at Wilsey Dam allows large woody debris to pass downstream to Mable Lake. Sand deposition in the headpond may have improved spawning habitat downstream of the dam, but may have trapped and reduced nutrient sources (nitrogen and phosphorous). Migration barriers (described below) have prevented historic access for some species to 31 km of Shuswap River mainstem and additional tributary habitat. Habitat upstream of the Sugar Lake Dam may have also been accessible to some fish species prior to installation of the Sugar Lake Dam.

Migration Barriers: Historically, Shuswap Falls was a partial or complete upstream barrier to chinook, coho, sockeye and non-anadromous resident fish species. A further 31km upstream, Brenda Falls, near the outlet of Sugar Lake, also blocked upstream passage to Sugar Lake for resident river species and possibly anadromous species.

Wilsey Dam, at the Shuswap Falls location, blocks all upstream fish passage. The Sugar Lake Dam at the Brenda Falls location blocks all upstream fish passage from the river above the dam to Sugar Lake.

New Habitat: There was a gain of 653 ha of reservoir habitat; however, the littoral area is less productive due to fluctuating reservoir levels.

Nutrient Loss: Productivity has declined below Sugar Lake as dam blocks salmon carcasses from being washed into the river.

Diversions: Diversion to the powerhouse dewater 190 m of stream channel immediately downstream of Wilsey Dam. Water not used for power generation is diverted over the spillway weir to a rocky channel/canyon area, rejoining the original channel near the base of the original Shuswap Falls. **Fluctuating Reservoir:** The Sugar Lake reservoir annual fluctuation is approximately 7 m, reducing littoral productivity. The shoreline was expanded from 25 km to 39 km.

Altered Flow Regime: Rapid flow alterations may affect benthic insect populations, potentially strand fish, and dewater eggs. However, dam operational efforts, and installation of an Environmental Bypass Valve have reduced incidence of rapid flow alterations.

Entrainment: The magnitude of entrainment at Sugar Lake Dam and Wilsey Dam is unknown.

Non-hydro Impacts

Other impacts in the Shuswap River watershed include historic effects of fish harvest, logging, public access, farming, cattle grazing, and road construction. The slides in the Fraser River at Hells Gate in 1913 and 1914 negatively affected anadromous fish passage into the Shuswap River Watershed. Fish passage at Hells Gate was established in 1945 and extended in 1956; however, fish stocks took a long time to recover.

Objectives for the Shuswap River Watershed

Clear management objectives are needed to guide information gathering and effective prioritizing of management actions. Each Ecosystem Chapter has three objectives, which are high-level statements of desired future conditions (outcomes), consistent with FWCP strategic objectives, partner mandates and policies. Each Ecosystem Chapter also has more detailed sub-objectives, which provide more specific direction on desired future conditions. Priority Actions in the [Action Table](#) align with the objectives and sub-objectives, summarized in Table 1.

Table 1: Summary of objectives and sub-objectives in each Ecosystem Chapter.

Objectives	Sub-objectives		
	Rivers, Lakes & Reservoirs	Wetland & Riparian Areas	Upland & Dryland
Ensure a productive and diverse ecosystem	Conserve and restore habitat capacity and diversity for fish and other aquatic organisms.	Protect, enhance and create new wetland and riparian habitat.	Protect and enhance rare and ecologically significant upland/dryland habitat.
Maintain or improve the status of species of interest	Sustain and increase the population viability of: (a) Anadromous salmon (Coho, Chinook, and Sockeye); and, (b) Resident salmonids (Rainbow, Cutthroat, and Bull Trout).	Maintain and, where feasible, increase the abundance of species of interest (e.g., federally listed species-at-risk and species identified through government, community, and First Nations engagement). See Action Table for specific species.	Maintain and, where feasible, increase the abundance of species of interest (e.g., federally listed species-at-risk and species identified through government, community, and First Nations engagement). See Action Table for specific species.
Maintain or improve opportunities for sustainable use	Maintain or improve opportunities for sustainable use, including for food, social, ceremonial, recreational, or commercial purposes.		

FWCP Projects Implemented: Shuswap River Watershed

FWCP has been funding projects in the Shuswap River Watershed since 1999 under the Bridge-Coastal Restoration Program (BCRP) and subsequently under the Fish & Wildlife Compensation Program² Coastal Region. A full list of the reports from projects undertaken to date is available online at www.fwcp.ca. Below is a brief summary of the work undertaken during the 2010/2011 to 2015/2016 FWCP project years.

Rivers, Lakes & Reservoirs

Eight Rivers, Lakes & Reservoirs projects were undertaken in the Shuswap River watershed during the 2010/2011 to 2015/2016 FWCP project years with \$478,325 of FWCP funding. Of these, four projects were associated with the research and information acquisition action of assessing viability of fish passage at Wilsey Dam (priority 1), which would add approximately 32 km of mainstem Chinook, Coho and Sockeye salmon habitat in the Middle Shuswap River above Wilsey Dam. Additional high quality habitat would be accessible in the tributaries upstream of Wilsey Dam. In 2012, one of these projects assessed spawning habitat quantity and quality for primarily Chinook and Coho below versus above Wilsey Dam and estimated that there is roughly double the spawning habitat above the dam compared to below. In 2013, the Okanagan Nation Alliance produced a detailed environmental feasibility assessment for re-establishing fish passage above Wilsey Dam, including assessments of habitat capacity and potential impacts. This work concluded that there are no serious impediments to re-establishing fish passage above Wilsey Dam and that planning should proceed. Entrainment and mortality of juveniles at Wilsey Dam was identified as one of the primary data gaps, which has begun to be addressed with two projects from 2014 to 2016 that assessed feasibility to monitor entrainment and juvenile passage at Wilsey Dam. This work showed that it is possible to configure equipment to definitively quantify fish passage routes through the dam and over the spillway weir.

The four remaining projects were habitat-based actions downstream of Wilsey Dam conducted through the Whitevalley Community Resource Centre, and received \$294,320 of FWCP funding. Three of these projects were phases of a multi-year effort to restore Bessette Creek for Coho, Chinook and Rainbow Trout, including creation of a more stable channel with continuous flow and deep pool habitat, increased habitat complexing, bank stabilization and riparian plantings. The final project was completed in 2014-2015 and addressed river migration and erosion that was affecting 1500 m of the Lower Shuswap River including damages to the Maltman side channels. Habitat complexing, pool creation, and side channel protection activities sustain and restore important spawning and rearing habitats for Coho and other salmonids in the Middle Shuswap River.

Wetland & Riparian Areas

One Wetland & Riparian Areas project was undertaken during the 2010/2011 to 2015/2016 FWCP project years with \$63,049 of FWCP funding. This project conducted Terrestrial Ecosystem Mapping as a base for a Sensitive Ecosystem Inventory of Riparian/Wetland and Upland/Dryland habitat. Habitat suitability was also mapped for several Riparian/Wetland species including the high priority Western Toad, Western Painted Turtle, and Western Screech-owl.

