ALOUETTE RIVER WATERSHED ACTION PLAN

FINAL November 14, 2017
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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 a BC Hydro dam in this watershed. Above photo: Alouette Dam (Credit BC Hydro). Cover photo: Coho fry (Credit iStock).

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: ALOUETTE RIVER WATERSHED

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.

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 Alouette River watershed. The focus of the next five-year period will be Priority Actions identified for fish, wildlife, and habitats in three broad ecosystems 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 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. Actions fall into one or more of the following types:

1. **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.
2. **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.
3. **Land Securement** – These actions will contribute to the establishment of easements or covenants or the purchase of private land for conservation purposes.
4. **Species-based Actions** – These actions will alleviate limiting factors for a species. Examples include restoration planning, captive breeding/rearing and reintroduction.
5. **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 out 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 selection 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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ALOUETTE 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.

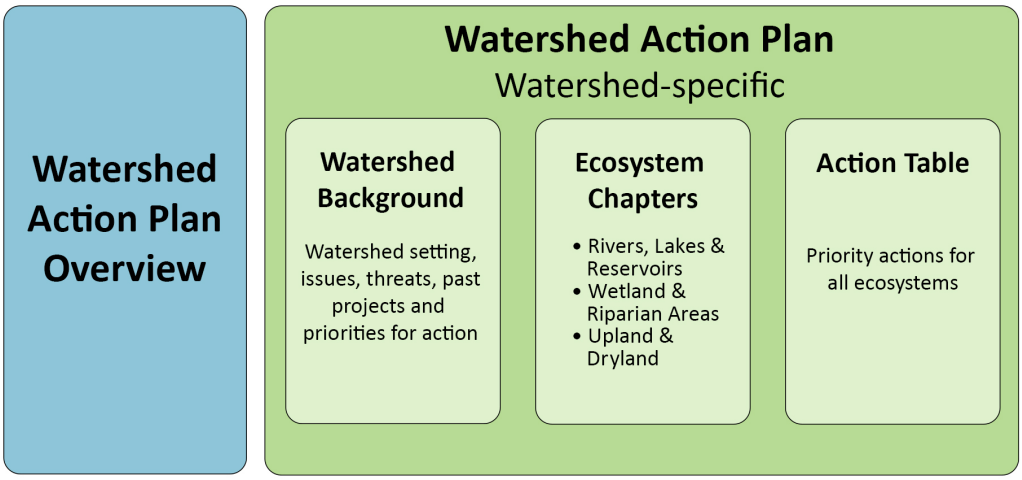

Figure 1: Structure of FWCP Action Plan Overview and Action Plan components.

Setting

The Alouette River Watershed is located approximately 50 km east of Vancouver, next to the Stave watershed on the north side of the Fraser Valley (Figure 2). The Alouette River Watershed has a drainage area of 202 km^2 and ranges in elevation from 120m to 1800m. The Alouette River (sometimes called the South Alouette River) flows predominantly southwest and discharges into the Pitt River, less than 6 km upstream of the Pitt River's confluence with the Fraser River. Inflows to the Alouette system come primarily from heavy rain in the fall from Pacific frontal systems and snowmelt in the spring. Average rainfall in November is close to 500 mm, but can reach 900 mm.

The Alouette-Stave Falls-Ruskin generating complex includes four dams, a 1090 m long diversion tunnel and three powerhouses. Alouette Dam, at the south end of Alouette Lake Reservoir, provides water storage in the Alouette River Watershed. The earthfill dam, rebuilt in 1983, is located at the natural outlet of the original Alouette Lake and is immediately downstream from a dam previously constructed at this site in the mid 1920s. About 94% of the annual inflow into Alouette Lake Reservoir is diverted through the diversion tunnel to the Alouette Generating Station on the shore of Stave Lake Reservoir. At the south end of Stave Lake Reservoir are Blind Slough and Stave Falls dams, and Stave Falls Generating Station. Flows through Stave Falls Dam discharge into Hayward Reservoir. Outflow from Hayward Reservoir is controlled by Ruskin Dam, with power being generated at the Ruskin Generating Station. Water diverted from Alouette Lake Reservoir is thus used for power generation at three separate generating stations.

The watershed has a diverse group of users. The Alouette River system lies within the traditional territory of the Katzie and Kwantlen First Nations. The watershed is also of interest to the Matsqui First Nation, Seabird Island Band, Semiahmoo First Nation, Shxw'ow'hamel First Nation, Skawahlook First Nation, and Soowahlie First Nation. The lower Alouette River flows through parks, residential areas and intensive farmland, including Golden Ears Provincial Park and the municipality of Maple Ridge.

