



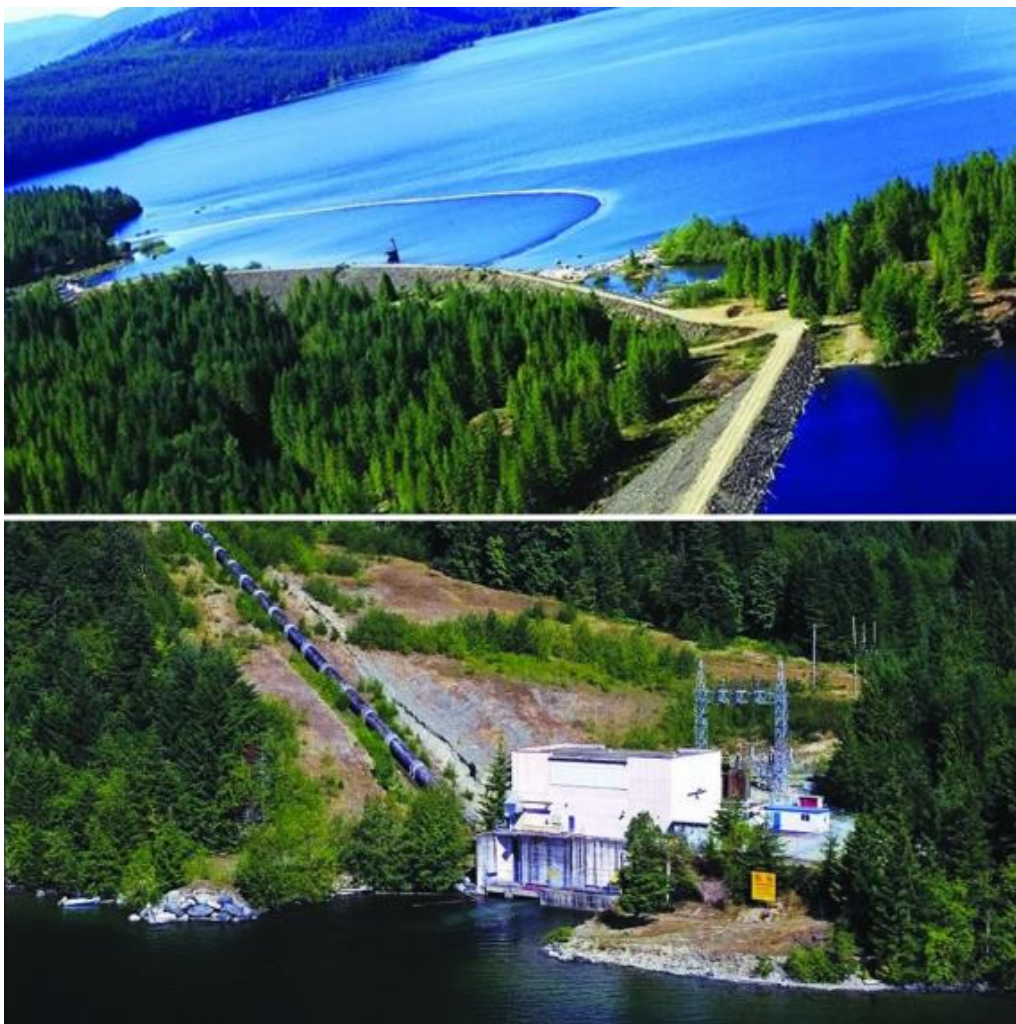
# ASH RIVER WATERSHED ACTION PLAN

**FINAL August 20, 2018**

**Administrative Update July 21, 2020**

---

*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 BC Hydro dam construction in this watershed. Photo from top: Elsie Lake Dam at Elsie Reservoir; and Ash Generating Station at Great Central Lake, Credit: BC Hydro. Cover photo: Steelhead, Credit: NOAA.*



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](http://fwcp.ca). Subscribe to our free email updates and annual newsletter at [www.fwcp.ca/subscribe](http://www.fwcp.ca/subscribe). Contact us anytime at [fwcp@bchydro.com](mailto:fwcp@bchydro.com).