Upland & Dryland

Four Upland & Dryland projects were undertaken during the 2010/2011 to 2015/2016 FWCP project years with a total of \$141,385 of FWCP funding. One of these was the same as that which conducted Terrestrial Ecosystem Mapping for Riparian/Wetland species and habitat; it also mapped Upland/Dryland habitat (e.g., grasslands, coniferous woodlands)

² The Program changed its name in 2011 from the BCRP to the FWCP.

and conducted habitat suitability modelling for Upland/Dryland species of conservation concern (American Badger, Flammulated Owl, Northern Rubber Boa, and Western Skink). Two of the projects (2013, 2014) targeted Bobolink, a high priority Upland/Dryland species, through inventory and engagement with landowners to encourage beneficial changes in farming practices. The third project (2016) conducted a survey of the South Monashee Caribou population (medium priority).

Interactions with Other Ongoing Processes

Water Use Plan (WUP) – BC Hydro undertook Water Use Planning in the Shuswap River Watershed to find a better balance of power and non-power interests (such as fish, wildlife and recreation) when operating the system. The resulting WUP Order directed incremental operational changes and monitoring studies to determine the effectiveness of the operational changes. FWCP partners support and coordinate with the WUP ordered monitoring studies, however FWCP does not fund the monitoring associated with operations.

Fish Passage Decision Framework – Any studies to assess the feasibility of restoring fish passage at existing BC Hydro facilities must adhere to the [Fish Passage Decision Framework](#) (BC Hydro 2016) to be funded by the FWCP.

Fish Entrainment Strategy – Fish entrainment issues are addressed through BC Hydro's Fish Entrainment Strategy (BC Hydro 2006). Grant applications to study or mitigate entrainment issues are not eligible for FWCP funding.

ECOSYSTEM CHAPTERS

SHUSWAP RIVER WATERSHED

ECOSYSTEM CHAPTER: RIVERS, LAKES & RESERVOIRS

Actions for Rivers, Lakes & Reservoirs

The [Action Table](#) in this document (see page 22) identifies our Priority Actions to conserve and enhance fish & wildlife in this watershed. Priority Actions are organized by Action type: Research and Information Acquisition, Habitat-based Actions, Species-based Actions, Land Securement and Monitoring and Evaluation. Actions are assigned a priority ranking from 1 (highest priority) to 3 (lowest priority).

Aquatic Habitat in the Shuswap River Watershed

The Middle Shuswap River flows southwest out of Sugar Lake to Cherryville and Lumby, and then flows north into Mabel Lake. The Middle Shuswap River is an important Chinook and Coho Salmon producer in the region and also supports a late-run Sockeye Salmon population and resident fish species including Kokanee, Rainbow Trout, Bull Trout and Mountain Whitefish (Fraser Basin Council 2016).

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. Chinook, Coho and Sockeye Salmon likely migrated upstream of the falls, though their run size is unknown. Brenda Falls, at the current site of Sugar Lake Dam, was about 3 m high and may have been passable, although there is no clear documented evidence of historic anadromous fish in Sugar Lake (Benneyfield et al. 2001). High quality spawning and rearing areas occur between Shuswap Falls and Brenda Falls (McGrath et al. 2014). Water temperatures above Wilsey Dam are cooler and the river is generally less modified by human activities. Abundant natural side channels also exist, which provide salmonid rearing habitat. Overall spawning habitat is approximately 1.5 to 2 times greater above Wilsey Dam than downstream of the dam for Chinook and Coho Salmon combined.

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. Bull Trout/Dolly Varden and Mountain Whitefish are present in the Middle Shuswap River and tributaries. Other fish species recorded in the watershed include Cutthroat Trout, Burbot, Largemouth Sucker, Longnose Sucker, Bridgelip Sucker, Northern Pikeminnow, Peamouth Chub, Redside Shiner, Prickly Sculpin, Slimy Sculpin, and Longnose Dace.

Limiting Factors

Limiting factors vary among species and need to be further assessed. They are expected to include:

- **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 Salmon in the system; while rearing habitat appears limiting for Rainbow Trout.
- **Habitat quality:** Physical habitat below dams is altered by reduced recruitment of gravel. Bank erosion and lack of riparian vegetation is also a concern in some areas, and affects habitat through sedimentation. Some tributaries are also affected by low flows, which can be exacerbated by water withdrawals for agriculture.

- **Access:** Wilsey Dam blocks access to formerly useable habitat above Shuswap Falls for Chinook, Sockeye and Coho Salmon. It is possible that Sugar Lake Dam also blocked anadromous access to Sugar Lake and the upper Shuswap. However, current evidence suggests that there was no anadromous access past Brenda falls. Altered flow regimes affect passage conditions in some locations downstream of dams.
- **Low nutrient load:** River productivity may have reduced from historic levels due to a loss of marine derived nutrients in the form of fish (specifically chinook) carcasses in the reaches between Sugar Lake Dam and Wilsey Dam.

Knowledge Status

Habitat

A detailed account of habitat impacts from hydropower development is provided in BCRP (2000) and is summarized on page 8. In addition to present and historic hydropower impacts there are diverse impacts in the watershed from agriculture, forestry and linear development. For example, land clearing associated with agriculture affects stream habitat by decreasing streambank stability, increasing erosion, changing temperature regimes, and altering nutrient dynamics (Fraser Basin Council 2016).

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 Sugar Lake 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 many restoration projects have been undertaken by FWCP and community partners such as the Whitevalley Community Resource Centre and over 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 the Maltman side channels, and stream complexing, bank stabilization and riparian plantings have been completed in Bessette Creek. Inventory and mapping of aquatic habitat in the Lower Shuswap River has been completed for the Regional District North Okanagan, City of Enderby and DFO (Ecoscape 2011).

Knowledge Gaps

The following knowledge gaps have been highlighted by agencies, First Nations and stakeholders:

- To help set priorities for restoration, the program needs a better understanding of limiting factors that can be addressed by restoration initiatives
- Understanding the effects of previous restoration efforts and a need to develop detailed restoration plans to achieve long-term salmon conservation objectives
- There are various knowledge gaps with respect to supporting anadromous fish passage past Wilsey Dam. Work should build upon that conducted in the "Environmental Feasibility of Establishing Fish Passage at Wilsey Dam" (13.SHU.01) and "Developing a fish passage plan at Wilsey Dam" (COA-F18-F-2412). One continued uncertainty is the extent of entrainment mortality.

- Developing a water management strategy for the Middle Shuswap is a priority. Uncertainties include opportunities to support rearing of Coho Salmon with groundwater, water management in Besette and Duteau creeks, and habitat constraints during low flow periods.
- Success of previous habitat-based actions undertaken by FWCP and partners.

Objectives and Measures

The following objectives have been developed to define the scope of the Rivers, Lakes & Reservoirs Ecosystem Chapter. While the objectives are expected to remain stable over time, the projects funded may evolve as management priorities shift, or new information becomes available.

Objective 1: Ensure a productive and diverse aquatic ecosystem.

This objective addresses overall ecosystem integrity and productivity and directs compensation activities to develop productive, useable aquatic habitats. Where cost-effective opportunities exist, compensation works will be aimed at aiding multiple aquatic species to conserve and restore habitat capacity and diversity for fish and other aquatic organisms.