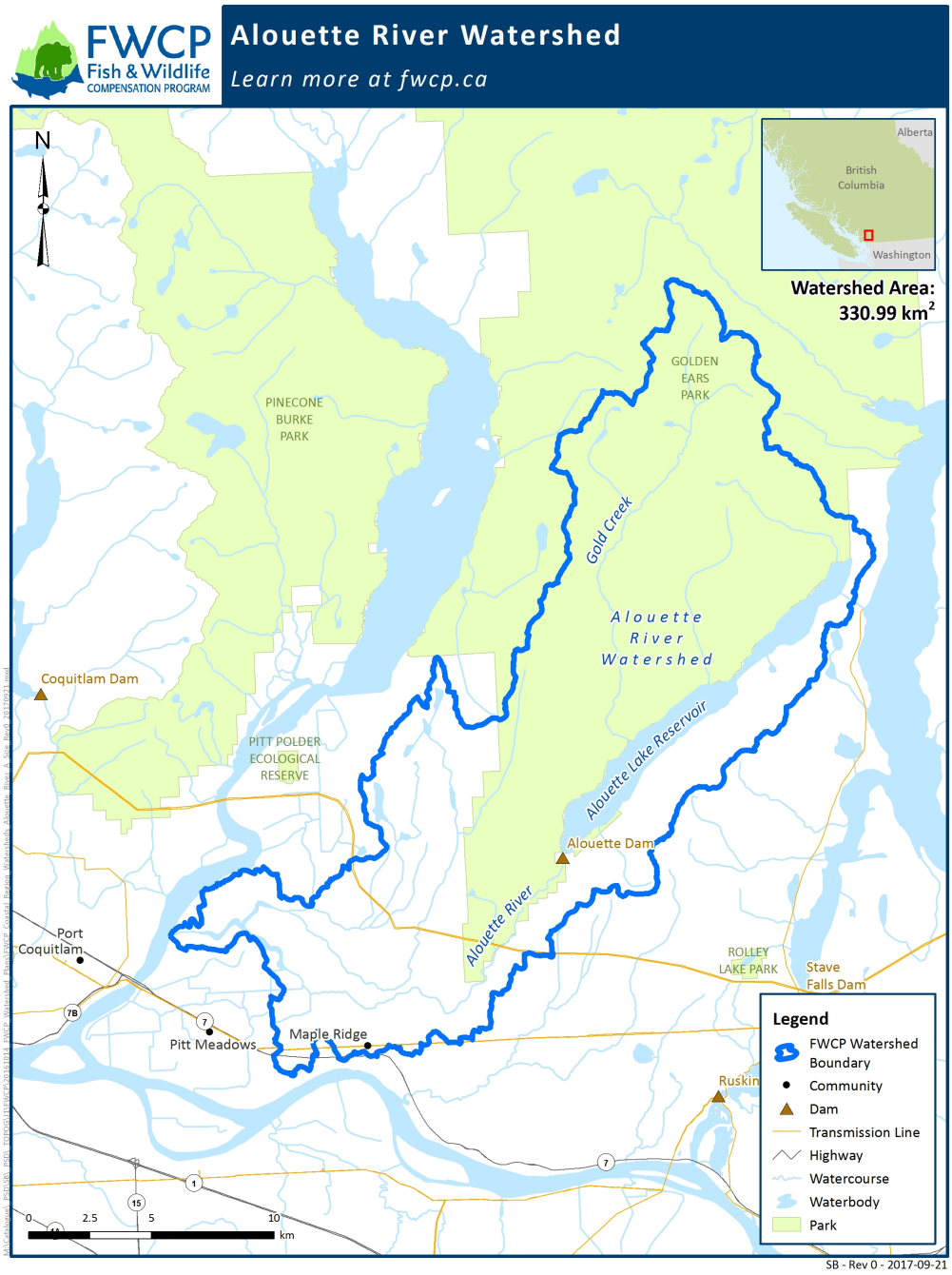

Figure 2: The FWCP Alouette River Watershed boundary.

Land Ownership in the Alouette River Watershed

Most of the northern part of the watershed lies within Golden Ears Provincial Park. The southwestern part of the watershed is predominantly urban, suburban and agricultural land that is privately owned. 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.

Hydro-related Impacts

Inundation: Reservoir impoundment raised the elevation of the original lake by approximately 15 m. The reservoir area measures 1580 ha after flooding 373 ha of land. The reservoir shoreline length is now 37.6 km – a 1.4 km reduction from the original shoreline, due to flooding of the two lakes and the complex channels at the inlet. The reservoir impounded Alouette Lake, and inundated 0.3 km of mainstem, 4km of tributaries and associated riparian habitat.

Habitat Loss: Loss of instream, riparian and upland habitats; loss of lake outlet spawning for anadromous stocks was compensated by construction of spawning channel below the dam in 1994. The dam has reduced recruitment of large woody debris and gravel downstream.

Migration Barriers: The dam blocked fish passage for anadromous and resident migratory fish, including all species of salmon, Steelhead and possibly anadromous cutthroat trout.

New Habitat: The reservoir has created new habitat for lake species and spawning channels have been constructed below the dam.

Fluctuating Reservoir: Annual reservoir drawdown of 9.5 m reduces access to tributaries and reduces littoral productivity.

Altered Flow Regime: There were no fish flows on Alouette for 40 years. Periodic large spills and low level outlet at the dam may cause sedimentation of spawning habitat in the mainstem.

Diversions: 90% of the water in the Alouette River basin is diverted to the Stave River basin. This diversion affected spawning and rearing habitat quantity and quality and productivity, and reduced access to off-channel habitat.

Entrainment: Fish entrainment occurs via the diversion tunnel to the Stave Reservoir in the north basin of the Alouette Reservoir. Kokanee Salmon entrainment exposure can occur during a low water window from August to October and during a high velocity window from November to February. Surface release flows over the Alouette Dam in the spring have increased Kokanee out-migration from Alouette Reservoir.