Measures — Measures will be ecosystem- and project-specific.

Objective 2: Maintain or improve the status of species of interest

This objective is supported by two sub-objectives:

1. Sustain and increase the population viability of anadromous salmon and steelhead.

Measures – Measures will be species- and project-specific.

2. Sustain and increase the population viability of resident salmonids.

Measures – Measures will be species- and project-specific.

Objective 3: Maintain or improve opportunities for sustainable use.

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 the above objective also support this sustainable use objective.

Measures — There are no specific measures required at this time.

ECOSYSTEM CHAPTER: WETLAND & RIPARIAN AREAS

Actions for Wetland & Riparian Areas

The [Action Table](#) in this document (see page 22) identifies our Priority Actions to conserve and enhance fish & wildlife in this watershed. Priority Actions are organized by Action type: Research and Information Acquisition, Habitat-based Actions, Species-based Actions, Land Securement and Monitoring and Evaluation. Actions are assigned a priority ranking from 1 (highest priority) to 3 (lowest priority).

Wetland and Riparian Areas in the Shuswap River Watershed

Wetland and riparian areas are the most diverse and biologically rich terrestrial ecosystems in BC and are considered highly valuable from an ecological standpoint. Riparian areas are the areas bordering on streams, lakes, and wetlands that link water to land. The blend of streambed, water, trees, shrubs and grasses directly influences and provides habitat for fish and wildlife. The abundance, distribution and condition of wetland and riparian habitats may be limiting factors for many species, especially amphibians, which depend upon them either for the majority of their lifecycles or for key periods such as breeding. Riparian and wetland habitats are often critical in terms of maintaining function and structure for natural systems, including helping to support trophic level functioning and genetic diversity, as well as providing key ecological services such as erosion control, flood control, assimilation of nutrients and water purification. Furthermore, many wetland and riparian species are the focus of sustainable use activities by First Nations and non-First Nations people. Riparian and wetland areas are commonly inundated by impoundments or adversely affected by changes in hydrological regimes that result from water management for power generation. Loss and alteration can significantly affect the services provided by these ecosystems.

The FWCP uses three general categories of riparian and wetland areas for setting objectives (Table 2). These categories define a general level of ecosystem functioning and require different management actions to maintain and improve their condition.

Table 2: Categories of riparian and wetland habitats used by the FWCP.

Category	Description
Category 1 – Natural riparian or wetland habitat	Largely intact ecosystems with natural disturbances sufficient to maintain subclimax communities and processes characteristics of wetlands and riparian ecosystems.
Category 2 – Disclimax or degraded wetland or riparian habitat, or creation of habitat	Formerly natural wetland or riparian ecosystems that have lost most or all of their natural disturbance regime and are no longer functioning effectively as wetland or riparian habitat. These areas are candidates for restoration.
Category 3 – Restored or created riparian or wetland habitat	Ecosystems resulting from water impoundments, diversions or other artificial disturbances that require active management to maintain productivity and function.

Limiting Factors

The limiting factors for wetland and riparian areas are predominantly related to extent of the available habitat, connectivity and distribution of the habitat, and its productivity. Limiting factors need to be further assessed and are expected to include:

- **Extent:** The contribution of riparian and wetland habitats to broader ecological function is predominantly limited by the extent of the habitats on the land base. Habitats are lost through inundation and conversion to other land uses.
- **Distribution:** Connectivity among riparian and wetland habitats, and between these habitats and other habitats and features, are important for dispersal of plants and animals and for seasonal movements of some species. Wetland and riparian habitats that are isolated will likely have decreased diversity compared to those which experience a healthy connectivity between areas. Distribution is therefore related not only to the extent of healthy riparian and wetland habitats, but also to adjacent land uses.
- **Productivity:** Even where riparian and wetland habitats are adequately represented and connected, there are several factors that can affect their productivity:
 - Hydrologic conditions such as water level variability and flow rates are among the most important variables driving riparian and wetland habitat development, structure, functioning and persistence (National Research Council 2001). Wetlands and riparian ecosystems require dynamic water regimes to maintain their productivity, but managed systems can result in unnatural cycles of stability and de-watering that can impair function or result in succession to different habitat types (e.g., forest, mudflats).
 - Stressors such as invasive species or disruptive human access can affect community structure and function.
 - Loss of specific habitat features can affect life requisites of specific species, e.g., dense nesting cover for waterfowl, suitable tree cavities for nesting owls or waterfowl, basking sites to turtles.
 - Poorly understood factors limit the productivity of created wetlands. These are generally thought to be related to unnatural hydrologic regimes and soil conditions (e.g., Atkinson et al. 2010).

Knowledge Status

Habitat

Basin-wide trends in the abundance, distribution and productivity of riparian and wetland habitats have not been completely compiled (other than direct BC Hydro footprint impacts) for the entire watershed, however, extensive mapping has been done of the Middle Shuswap River. Much of the riparian forests of the Middle and Lower Shuswap Rivers have been lost due to land clearing for agricultural development.

The area of inundation has not increased since dam construction, but the productivity of adjacent habitats has continued to be affected, either directly or indirectly as a result of BC Hydro operations.

High priority habitats in the Shuswap River Watershed, including wetlands, riparian habitats and at-risk ecological communities have also been identified by the provincial government and the Regional District of the North Okanagan. A Shuswap River Watershed Sustainability Plan (Regional District of North Okanagan (2014) has been developed by the Regional District of the North Okanagan Terrestrial Ecosystem Mapping (TEM) was completed for a 4,833 ha area within 1 km of the Shuswap River, showing several rare ecosystems that are important for a variety of wildlife species. The most significant ecosystem is late-successional cottonwood riparian floodplain forests, both “old-forest” and “mature-forest” IDFmw1/05 (CwFd - Dogwood; cottonwood floodplain). This ecosystem is essential habitat for Western Screech-owls and is on the provincial “blue” list. Other rare ecosystems and seral stages are present include:

- mature-forest IDFmw1/04 (Fd - Pinegrass – Feathermoss; CF priority=2)
- mature-forest IDFmw1/01 (zonal: FdCw - Falsebox - Prince's pine; CF priority=2)

The importance in these riparian ecosystems is magnified by the existence of some later seral stages that are rare and under-represented in protected areas in BC.

Knowledge Gaps

Past investments in the Shuswap River watershed have improved knowledge about various riparian-associated wildlife species and ecosystems. An inventory and research project on interior Western Screech-owls (which led to the creation of 2 Wildlife Habitat Areas for the species) and inventories of amphibians and large riparian-nesting birds (e.g., Ospreys, Bald Eagles and Great Blue Herons) have been conducted. Habitat mapping in the Middle Shuswap River area has been conducted.

Objectives and Measures

The following objectives have been developed to define the scope of the Wetland & Riparian Areas Ecosystem Chapter. While the objectives are expected to remain stable over time, the projects funded may evolve as management priorities shift, or as new information becomes available.

Objective 1: Ensure productive and diverse wetland and riparian ecosystems.

This objective addresses overall ecosystem integrity and directs compensation activities to maintain ecosystem productivity by protecting, enhancing or creating new wetland and riparian habitat.

This objective is supported by three sub-objectives:

1. Secure remaining Category 1 riparian and wetland habitat.

Wetland and riparian areas can be heavily impacted by conversion to other lands uses, such as agriculture development or forestry, amongst others. Securing remaining habitat to prevent loss is very important. Habitat is considered secure if it is protected from conversion to other land use, for example by purchasing the land or negotiating a covenant agreement.

Measures — Measures will be ecosystem- and project-specific.

2. Reduce threats to Category 1 riparian and wetland habitat.

Wetlands and riparian areas are subject to a variety of threats both internally and externally. Many naturally functioning riparian and wetland habitats (Category 1) can benefit from management actions that reduce specific threats (e.g., treatment for invasive species, access control, forestry in adjacent areas etc.).

Measures — Measures will be ecosystem- and project-specific.

3. Restore degraded or create new riparian and wetland habitat (Category 2).

While conservation of existing high quality habitat is always preferable, category 1 habitat may be limited or the opportunities for conservation are difficult. Restoration opportunities may be more available in areas where changes in water regime have altered successional pathways in pre-existing riparian and wetland ecosystems. Typically the regime in managed watersheds becomes more stable. Riparian and wetland ecosystems require the disturbances caused by fluctuating water levels to maintain their productivity. When these disturbances are reduced or eliminated, riparian and wetland ecosystems transition to other ecosystem types. Projects can be designed to restore the original ecological function of these areas, or to create new riparian or wetland habitats that differ from what was present historically, but still represent an improvement in function.

Measures — Measures will be ecosystem- and project-specific.

Objective 2: Maintain or improve the status of species of interest.

Actions under this objective focus on addressing limiting factors that are not otherwise addressed by general improvements to ecosystem function under Objective 1. The intent is to maintain, or where feasible, increase the abundance of species of interest (e.g., federally listed species-at-risk or species identified through government, industry, public and First Nations engagement).

Measures — Measures will be species- and project-specific.

Objective 3: Maintain or improve opportunities for sustainable use.

Many wetland and riparian species are the focus of sustainable use activities by First Nations and non-First Nations people (e.g., duck hunting, medicinal plants, wildlife viewing). Actions addressing Objectives 1 and 2 will often support this sustainable use objective.

Measures — Measures will be species- and project-specific.

ECOSYSTEM CHAPTER: UPLAND & DRYLAND

Actions for Upland and Dryland Areas

The [Action Table](#) in this document (see page 22) identifies our Priority Actions to conserve and enhance fish & wildlife in this watershed. Priority Actions are organized by Action type: Research and Information Acquisition, Habitat-based Actions, Species-based Actions, Land Securement and Monitoring and Evaluation. Actions are assigned a priority ranking from 1 (highest priority) to 3 (lowest priority).

Upland and Dryland in the Shuswap River Watershed

Upland and dryland habitats are those that occur above areas of permanent inundation or periodic flooding. They are usually the habitats least affected by hydroelectric generating infrastructure or operation; however, footprint impacts have occurred and they contribute to the cumulative effects of human-related activities in these habitats.

Upland/dryland habitats are diverse and can range from unvegetated areas to grasslands, forests and alpine ecosystems. Different habitats are associated with distinct species assemblages that react to direct or indirect stressors in their distinct habitat niches.

The Shuswap River Watershed is large and ecologically diverse, spanning forested grasslands to alpine meadows (Lloyd et al. 1990). Lower elevations are located in the Interior Douglas-fir (IDF) zone, while mid elevations are characteristic of the Interior Cedar Hemlock (ICH) and Montane Spruce (MS) zones. High elevation forests are in the Engelmann Spruce Subalpine Fir (ESSF), which transition to Interior Mountain Heather Alpine (IMA).

Limiting Factors

Limiting factors vary among species and need to be further assessed. They are generally associated with:

- **Habitat loss and alteration:** The cumulative effects of forestry and hydro-electric development have resulted in substantial losses and alterations to habitat and habitat connectivity.
- **Habitat connectivity:** Habitat loss and road development have resulted in lost connectivity between habitats, which alter wildlife movement.

Knowledge Status

Habitat

The Middle Shuswap portion (between Mabel Lake and Sugar Lake) of the Shuswap River watershed is unique in that it has a hot and dry climate that is more characteristic of the nearby Okanagan Valley. As such it hosts a wide array of amphibians, reptiles, birds, and mammals that are not found elsewhere within the watershed.

Knowledge Gaps

A comprehensive inventory of the species present in the in the larger Shuswap River watershed does not exist but previous FWCP investments have conducted inventories for the Southern Monashee Caribou herd, bats, Bobolinks and reptiles.

Objectives and Measures

The following objectives have been developed to define the scope of the Upland & Dryland Ecosystem Chapter. While the objectives are expected to remain stable over time, the projects funded may evolve as management priorities shift, or as new information becomes available.

Objective 1: Ensure productive and diverse upland and dryland ecosystems.

Actions under this objective are aimed at protecting/enhancing rare or ecologically significant features.

Measures — Measures will be ecosystem- and project-specific.

Objective 2: Maintain or improve the status of species of interest.

Actions under this objective focus on addressing limiting factors that are not otherwise addressed by general improvements to ecosystem function under Objective 1. The intent is to maintain, or where feasible, increase the abundance of species of interest (e.g., federally listed species-at-risk or species identified through government and First Nations engagement).

Measures — Measures will be species- and project-specific.

Objective 3: Maintain or improve opportunities for sustainable use.

Upland and dryland habitats and associated species are also a focus of sustainable use activities by First Nations and non-First Nations people (e.g., hunting, medicinal plant collection, wildlife viewing). Actions addressing Objectives 1 and 2 will often support this sustainable use objective.

Measures — Measures will be species- and project-specific.

ACTION TABLE

This Action Table identifies the FWCP's Priority Actions to conserve and enhance fish and wildlife impacted by BC Hydro dams in this watershed. Actions identified as OPEN (see Delivery Approach column) are eligible for a grant. When completing your online grant application, you will be required to identify a Priority Action(s) that best aligns with your project idea. A high-quality grant application will clearly demonstrate alignment with Priority Action(s) in an Action Table.