Non-hydro Impacts

Other impacts to fish and wildlife populations in the Alouette River Watershed have occurred due to high levels of urbanization and agricultural land conversion in the lower Alouette River valley. Protection of habitat in Golden Ears Park has limited extensive footprint impacts in much of the upper watershed since the park was established in 1967. Logging and associated road-building occurs on crown land outside the park boundaries.

Objectives for the Alouette 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 (Sockeye, Coho, Chinook, and Pink) and Steelhead; and (b) Resident salmonids (Kokanee, Rainbow, Cutthroat, and Bull Trout/Dolly Varden).	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: Alouette River Watershed

FWCP has been funding projects in the Alouette River Watershed since 1999 under the Bridge-Coastal Restoration Program (BCRP) and subsequently under the Fish & Wildlife Compensation Program[1] 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

A total of 15 Rivers, Lakes & Reservoirs projects were undertaken in the Alouette River Watershed during the 2010/2011 to 2015/2016 FWCP project years with $535,999 of FWCP funding. Of these, 11 were Research and Information Acquisition projects associated with the Priority 1 Action of obtaining baseline information in relation to the reintroduction of Sockeye Salmon. These projects are largely part of several multi–year studies that are integrated into the Fish Passage Decision Framework for the Alouette River Watershed. A spring surface release of 3 m^3/s from the Alouette Dam was initiated in 2005 as a part of the Alouette Water Use Plan that has facilitated Kokanee/Sockeye smolt outmigration through the spillway gate and to the ocean via the Alouette River. Monitoring studies have since been

[1] The Program changed its name in 2011 from the BCRP to the FWCP.

conducted with FWCP support to determine the migration success of Kokanee/Sockeye smolts and the number of adults returning to the lower river. Since 2007, 312 adult Sockeye Salmon have returned to the lower Alouette River Watershed (range = 0 to 115 fish/yr). The Alouette River Management Society (ARMS) has captured these adult sockeye at the Allco fish fence, sampled their DNA and transferred the fish to the Alouette Reservoir by truck. Unfortunately, few of these have produced progeny, which may have limited the success of the re-introduction.

Three projects were undertaken to address Priority 1 Habitat-based Actions in the lower Alouette River, and received $99,895 of FWCP funding. These projects focussed on restoration and maintenance of spawning and rearing habitat targeting Chinook and Coho Salmon in the lower Alouette River. There remains substantial opportunity to support ongoing efforts to restore Chinook, Coho, Pink and Steelhead populations in the lower Alouette River.

Wetland & Riparian Areas

A single multi-year project was undertaken during the 2010/2011 to 2015/2016 FWCP project years that addressed Riparian/Wetland species and habitat with $303,430 of FWCP funding. This five-year project (2011-2016) was focused on inventory, habitat suitability mapping, and habitat restoration for five Riparian/Wetland species identified as high priority in the previous Species of Interest Action Plan (Pacific Water Shrew, Northern Red-legged Frog, Western Painted Turtle, Great Blue Heron, and Western Screech-owl), but also included investment in two Upland/Dryland species at risk (see below). Progress on Research and Information Actions has included habitat mapping for Pacific Water Shrew, inventory of Western Painted Turtles and Northern Red-legged Frogs, identification of threats and potential mitigation strategies to improve Category 1 riparian and wetland areas, and identification of opportunities for restoration or creation of Category 2 areas. Progress was also made on a Species-based Action to implement the Pacific Water Shrew recovery strategy and on a Habitat-based Action to begin riparian and wetland restoration. A large-scale restoration effort was initiated in 2013 at a low-bench riverine site (Hale Road) along the Alouette River, which has recently been expanded with FWCP support to several additional riparian/wetland sites throughout the watershed.

Upland & Dryland

A single multi-year project was undertaken during the 2010/2011 to 2015/2016 FWCP project years that addressed Upland/Dryland species. This five-year project (2011-2016) received a total of $303,430 of FWCP funding, is the same project that primarily targeted Riparian/Wetland species and habitat; however, it also provided baseline inventory for Northern Goshawk (medium priority) and Short-eared Owl (no priority rating).

Interactions with Other Ongoing Processes

Water Use Plan (WUP) – BC Hydro undertook Water Use Planning on the Alouette River 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
ALOUETTE RIVER WATERSHED

ECOSYSTEM CHAPTER: RIVERS, LAKES & RESERVOIRS

Actions for Rivers, Lakes & Reservoirs

The Action Table in this document (see page 21) 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 Alouette River Watershed

Historically, anadromous salmon and Steelhead had access to Alouette Lake and its tributaries. Alouette Dam was built in the 1920s and has no fish passage facilities. The dam extirpated the Alouette Chinook and Sockeye stocks; both spring and fall run Sockeye occurred in the system. Pink salmon were extirpated by gravel mining in the early 1950s, but have been re-established by DFO. Resident fish species occur in the reservoir and tributaries today, including Rainbow Trout, Cutthroat Trout, Bull Trout, Kokanee, Largescale Sucker, Longnose Sucker, Northern Pikeminnow, Peamouth Chub, Redside Shiner, Spottail Shiner, Threespine Stickleback, and Sculpins. Lake Trout were introduced in 1968, but did not establish a self-supporting population. The majority of reservoir fish biomass is made up of non-salmonids. Gold Creek, Moyer Creek and the upper Alouette River provide important spawning and rearing habitats; most other tributaries are steep and have intermittent or erratic flows.