SHUSWAP RIVER WATERSHED ACTION TABLE							Version: 20Aug18		
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
1	All	Research and Information Acquisition	SHU.ALL.RI.01.01 Develop a current habitat assessment map-P1	1	Fish & Wildlife	<p>Develop a current habitat assessment map for priority fish and/or wildlife species in the Shuswap watershed. Habitats to be assessed & mapped include:</p> <ul style="list-style-type: none">• Wetlands• Riparian Areas• Stream Habitats• Connectivity Corridors• Forested Ecosystems (e.g., seral stage distribution)• Over-wintering habitat for species that utilize talus, karst or rock features (e.g., bats, snakes)• Culturally Important Areas <p>Mapping is to include as much on-the-ground information as possible relevant to the subject fish and/or wildlife species. The assessment should focus on practical conservation and restoration opportunities. For fish, this work should inform development of habitat restoration and protection plans for priority species and habitats. Consideration should be given to potential impacts from available climate change predictions relevant to the specific habitats (i.e., potential changes to vegetation communities, precipitation, wetland hydro-periods, snowpack, wildfire risk, wildlife movements, etc.). Project proponents should review "A Biodiversity Conservation Analysis for the North and Central Okanagan Region" (Caslys Consulting Ltd. 2013, available at <http://a100.gov.bc.ca/appsdata/acat/documents/r42389/Part2_1416247567273_6247203863.pdf>), the Shuswap River Water Sustainability Plan (http://www.rdno.ca/docs/141114_SRWSP_FinalFormat.pdf) and work conducted through the Shuswap Watershed Mapping Project (http://cmnbc.ca/atlas-group/shuswap-watershed-mapping-project). Mapping on the Middle Shuswap should also build upon the "Middle Shuswap Sensitive Ecosystem Inventory and Sensitive Habitat Inventory Mapping Project: 06.SHU.03". Particular areas of interest for BC Parks include Enderby Cliffs, and the Mt. Griffin, Kingfisher and Mara Meadows Ecological Reserves. Recommendations should be made through this work for future management actions and assessments.</p>	Improved strategic planning for conservation and restoration opportunities.	Directed	Throughout

SHUSWAP RIVER WATERSHED ACTION TABLE							Version: 20Aug18		
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
2	All	Research and Information Acquisition	SHU.ALL.RI.02.0 1 Conduct a limiting factors analysis for priority FISH-Middle Shuswap River downstream of Wilsey Dam-P1	1	Fish & Wildlife	Conduct a limiting factors analysis for priority fish and/or wildlife in the Shuswap watershed or sub-basins to support prioritization of future projects. This will include an assessment of population status, habitat status or habitat capacity and/or a cost-benefit analysis of any habitat-based actions proposed by the program, and should be considerate of the root causes of degraded habitats and limitations to productive potential.	To determine cost-benefit of potential FWCP actions and support prioritization of future projects. Leads to the creation of robust habitat or species-based restoration plans for the watershed or sub-basins.	Open	Throughout
			SHU.ALL.RI.02.0 2 Conduct a limiting factors analysis for priority FISH-Bessette Creek & tributaries-P2	2		For fish, sub-basins for assessment include the Middle Shuswap River downstream of Wilsey Dam (Priority 1), Bessette Creek and tributaries (Priority 2), the Middle Shuswap River and tributaries between Wilsey Dam and Sugar Lake Dam (Priority 1), and the Upper Shuswap River including Sugar Lake and tributaries (Priority 2). For wildlife, sub-basins for assessment include the Upper Shuswap River including Sugar Lake and tributaries (Priority 2), Middle Shuswap River between Sugar Lake Dam and Wilsey Dam (Priority 1), Middle Shuswap River between Wilsey Dam and Mabel Lake (Priority 2) and Lower Shuswap (Mabel Lake and downstream; Priority 3). Analyses should build upon previous and ongoing assessments, including the Water Use Plan studies and any existing restoration plans, in association with local agency, First Nation and BC Hydro staff, private landowners and other land managers. Analyses for fish in the Middle Shuswap between Wilsey Dam and Sugar Lake Dam should build upon work conducted in the "Environmental Feasibility of Establishing Fish Passage at Wilsey Dam" (13.SHU.01) and "Developing a fish passage plan at Wilsey Dam" (COA-F18-F-2412).			
			SHU.ALL.RI.02.0 3 Conduct a limiting factors analysis for priority FISH-Mid.Shuswap Riv&tributaries betwn Wilsey Dam&Sugar Lk Dam-P1	1					
			SHU.ALL.RI.02.0 4 Conduct a limiting factors analysis for priority FISH-Upper Shuswap River incl.Sugar Lk&tributaries-P2	2		*Please note that the FWCP may develop templates for this work. Please check with FWCP to see if these templates are available.			

SHUSWAP RIVER WATERSHED ACTION TABLE								Version: 20Aug18	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
2 cont.			SHU.ALL.RI.02.0 5 Conduct a limiting factors analysis for priority WILDLIFE-Upper Shuswap Riv.incl.Sugar Lk&tributaries-P2	2					
			SHU.ALL.RI.02.0 6 Conduct a limiting factors analysis for priority WILDLIFE-Mid Shuswap River betwn Sugar Lk Dam&Wilsey Dam-P1	1					
			SHU.ALL.RI.02.0 7 Conduct a limiting factors analysis for priority WILDLIFE-Mid.Shuswap Riv betwn Wilsey Dam&Mabel Lk-P2	2					

SHUSWAP RIVER WATERSHED ACTION TABLE							Version: 20Aug18		
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
3	All	Research and Information Acquisition	SHU.ALL.RI.03.01 Develop a comprehensive restoration&protection plan for FISH-Middle Shuswap River downstream of Wilsey Dam-P1	1	Fish & Wildlife	<p>Develop a comprehensive restoration and protection plan for fish and/or wildlife in the Shuswap watershed or sub-basins in relation to limiting factors analyses and assessment of population status/habitat capacity. Restoration refers to habitat or species-based actions that restore habitat capacity or population viability, while protection includes habitat-based actions or land securement that protect important habitat from further degradation. Plans must include:</p> <ul style="list-style-type: none">• Baseline description of the watershed (hydrology, climate, topography);• Priorities of local First Nations for conservation and restoration;• Previous assessment and restoration works;• Distribution, timing, biological and critical habitat requirements and status of species in the watershed;• Clear goals and objectives based on a desired future condition;• Summary of habitat indicators and limiting factors (based on analyses of habitat pressure indicators, habitat state indicators, limiting factors analysis);• Knowledge gaps and recommended research and/or assessment priorities;• Restoration priorities with rationale/discussion;• Selected indicators and performance standards for effectiveness monitoring program; and,• Monitoring protocol and schedule. <p>Plans may be multi-species and habitat-based or they may be focused on individual high priority species in the watershed. High priority fish species include Chinook, Coho and Sockeye Salmon, Kokanee, Bull Trout and Rainbow Trout. High priority wildlife include bats, amphibians, and riparian-associated mammals and birds, as well as Category 1 wetland and riparian areas. Plans should be developed in association with local agency, First Nation and BC Hydro staff, landowners and other land managers.</p>	To determine high priority, cost-effective habitat and/or species-based actions that can be supported by the FWCP.	Directed	Throughout
			SHU.ALL.RI.03.02 Develop a comprehensive restoration&protection plan for FISH-Bessette Creek & tributaries-P2	2					
			SHU.ALL.RI.03.03 Develop a comprehensive restoration &protection plan for FISH-Mid.Shuswap Riv&tributaries betwn Wilsey Dam&Sugar Lk Dam-P1	1					
3 cont.			SHU.ALL.RI.03.04 Develop a comprehensive restoration&protection plan for FISH-Upper Shuswap River incl.Sugar Lk&tributaries-P2	2					