Chum, Coho and Steelhead occur in the lower Alouette, below the dam, and increased following an improved minimum flow release in 1971. Additional fish habitat improvements have occurred from further increases in minimum flows implemented as part of the Alouette WUP (BC Hydro 2009). Production of hatchery Coho began in 1980. Since 2005, studies undertaken in the Alouette River Watershed have concluded that the non-anadromous Alouette River Kokanee can revert to the anadromous form if given the opportunity. As a result the Alouette River Sockeye Re-Anadromization Project has been initiated with a long-term goal to restore anadromous Sockeye to the Alouette River Watershed following BC Hydro's Fish Passage Decision Framework.

Limiting Factors

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

- **Competition for habitat:** One of the main limiting factors in the lower Alouette River is competition for spawning habitat between Chum Salmon and other species. The alteration from the natural flow regime, including operations determined under the WUP, currently favours Chum Salmon.
- **Habitat area**: Former spawning, rearing and overwintering areas are permanently lost or seasonally reduced by dam footprint, reservoir flooding, flow diversions, or operating flows; or from non-hydro sources, such as urban encroachment along banks of the lower river. Impacts to riparian habitats in the lower river are a limiting factor for some species, as there are disturbances and loss of habitat. Pool and boulder habitat is limiting for the rearing of Steelhead and Rainbow Trout parr.
- **Habitat quality**: Physical habitat below dams has been altered by reduced gravel and wood recruitment. Productivity of Alouette Lake Reservoir has been affected by long-term reservoir drawdowns and loss of salmon-derived nutrients. Lakes and streams in this region have naturally low nutrient levels.
- **Access**: Anadromous and migratory resident stocks have been excluded from the upper Alouette River. Access has been reduced through alteration of the natural flow regime. For example, access to side channel habitat is

reduced due to lower mainstem flows. Access to tributaries has been affected by reservoir drawdowns and lower flows in the mainstem. Lack of fish passage at Alouette Dam has blocked inputs of salmon-derived nutrients.

- **Diversions**: The Alouette diversion has decreased annual flow volume to the lower Alouette River, which has affected habitat quantity and quality, seasonal temperatures and stream productivity.
- **Entrainment**: Fish entrainment occurs via the diversion tunnel to the Stave Reservoir in the north basin of the Alouette Reservoir. Kokanee Salmon entrainment exposure can occur during a low water window from August to October and during a high velocity window from November to February.
- **Hatchery practices**: Salmon populations are augmented by hatchery production, which may have positive and negative effects on wild salmonid stocks. The hatchery increases abundance, which at times is necessary for maintaining runs. At the same time, wild populations may be harvested along with hatchery fish. Genetic diversity of wild salmon can be altered by hatchery practices and hatchery-raised fish compete for food and habitat with wild salmon. Under the Wild Salmon Policy (Fisheries and Oceans Canada 2005), the Salmon Enhancement Program takes steps to minimize these risks.

Knowledge Status

Habitat

A detailed account of habitat alterations from hydropower development is provided in BCRP (2000). In addition to present and historic hydropower impacts there are impacts in the watershed from agriculture and urban land use, particularly in the lower reaches of the river.

Changes in operations as part the Alouette WUP have been implemented to improve aquatic habitat conditions (BC Hydro 2009). The expected benefits of the WUP are the maintenance or improvement of fish habitat conditions in Alouette River below Alouette Dam, including possible increases in habitat and improved water quality. A spring surface release of 3 m^3/s from the Alouette Dam was initiated in 2005 as a part of the WUP that has facilitated Kokanee outmigration through the spillway gate and to the ocean via the Alouette River. Monitoring is underway to assess the effects of the operational changes.

Since 2000 several restoration projects have been undertaken on the Alouette system by FWCP partners and the local community, including:

- Installation of 25 large woody debris structures.
- Restoration works have been conducted on off channel and tributary areas resulting in the creation of and improved access to approximately 5100 m^2 of spawning and rearing habitat and access to an additional 4 km of tributary habitat.
- Restoration and maintenance of spawning and rearing habitat targeting Chinook and Coho Salmon in the lower Alouette River.

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 feasibility of Sockeye Salmon re-introduction to the Alouette River Watershed. Work should build upon the Alouette River Sockeye Re-Introduction Synthesis (13.ALU.02) and the Alouette Watershed Sockeye Fish Passage Feasibility (COA-F18-F-2385).
- Bull Trout/Dolly Varden stock status and distribution in the Alouette River Watershed is a continued uncertainty.

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 ecosystem- and project-specific.

2. **Sustain and increase the population viability of resident salmonids.**
   ***Measures* –** Measures will be ecosystem- 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, aside from those associated with Objective 1 and 2.

ECOSYSTEM CHAPTER: WETLAND & RIPARIAN AREAS

Actions for Wetland and Riparian Areas

The Action Table in this document (see page 21) 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 Alouette 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 compiled, but inundation following dam construction was likely the most significant source of habitat loss. The area of inundation has not increased since dam construction, but the productivity of adjacent habitats is likely still affected, either directly or indirectly from BC Hydro operations, agriculture, development and other stressors.

Knowledge Gaps

Extensive mapping, surveys and assessments of riparian and wetland areas have occurred in the watershed. While wetland restoration and creation projects have been undertaken, the effectiveness of these projects in meeting management objectives has yet to be determined. Additional knowledge gaps to be filled in future years include inventory on a number of species of interest as well as filling knowledge gaps identified in management plans and recovery strategies of Species At Risk known to be present in the watershed.

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

The Action Table in this document (see page 21) 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 Alouette 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.

Within the Alouette River Watershed, elevations vary from sea level to unvegetated alpine areas. Winters are wet and mild and summers are comparatively dry and warm. Upper elevations experience deep snowpacks as a result of winter precipitation. The watershed lies within the Georgia Depression Ecoprovince (Demarchi 1996) and low elevations are dominated by the Coastal Western Hemlock Dry Maritime (CWHdm), Submontane Very Wet Maritime (CWHvm1), and Montane Very Wet Martime (CWHvm2) subzone variants. Higher elevations are dominated by Mountain Hemlock (MHmm1) and alpine ecosystems (Green and Klinka 1994). Most of the watershed is forested, with lower elevations dominated by Western Hemlock (*Tsuga heterophylla*), Amabilis Fir (*Abies amabilis*), Western Redcedar (*Thuja plicata*), and Douglas-fir (*Pseudotsuga menziesii)*. Shrub layers include Red Huckleberry (*Vaccinium parvifolium*), Alaskan Blueberry (*V. alaskaense*), Salal (*Gaultheria shallon*) and Dull Oregon-grape (*Mahonia nervosa*). Higher-elevation forests are dominated by Yellow-cedar (*Chamaecyparis nootkatensis*) and Mountain Hemlock (*Tsuga mertensiana*; Green and Klinka 1994).

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

High levels of urbanization and agriculture in the lower Alouette River have resulted in permanent alteration of upland and dryland habitat in the watershed. Losses due to inundation are known, however because the valley is steep-sided, the effects on upland habitat were limited. There are ongoing forestry operations and loss of old forest in those areas has led to localized biodiversity impacts.

Knowledge Gaps

Past investments in the Alouette River Watershed have led to gains in knowledge about various wildlife species. There have been extensive inventories of Species At Risk conducted. One Northern Goshawk was detected during surveys in 2013 but no nest was found. There have been detections of Short-eared Owls and Barn Swallows. Knowledge gaps to be filled in future years include inventory on a number of species of interest as well as filling knowledge gaps identified in management plans and recovery strategies of Species At Risk known to be present in the watershed.

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.
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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.

ALOUETTE RIVER WATERSHED ACTION TABLE									Version: 21July2020
Action #	**Ecosystem Chapter**	**Action Type**	**Priority Action Short Description**	**Priority**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**	**Location**
1	All	Research & Information Acquisition	**ALU.ALL.RI.01.01 Develop a current habitat assessment map -P1**	**1**	Fish & Wildlife	Develop a **current habitat assessment map** for priority fish & wildlife species in the Alouette watershed. Habitats to be assessed & mapped include: • Wetlands • Riparian Areas • Stream Habitats • Connectivity Corridors • Forested Ecosystems (e.g., seral stage distribution) • Over-wintering habitat for species that utilize talus or rock features (e.g., bats, snakes) • Culturally Important Areas Mapping is to include as much on-the-ground information as possible relevant to the subject fish & 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.). Recommendations should be made through this work for future management actions and assessments. Refer to mapping work undertaken by the City of Maple Ridge: http://mapleridge.ca/346/Environmental-Mapping-Management-Systems.	Improved strategic planning for conservation and restoration opportunities.	Directed	Throughout
2	All	Research & Information Acquisition	**ALU.ALL.RI.02.01 Conduct a limiting factors analysis-Lower Alouette River-**	**1**	Fish & Wildlife	Conduct a **limiting factors analysis** for priority fish and/or wildlife in the Alouette River 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	To determine cost-benefit of potential FWCP actions and support	Directed	Throughout

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Action #	**Ecosystem Chapter**	**Action Type**	**Priority Action Short Description**	**Priority**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**	**Location**
			P1			limitations to productive potential. For fish, sub-basins for assessment include the Lower Alouette River (Priority 1), the North Alouette River (Priority 3), and the upper Alouette including Alouette Lake and tributaries (Priority 1). 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, landowners and other land managers. *Please note that the FWCP may develop templates for this work. Please check with FWCP to see if these templates are available.	prioritization of future projects. Leads to the creation of robust habitat or species-based restoration plans for the watershed or sub-basins.		
			ALU.ALL.RI.02.02 Conduct a limiting factors analysis-North Alouette River-P3	**3**					
			ALU.ALL.RI.02.03 Conduct a limiting factors analysis-upper Alouette incl. Alouette Lake&tributaries -P1	**1**					
			ALU.ALL.RI.02.04 Conduct a limiting factors analysis-upper Alouette River Watershed-P1	**1**					
	All	Research & Information Acquisition	**ALU.ALL.RI.03.01 Develop a comprehensive restoration&protection plan-Lower Alouette River-P1**	**1**	Fish & Wildlife	**Develop a comprehensive restoration and protection plan** for fish and/or wildlife in the Alouette River 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: • 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	To determine high priority, cost-effective habitat and/or species-based actions that can be supported by the FWCP.	Directed	Throughout