SHUSWAP RIVER WATERSHED ACTION TABLE							Version: 20Aug18		
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
3 cont.			SHU.ALL.RI.03.0 5 Develop a comprehensive restoration & protection plan for WILDLIFE-Upper Shuswap Riv.incl.Sugar Lk&tributaries-P2	2		but further development of restoration actions would be beneficial. For fish, work should build upon that conducted in the Strategic Review of Fisheries Resources for the South Thompson - Shuswap Habitat Management Area (http://www.fraserbasin.bc.ca/_Library/TR/srfr-sts-shm_march_2016_final_web.pdf). *Please note that the FWCP may develop templates for this work. Please check with FWCP to see if these templates are available.			
			SHU.ALL.RI.03.0 6 Develop a comprehensive restoration & protection plan for WILDLIFE-Mid Shuswap River betwn Sugar Lk Dam&Wilsey Dam-P1	1					
			SHU.ALL.RI.03.0 7 Develop a comprehensive restoration&protection plan for WILDLIFE-Mid.Shuswap Riv betwn Wilsey Dam&Mabel Lk-P2	2					

SHUSWAP RIVER WATERSHED ACTION TABLE								Version: 20Aug18	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
			SHU.ALL.RI.03.08 Develop a comprehensive restoration&protection plan for WILDLIFE-Lower Shuswap (Mabel Lk&downstream)-P3	3					
			SHU.ALL.RI.03.09 Develop a comprehensive restoration&protection plan for FISH and/or WILDLIFE-Shuswap Watershed-P3	3					
4	All	Habitat-based Actions	SHU.ALL.HB.04.01 Implement high priority habitat-based actions - P1	1	Fish & Wildlife	Implement high priority habitat and/or species-based actions for fish and/or wildlife as recommended by mapping activities (Action 1), inventory (Action 17), or by the restoration and protection plan (Action 3), or other similar plans already developed in the watershed. Note that a number of priority habitat and/or species-based actions have been developed already and are described in this Action Table, but further development of restoration actions would be beneficial.	Implement high priority, cost-effective habitat and/or species-based actions that can be supported by the FWCP.	Open	Throughout
4 cont.		Species-based Actions	SHU.ALL.SB.04.02 Implement high priority species-based actions - P2	2					
5	All	Land Securement	SHU.ALL.LS.05.01 conduct an options assessment for land securement -P1	1	Fish & Wildlife	Considering ecosystem, conservation, and/or local management objectives, conduct an options assessment for land securement that establishes priority areas to be protected through land securement and identifies feasible mechanisms (e.g., fee-simple purchase, covenants, WHAs, etc.).	Prioritize locations and secure partnerships for land securement.	Open	Throughout

SHUSWAP RIVER WATERSHED ACTION TABLE								Version: 20Aug18	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
6	All	Land Securement	SHU.ALL.LS.06.01 Land securement-P1	1	Fish & Wildlife	Land securement in association with partner organizations to address fish and wildlife management objectives or to support habitat-based actions proposed by the FWCP. Land securement could address ecosystem function objectives across the watershed plan chapters of Rivers, Lakes & Reservoirs, Riparian/Wetland, and Upland/Dryland. Priority habitats include wetlands, riparian forests and old growth forests. Refer to options assessment findings, in Action 5 above, before conducting land securement activities.	Conserve, protect and restore ecosystem function and resilience through land securement.	Open	Throughout
7	All	Monitoring and Evaluation	SHU.ALL.ME.07.01 Develop and implement an integrated monitoring plan for fish and/or wildlife-P1	1	Fish & Wildlife	Develop and implement an integrated monitoring plan for fish and/or wildlife in the Shuswap River watershed or sub-basins in relation to existing agency monitoring programs, limiting factors analyses (Action 2), restoration plans (Action 3) and/or habitat or species-based actions supported by the FWCP. Monitoring should inform limiting factors analyses and/or habitat restoration and should be compatible with existing programs.	Support prioritization of monitoring associated with actions to sustain and restore habitat capacity and population viability of fish & wildlife.	Open	Throughout
8	All	Monitoring and Evaluation	SHU.ALL.ME.08.01 Assess success of habitat-based actions supported by FWCP-P1	1	Fish & Wildlife	Assess success of habitat-based actions supported by the FWCP. Success could be assessed through monitoring of biological and/or physical habitat responses. Success could be assessed on a graduated schedule such as every 1, 3, 5 and 10 years or based on high flow events or other natural or human-caused disturbances.	Assess success of habitat-based actions and support future planning and prioritization.	Open	Throughout
9	All	Monitoring and Evaluation	SHU.ALL.ME.09.01 Conduct condition assessments and/or maintenance on habitat enhancements-P1	1	Fish & Wildlife	Conduct condition assessments and/or maintenance on habitat enhancements supported by the FWCP. This could include the development of an inspection and maintenance schedule if required. If part of a multi-year study, provide information about future objectives and actions.	Maintain functioning of habitat enhancement s supported by the FWCP.	Open	Throughout

SHUSWAP RIVER WATERSHED ACTION TABLE								Version: 20Aug18	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
10	Rivers, Lakes & Reservoirs	Research and Information Acquisition	SHU.RLR.RI.10.0 1 Improve fish production & survival during low flow Middle SHU-P2	2	Anadromous & Resident Salmonids	Explore strategies to improve fish production and survival in the Middle Shuswap River, including in Besette and Duteau creeks, during low flow periods. For example, assess opportunities for watering areas with groundwater, with a focus on over-wintering and rearing habitats for Coho Salmon; and/or assess habitat constraints during critical low flow periods (Jul-Oct), including potential effects of water temperature for multiple species.	Sustain and restore habitat capacity and population viability of anadromous and resident salmonids.	Open	Middle Shuswap and tributaries downstream of Wilsey Dam
11	Rivers, Lakes & Reservoirs	Research and Information Acquisition	SHU.RLR.RI.11.0 1 Inventory & map riparian zones along Middle Shuswap River...plan to re-establish a riparian corridor-P2	2	Anadromous & Resident Salmonids	Inventory and map riparian zones along the Middle Shuswap River, and develop a management plan to re-establish a riparian corridor. Plans should include re-vegetation of streambanks and fencing of livestock away from the banks, education of landowners on the importance of riparian cover to stream ecology and bio-engineering techniques to stabilize eroding banks. See management strategies for the Middle Shuswap in Strategic Review of Fisheries Resources for the South Thompson - Shuswap Habitat Management Area (http://www.fraserbasin.bc.ca/_Library/TR/srfr-sts-shm_march_2016_final_web.pdf). Work should also build upon the Sensitive Habitat Inventory Mapping Project: 06.SHU.03 and other mapping work described and conducted in Action 1.	Develop a riparian management and restoration plan for the Middle Shuswap.	Open	Middle Shuswap River and tributaries including Besette Creek
12	Rivers, Lakes & Reservoirs	Research and Information Acquisition	SHU.RLR.RI.12.0 1 Assess current habitat use, distribution and restoration opportunities for Bull Trout-P2	2	Bull Trout	Assess current habitat use, distribution and restoration opportunities for Bull Trout, including in the Upper Shuswap upstream of Sugar Lake Dam. Any assessment/inventory should meet the criteria outlined in Action 17.	Support prioritization of further actions related to Bull Trout.	Open	Throughout
13	Rivers, Lakes & Reservoirs	Habitat-based Actions	SHU.RLR.HB.13.01 1 Implement habitat enhancements in the Middle Shuswap River and tributaries-P1	1	Anadromous & Resident Salmonids	Implement habitat enhancements in the Middle Shuswap River and tributaries downstream of Wilsey Dam or between Wilsey Dam and Sugar Lake Dam. Habitat restoration should improve riparian function, instream complexity, and connectivity throughout the watershed. Examples include riparian planting and other improvements, and to develop or improve access to side channel habitat. If a restoration plan has been completed under Action 3, please reference that plan for more information.	Sustain and restore habitat capacity and population viability of anadromous and resident salmonids.	Open	Middle Shuswap River