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Action #	**Ecosystem Chapter**	**Action Type**	**Priority Action Short Description**	**Priority**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**	**Location**
3			**ALU.ALL.RI.03.02 Develop a comprehensive restoration&protection plan-North Alouette River-P3**	**3**		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. 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 Sockeye, Chinook, Pink and Coho Salmon, Kokanee, Steelhead/Rainbow Trout, Bull Trout, Cutthroat Trout, Nooksack Dace and Salish Sucker. 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. Sub-basins for fish plans include the Lower Alouette River (Priority 1), the North Alouette River (Priority 3), and the upper Alouette including Alouette Lake and tributaries (Priority 1). Restoration plans are best developed as 'living documents' so that they can be updated over time. A number of Priority Actions have been developed already and are described in this Action Table, but further development of restoration actions would be beneficial. For work on Sockeye Salmon, any analyses must build upon the Alouette River Sockeye Re-Introduction Synthesis (13.ALU.02) and the Alouette Watershed Sockeye-fish passage Feasibility (COA-F18-F-2385). For cultural priorities, reference COA-F17-W-1295 Restoring Species of Conservation and Cultural Value. *Please note that the FWCP may develop templates for this work. Please check with FWCP to see if these templates are available.			
			ALU.ALL.RI.03.03 Develop a comprehensive restoration&protection plan-upper Alouette incl.Alouette Lake&tributaries-P1	**1**					
3 cont.			**ALU.ALL.RI.03.03 Develop a comprehensive restoration&protection plan-Alouette River Watershed-P1**	**1**					

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Action #	**Ecosystem Chapter**	**Action Type**	**Priority Action Short Description**	**Priority**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**	**Location**
4	All	Habitat-based Actions	**ALU.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 19**), 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
		Species-based Actions	**ALU.ALL.SB.04.02 Implement high priority species-based actions-P2**	**1**					
5	All	Land Securement	**ALU.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
6	All	Land Securement	**ALU.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. 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

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Action #	**Ecosystem Chapter**	**Action Type**	**Priority Action Short Description**	**Priority**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**	**Location**
7	All	Monitoring & Evaluation	**ALU.ALL.ME.07.01 Develop and implement an integrated monitoring plan-P1**	**1**	Fish & Wildlife	**Develop and implement an integrated monitoring plan for fish and/or wildlife** in the Alouette 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 & Evaluation	**ALU.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 & Evaluation	**ALU.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 enhancements supported by the FWCP.	Open	Throughout

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10	Rivers, Lakes & Reservoirs	Research & Information Acquisition	**ALU.RLR.RI.10.01 Assess Bull Trout/Dolly Varden stock status&distribution… determine opportunites for restoration-P1**	**1**	Bull Trout/Dolly Varden	**Assess Bull Trout/Dolly Varden stock status and distribution in the Alouette watershed and determine opportunities for restoration.** Work should build upon the "Alouette River Bull Trout Spawner Enumeration and Life History Investigation (14.ALU.02)" and should include assessments of historical versus present status in the Upper Alouette. Any assessment/inventory should meet the criteria outlined in **Action 19.**	Determine the current distribution and viability of Bull Trout/Dolly Varden and opportunities for restoration.	Open	Throughout
11	Rivers, Lakes & Reservoirs	Research & Information Acquisition	**ALU.RLR.RI.11.01 Research options to improve productivity of Alouette River Chinook Salmon-P2**	**2**	Chinook Salmon	**Research options to improve productivity of Alouette River Chinook Salmon** by reducing competition with Chum Salmon on spawning grounds	Sustain and restore habitat capacity and population viability of Chinook Salmon.	Open	Lower Alouette
12	Rivers, Lakes & Reservoirs	Habitat-based Actions	**ALU.RLR.HB.12.01 Implement habitat enhancements in Lower Alouette River-P1**	**1**	Anadromous & Resident Salmonids	**Implement habitat enhancements in Lower Alouette River.** 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	Lower Alouette
13	Rivers, Lakes & Reservoirs	Habitat-based Actions	**ALU.RLR.HB.13.01 Develop new spawning areas for Chinook Salmon in the Lower Alouette River-P1**	**1**	Chinook Salmon	**Develop new spawning areas for Chinook Salmon in the Lower Alouette River** that are in areas not favoured by Chum Salmon, such as in the vicinity of the dam.	Sustain and restore habitat capacity and population viability of Chinook Salmon.	Open	Lower Alouette

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14	Rivers, Lakes & Reservoirs	Habitat-based Actions	**ALU.RLR.HB.14.01 Improve rearing habitat capacity for Chinook&Coho Salmon&Steelhead in the Lower Alouette River-P1**	**1**	Chinook and Coho Salmon, and Steelhead	**Improve rearing habitat capacity for Chinook and Coho Salmon and Steelhead** in the Lower Alouette River. Examples include development of off-channel habitat and increasing pool, wood and boulder habitat.	Sustain and restore habitat capacity and population viability Chinook and Coho Salmon and Steelhead.	Open	Lower Alouette
15	Rivers, Lakes & Reservoirs	Habitat-based Actions	**ALU.RLR.HB.15.01 Develop new spawning areas for Pink Salmon-P2**	**2**	Pink Salmon	**Develop new spawning areas for Pink Salmon** that are in areas not favoured by Chum Salmon, such as in the North Alouette River, where natural fluctuations do not favour Chum Salmon.	Sustain and restore habitat capacity and population viability of Pink Salmon.	Open	North Alouette River
16	Rivers, Lakes & Reservoirs	Habitat-based Actions	**ALU.RLR.HB.16.01 Implement habitat enhancements in Upper Alouette-P2**	**2**	Anadromous & Resident Salmonids	**Implement habitat enhancements in Upper Alouette**, including Alouette Reservoir and tributaries. 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	Upper Alouette
17	Rivers, Lakes & Reservoirs	Habitat-based Actions	**ALU.RLR.HB.17.01 Implement habitat enhancements in North Alouette River-P3**	**3**	Anadromous & Resident Salmonids	**Implement habitat enhancements in North Alouette River**. 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	North Alouette River

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18	Rivers, Lakes & Reservoirs	Species-based Actions	**ALU.RLR.SB.18.01 Conduct technical feasibility assessment...Sockeye Salmon passage at Alouette Dam-P1**	**1**	Sockeye Salmon	**Conduct technical feasibility assessment, monitoring and/or species-based actions associated with Sockeye Salmon passage at Alouette Dam to support re-introduction to the Alouette system.** Work must build upon the Alouette River Sockeye Re-Introduction Synthesis (13.ALU.02) and the Alouette Watershed Sockeye-fish passage Feasibility (COA-F18-F-2385). 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 re-introduction of Sockeye Salmon to the Alouette watershed	Open	Lower Alouette/ Upper Alouette

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19	All	Research & Information Acquisition	**ALU.ALL.RI.19.01 Inventory for species of interest that are likely in the watershed-P2**	**2**	Wildlife	**Inventory for species of interest that are likely in the watershed. Inventory actions must meet the following criteria:** • The data collected will clearly inform a specific natural resource management decision or conservation action; this includes a clear understanding of: - 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: - 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. Species of interest reflect engagement from FWCP partners and include, but are not limited to: • Grizzly Bear. Inventory needed to determine occupancy, lacking baseline information. • Long-tailed Weasel (*altifrontalis subspecies*), Wolverine, and Spotted Skunk. Inventory required to assess if and where these species still occur in Lower Mainland watersheds. No specific surveys for the weasel subspecies have been conducted to date, so unclear if the species are extant in these watersheds • Mesocarnivores (species of interest: Ermine, Pacific Marten, American Mink, Spotted Skunk). Conduct risk assessment and evaluate population sustainability through monitoring program. If necessary, implement habitat enhancement strategies to maintain sustainable populations. • Snowshoe Hare (*washingtonii subspecies)*. Inventory required to evaluate occurrences of subspecies in watershed. • Short-eared Owl. Some surveys have been completed, build upon work done in FWCP project #16.W.ALU.01 Identify, Conserve and Restore Populations of Priority Species at Risk and their Associated Habitats within the Alouette River Watershed. • At-risk invertebrates. If found, implement restoration plan if required. Potential species of interest: Grappletail, Emma's Dancer.	Habitat enhancement opportunities. Maintain or, where feasible, increase the abundance of species of interest.	Open	Throughout

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20	All	Habitat-based Actions	**ALU.ALL.HB.20.01 Implement priority species- and habitat-related conservation actions...-P1**	**1**	Wildlife Species at Risk	**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. • Management Plan for Roosevelt Elk in British Columbia (Ministry of Forests, Lands and Natural Resource Operations 2015). • Management Plan for the Mountain Goat (*Oreamnos americanus*) in British Columbia (B.C. Ministry of Environment 2010). • Recovery Strategy for the Pacific Water Shrew (*Sorex bendirii)* in Canada (Environment Canada 2014). Build upon work completed by other FWCP-funded projects (e.g., project #16.W.ALU.01 Identify, Conserve and Restore Populations of Priority Species at Risk and their Associated Habitats within the Alouette River Watershed). There is critical habitat mapped for the species in the watershed (CDC 2016). • Management Plan for the Great Blue Heron *fannini* subspecies (*Ardea herodias fannini*) in Canada [Proposed] (Environment Canada 2016). Foraging observations have been made as part of multi-year SAR project (FWCP project #16.W.ALU.01), but no nests or colonies detected via that method. Any wetland, riverine or fish restoration activities will benefit herons. Any detected colonies should have trees mapped and protected (possibly identified as wildlife trees). Nest tree recruitment will likely have long-term benefits for this species. Carry out appropriate recommendations in the Management Plan for The Great Blue Heron (Ardea herodias fannini) in the Alouette River Watershed (Mitchell 2012, 2016). Priority area: Malcom Knapp Research Forest.	Habitat enhancement opportunities. Maintain or, where feasible, increase the abundance of species of interest.	Open	Throughout