SHUSWAP RIVER WATERSHED ACTION TABLE								Version: 20Aug18	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
14	Rivers, Lakes & Reservoirs	Habitat-based Actions	SHU.RLR.HB.14.01 Determine sediment source in the Bessette Creek watershed... to limit erosion & sedimentation-P1	1	Anadromous & Resident Salmonids	Determine sediment source in the Bessette Creek watershed and pending outcome, implement bank stabilization actions to limit erosion and sedimentation of the creek and the Middle Shuswap River.	To reduce the source of excessive sediment inputs to Bessette Creek and the Middle Shuswap River below Wilsey Dam.	Open	Bessette Creek and Middle Shuswap River below Wilsey Dam
15	Rivers, Lakes & Reservoirs	Habitat-based Actions	SHU.RLR.HB.15.01 Improve spawning habitat though gravel placement-P3	3	Anadromous & Resident Salmonids	Improve spawning habitat though gravel placement in the Middle Shuswap below Wilsey Dam. This work should be preceded by a limiting factors review and/or assessment. For example, sedimentation is a concern that will limit effectiveness of gravel placement.	Sustain and restore spawning habitat capacity in the Middle Shuswap.	Open	Middle Shuswap downstream of Wilsey Dam
16	Rivers, Lakes & Reservoirs	Species-based Actions	SHU.RLR.SB.16.01 Continue technical feasibility assessment, monitoring and/or species-based actions associated with fish passage at Wilsey Dam-P1	1	Anadromous & Resident Salmonids	Continue technical feasibility assessment, monitoring and/or species-based actions associated with fish passage at Wilsey Dam. Work should build upon that conducted in the "Environmental Feasibility of Establishing Fish Passage at Wilsey Dam" (13.SHU.01) and "Developing a fish passage plan at Wilsey Dam" (COA-F18-F-2412). Proponents looking for an FWCP grant to evaluate opportunities to restore fish production above BC Hydro facilities that previously blocked fish passage are required to work through the Fish Passage Decision Framework (http://fwcp.ca/fish-passage-decision-framework/).	Support fish passage at Wilsey Dam.	Action Complete	Middle Shuswap River

SHUSWAP RIVER WATERSHED ACTION TABLE								Version: 20Aug18	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
17	All	Research and Information Acquisition	SHU.ALL.RI.17.0 1 Inventory for species of interest that are likely in the watershed-P2	2	Wildlife	<p>Inventory for species of interest that are likely in the watershed. Inventory actions must meet the following criteria:</p> <ul style="list-style-type: none"> • The data collected will clearly inform a specific natural resource management decision or conservation action; this includes a clear understanding of: <ul style="list-style-type: none"> - The data or knowledge gap that is currently limiting a decision-maker or party(ies) from making a conservation decision or undertaking a conservation action; - How the inventory has been specifically designed to fill the above-noted data/knowledge gap; and - The decision-makers' commitment to using the data or information to support a specific decision. • The data collection is well informed by a clear and specific management objective (land use plan, recovery plan etc.) that also informs the management decision or conservation action; this includes clarity of: <ul style="list-style-type: none"> - How the inventory work has been designed to specifically assess the status or condition of the objective; and, - How the data will be used to inform/improve/clarify the management objective. <p>Species of interest reflect engagement from FWCP partners and include, but are not limited to:</p> <ul style="list-style-type: none"> • Grizzly Bear. Inventory required to determine occupancy. Area: W of Mabel Lake, S of Shuswap River, N of highway 6. • Mesocarnivores. Conduct risk assessment and evaluate population sustainability through monitoring program as part of multi-carnivore surveys in the watershed. Species of interest: Wolverine (area: Monashees). American Marten, American Mink, Short-Tailed Weasel, Lynx. If necessary, implement enhancement strategies to maintain sustainable populations. • Flammulated Owls. If found, refer to the Management Plan for the Flammulated Owl (<i>Otus flammeolus</i>) in Canada for priority species- and habitat-related conservation actions within the Shuswap River watershed. • Magnum Mantleslug and Pale Jumping-Slug. Inventory needed. Explore whether enhancement or mitigation options exist if found. • Rocky Mtn. Ridged Mussel. Inventory and monitoring needed. 	Habitat enhancement opportunities. Maintain or, where feasible, increase the abundance of species of interest.	Open	Throughout

SHUSWAP RIVER WATERSHED ACTION TABLE								Version: 20Aug18	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
18	All	Habitat-based Actions	SHU.ALL.HB.18.01 Implement priority species- and habitat-related conservation actions...-P1	1	Wildlife Species at Risk	<p>Implement priority species- and habitat-related conservation actions in the following (or most recent) Recovery Strategies and Management Plans for species at risk that are known to be in the watershed. Conservation actions must be well informed by a clear and specific management objective and must be well informed by previous inventory in the watershed.</p> <ul style="list-style-type: none"> • Management Plan for the Mountain Goat (<i>Oreamnos americanus</i>) in British Columbia (B.C. Ministry of Environment 2010). Priority area: Sitkum Creek. • Recovery Plan for the Western Screech-Owl, <i>macfarlanei</i> subspecies (<i>Megascops kennicottii macfarlanei</i>) in British Columbia (BC MOE 2016). Re-inventory to determine continued population status (last surveyed 2009). Build upon 06.W.SHU.02 Conserving Western Screech-owl Habitat Along the Shuswap River. Priority area: Middle Shuswap. • Recovery Strategy for the Common Nighthawk (<i>Chordeiles minor</i>) in Canada (Environment Canada 2016). • Management Plan for the Western Skink (<i>Plestiodon skiltonianus</i>) in British Columbia for priority species- and habitat-related conservation actions within the Shuswap River watershed. Build upon 04.W.Sh.01 Middle Shuswap Herptile and Avian Habitat Assessment. • Management Plan for the Painted Turtle – Intermountain–Rocky Mountain Population (<i>Chrysemys picta</i> pop. 2) in British Columbia (B.C. Ministry of Environment 2017). Priorities: Inventory and habitat protection and enhancement (e.g., basking logs, nesting beaches). Explore mitigation opportunities along highway 6 and Enderby Mabel Lake Road (e.g., culverts for crossing roads, enhancing nesting habitat so turtles don't cross roads etc.). Some surveys have been done: 04.W.Sh.01 Middle Shuswap Herptile and Avian Habitat Assessment. Priority areas: Lavington, Vernon. • Recovery Strategy for the Great Basin Spadefoot (<i>Spea intermontana</i>) in British Columbia (Southern Interior Reptile and Amphibian Working Group 2017). Build upon 04.W.Sh.01 Middle Shuswap Herptile and Avian Habitat Assessment. • Management plan for the Western Toad (<i>Anaxyrus boreas</i>) in British Columbia (Provincial Western Toad Working Group 2014). Build upon 04.W.Sh.01 Middle Shuswap Herptile and Avian Habitat Assessment. 	Habitat enhancement opportunities. Maintain or, where feasible, increase the abundance of species of interest.	Open	Throughout