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20 cont.						• Recovery Strategy for the Common Nighthawk (Chordeiles minor) in Canada (Environment Canada 2016). • Recovery Strategy for the Northern Spotted Owl (*Strix occidentalis caurina*) in British Columbia (Environment Canada 2006). • Recovery Plan for the Western Screech-owl, *kennicottii* subspecies (*Megascops kennicottii kennicottii)* in British Columbia (Ministry of Environment 2013). Extensive surveys have been completed but further breeding season surveys required, build upon work done in #16.W.ALU.01 Identify, Conserve and Restore Populations of Priority Species at Risk and their Associated Habitats within the Alouette River Watershed. • Recovery Plan or Management Strategy for the Barn Swallow (*Hirundo rustica*) once developed. • Recovery Plan for the Painted Turtle – Pacific Coast Population (*Chrysemys picta* pop. 1), in British Columbia (The Western Painted Turtle Recovery Team 2016). Carry out recommendations in the Management Plan for The Western Painted Turtle (*Chrysemys picta bellii*) in the Alouette River Watershed (Mitchell 2012) in cooperation with the Western Painted Turtle Recovery Team. • Management Plan for the Coastal Tailed Frog (*Ascaphus truei*) in Canada [Proposed] (Environment and Climate Change Canada 2016). Build upon work done in FWCP project #16.W.ALU.01 Identify, Conserve and Restore Populations of Priority Species at Risk and their Associated Habitats within the Alouette River Watershed. • Management Plan for the Northern Red-legged Frog (*Rana aurora*) in Canada [Proposed] (Environment Canada 2016). Build upon work done in #16.W.ALU.01 Identify, Conserve and Restore Populations of Priority Species at Risk and their Associated Habitats within the Alouette River Watershed. • Management Plan for the Western Toad (*Anaxyrus boreas*) in British Columbia (Provincial Western Toad Working Group 2014). Build upon work done in #16.W.ALU.01 Identify, Conserve and Restore Populations of Priority Species at Risk and their Associated Habitats within the Alouette River Watershed. Identify breeding sites. Identify threats to migration routes during summer emergence and create recommendations to mitigate these threats (e.g., fencing and underpass crossings designed to keep toads from crossing roads, etc.).			

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21	Upland & Dryland	Research & Information Acquisition	**ALU.UAD.RI.21.03 Year-round acoustic monitoring…bats-P3**	**3**	Bats	**Year-round acoustic monitoring** in the lower mainland watersheds is a priority to find migration routes and timing and to determine if bats are active during winter. Participants should participate in the the North American Bat Monitoring Program acoustic monitoring and BC Community Bat Program Roost Counts.	Maintain or, where feasible, increase the abundance of species of interest.	Open	Throughout
22	Upland & Dryland	Habitat-based Actions	**ALU.UAD.HB.22.01 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).	Maintain or, where feasible, increase the abundance of species of interest.	Open	Throughout
23	All	Habitat-based Actions	**ALU.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 5 and falls under the Pacific Birds Habitat Joint Venture. See the lists of priority species under the North American Wetlands Conservation Act at: http://www.pacificbirds.org/nawca-priority-species/. Proposed projects should refer to the priority lists and recommended conservation actions/guidance in the implementation plans (http://www.pacificbirds.org/science-and-planning/state-or-regional-plans/).	Varied types of species and habitat conservation, protection and enhancement opportunities.	Open	Throughout
24	Upland & Dryland	Habitat-based Actions	**ALU.UAD.HB.24.01 Winter range securement, enhancement and access management-P2**	**2**	Black-tailed deer	**Winter range securement, enhancement and access management** would be beneficial, but opportunities are limited.	Sustain and increase the food, social, ceremonial, recreational and/or commercial use of fish and wildlife resources.	Open	Throughout

ALOUETTE RIVER WATERSHED ACTION TABLE									Version: 21July2020
Action #	**Ecosystem Chapter**	**Action Type**	**Priority Action Short Description**	**Priority**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**	**Location**
25	Upland & Dryland	Habitat-based Actions	**ALU.UAD.HB.25.01 Restore and enhance the supply of cavities in trees for large cavity users-P2**	2	Northern Flying Squirrel + Pacific Marten	**Restore and enhance the supply of cavities in trees** for large cavity users (e.g., Pacific Marten, Flying Squirrels, various bird species). 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
26	Wetland & Riparian	Habitat-based Actions	**ALU.WAR.HB.26.01 Implement wetland&riparian 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 Alouette River Watershed.** If a restoration plan has been completed under **Action 3**, please reference that plan for more information as well as priority areas and restoration completed in FWCP project #16.W.ALU.01 Identify, Conserve and Restore Populations of Priority Species at Risk and their Associated Habitats within the Alouette River Watershed (or more recent reports). This can include managing invasive plants as needed.	Protect, restore and/or create new wetland and riparian habitat.	Open	Throughout
27	All	Research & Information Acquisition	**ALU.ALL.RI.27.01 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: American sweet-flag (Acorus americanus)Wapato/Arrowhead, Tule, Beaked Hazelnut, Bog Cranberry, Snow Bramble, Peacock Vinyl, Mountain Sneezeweed, Vancouver Island Beggarticks and Pointed Rush. Build upon work done in FWCP projects 16.W.ALU.01 Identify, Conserve and Restore Populations of Priority Species at Risk and their Associated Habitats within the Alouette River Watershed and COA-F17-W-1295 Restoring Species of Conservation and Cultural Value.	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

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