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19	Upland & Dryland	Research & Information Acquisition	SHU.UAD.RI.19.01 Gather baseline data on Mule Deer to determine key winter ranges....-P2	2	Mule Deer	Gather baseline data on Mule Deer to determine key winter ranges, habitat use, migration routes and timing to guide habitat enhancement decisions.	Sustain and increase the food, social, ceremonial, recreational and/or commercial use of fish and wildlife resources.	Open	Byers Range and drainages of Sugar Lake
20	Upland & Dryland	Habitat-based Actions	SHU.UAD.HB.20.01 Determine presence, identify/protect bat maternity roosts & winter hibernacula-P1	1	Bats	1) Determine presence of bat species , especially those species potentially vulnerable to White Nose Syndrome; 2) Through acoustic monitoring or other methods (e.g., radio-tracking, DNA), identify maternity roosts and winter hibernacula ; 3) Pursue protection of hibernacula and maternity roosts (e.g., critical habitat, WHAs or wildlife habitat feature designations). Build upon 06.W.SHU.01 Shuswap Bat Inventory.	Maintain or, where feasible, increase the abundance of species of interest.	Open	Throughout
21	Upland & Dryland	Habitat-based Actions	SHU.UAD.HB.21.01 Implement methods to reduce road mortality of Badgers (and other at-risk species)-P1	1	American Badger	Implement methods to reduce road mortality of Badgers (and other at-risk species) on Highway 6 (and secondary roads) and enhance landscape connectivity through this important corridor - as identified as a priority in Recovery Strategy for the Badger (<i>Taxidea taxus</i>) in British Columbia.	Maintain or, where feasible, increase the abundance of species of interest.	Open	Silver Hills, Middle Shuswap River, Cherryville, Duteau Plateau
22	Upland & Dryland	Habitat-based Actions	SHU.UAD.HB.22.01 Restore and enhance the supply of cavities in trees for large cavity users-P3	3	Multi-species	Restore and enhance the supply of cavities in trees for large cavity users (e.g., Pacific marten, flying squirrels, various bird species) after mesocarnivore surveys have been completed. Identify factors that control formation of large cavities in trees to better manage this population-limiting resource for priority wildlife species in the watershed. Increase education about the importance of wildlife trees to reduce their removal as "danger trees".	Protect and/or restore rare and ecologically significant upland/dryland habitat.	Open	Throughout

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23	All	Habitat-based Actions	SHU.ALL.HB.23.01 Conserve or enhance important habitats or mitigate habitat threats for priority bird species-P2	2	High priority birds	Conserve or enhance important habitats or mitigate habitat threats for priority bird species in the watershed. This watershed is within Bird Conservation Region 9 and 10 and falls under the Canadian Intermountain Joint Venture. See the lists of priority species for wetlands, lakes and rivers, riparian habitat and grasslands and shrub-steppe at http://cijv.ca/where-we-work/ . Proposed projects should refer to the priority lists and recommended conservation actions/guidance in the implementation plans (http://cijv.ca/resources/ ; to be posted April 2017). Build upon 14.W.SHU.01 Bobolink Habitat in the Middle Shuswap and 04.W.Sh.01 Middle Shuswap Herptile and Avian Habitat Assessment.	Varied types of species and habitat conservation, protection and enhancement opportunities.	Open	Throughout
24	Wetland & Riparian	Habitat-based Actions	SHU.WAR.HB.24.01 Implement wetland&riparia n restoration projects...through inventory, mapping or assesments-P1	1	Wildlife	Implement wetland and riparian restoration projects that are identified as high priorities through inventory, mapping or assessment in the Shuswap watershed. If a restoration plan has been completed under Action 3 , please reference that plan for more information. This can include managing invasive plants as needed.	Protect, restore and/or create new wetland and riparian habitat.	Open	Throughout
25	Upland & Dryland	Monitoring and Evaluation	SHU.UAD.ME.25.01 Evaluate whether stewardship actions for Townsend's big-eared bat have been effective-P1	1	Townsend's big-eared bat	Evaluate whether stewardship actions done for Townsend's big-eared bat have been effective (e.g., inventory of known maternity site). Build upon 06.W.SHU.01 Shuswap Bat Inventory.	Monitoring to inform habitat or species based actions undertaken by the FWCP.	Open	Barn with maternal colony
26	Wetland & Riparian	Monitoring and Evaluation	SHU.WAR.ME.26.01 Evaluate nest box program for Western Screech-owl-P1	1	Western Screech-owl, <i>macfarlanei</i> subspecies	Evaluate nest box program for Western Screech-owl and implement further if found to be successful. Build upon 06.W.SHU.02 Conserving Western Screech-owl Habitat Along the Shuswap River.	Monitoring to inform habitat or species based actions undertaken by the FWCP.	Open	Throughout

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27	All	Research & Information Acquisition	SHU.ALL.RI.27.0 1 Inventory & restoration for at-risk...and/or culturally important plant species-P3	3	At-risk Plants	Inventory and restoration for at-risk (e.g., SARA-listed, red- and blue-listed) and/or culturally important plant species and ecological communities. Potential species of interest: Whitebark pine, porcupinegrass, flat-topped broomrape, blunt-sepaed starwort, least moonwort, mountain moonwort, Tweedy's willow, crested wood fern, northern violet, yellow widelip orchid, brown beak-rush.	Habitat restoration opportunities. Maintain or, where feasible, increase the abundance of species of interest. Prevention of destruction of at-risk habitats while carrying out other projects.	Open	Throughout
28	Wetland & Riparian	Land Securement	SHU.WAR.LS.28.01 Private land stewardship to protect at-risk ecological communities-P1	1	At-risk Ecosystems	Private land stewardship to protect at-risk ecological communities . At-risk communities may include, but are not limited to: western redcedar- Douglas-fir / red-osier dogwood (IDFmw1/05), Douglas-fir / pinegrass / red-stemmed feathermoss (IDFmw1/04), Douglas-fir - western redcedar / falsebox (IDFmw1/01).	Protect, restore and/or create new wetland and riparian habitat.	Open	See TEM mapping
	Upland & Dryland	Land Securement	SHU.UAD.LS.28.02 Private land stewardship to protect at-risk ecological communities-P1	1					

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