---

## EXECUTIVE SUMMARY: ASH RIVER WATERSHED ACTION PLAN

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 Ash 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](http://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](http://fwcp.ca)

---

## TABLE OF CONTENTS

Executive Summary: Ash River Watershed action plan .....	3
Table of Contents .....	5
Ash River Watershed Background .....	6
Introduction .....	6
Setting .....	6
Land ownership in the Ash River Watershed.....	8
Footprint Impacts and Threats.....	8
Objectives for the Ash River Watershed .....	8
FWCP Projects Implemented: Ash River Watershed .....	9
Interactions Other Ongoing Processes .....	10
Ecosystem Chapter: Rivers, Lakes & Reservoirs .....	12
Actions for Rivers, Lakes & Reservoirs .....	12
Aquatic Habitat in the Ash River Watershed .....	12
Limiting Factors .....	12
Knowledge Status.....	13
Objectives and Measures.....	13
Ecosystem Chapter: Wetland & Riparian Areas.....	15
Actions for Wetland and Riparian Areas.....	15
Wetland and Riparian Areas in the Ash River Watershed .....	15
Limiting Factors .....	16
Knowledge Status.....	16
Objectives and Measures.....	17
Ecosystem Chapter: Upland & Dryland.....	18
Actions for Upland and Dryland.....	18
Upland and Dryland in the Ash River Watershed .....	18
Limiting Factors.....	18
Knowledge Status.....	18
Objectives and Measures.....	19
Action Table .....	20
References .....	34

## ASH 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 needed to support FWCP objectives. Please refer to the Action Plan Overview for more information on the on the process that was followed to develop Action Plans. The structure of this Action Plan is shown in Figure 1.

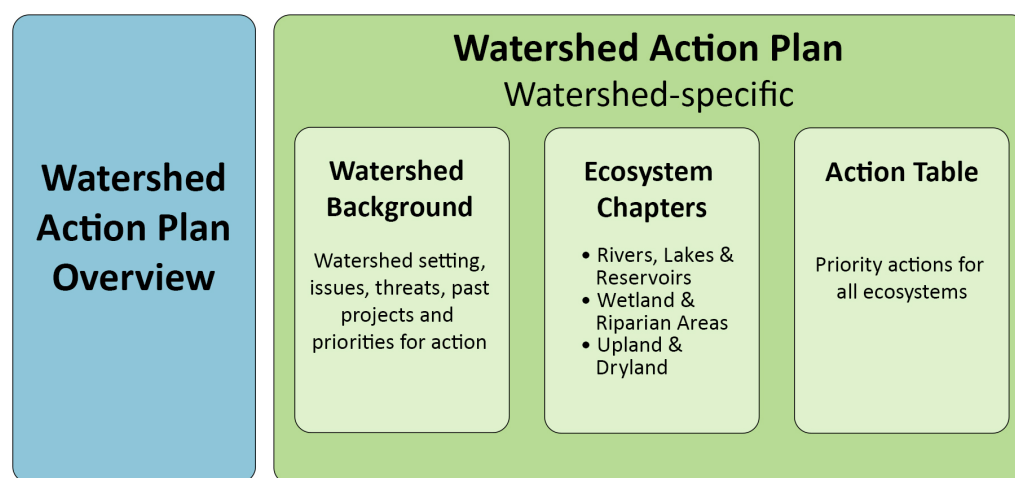


Figure 1: Structure of FWCP Action Plan Overview and Action Plan components.

### Setting

The Ash River Watershed is situated about 40 km northwest of Port Alberni in central Vancouver Island, between the Beaufort Range and Strathcona Provincial Park. The mountains in the upper Ash River Watershed are up to 2000 m in elevation and have permanent snowpack. These mountains form the boundary between the Ash, Campbell and Puntledge watersheds. From Oshinow Lake at an elevation of 410 m, the Ash River drops a further 80 m in 13 km to Elsie Lake Reservoir. The lower parts of the watershed have lower relief than the upper basin. Below Elsie Lake Reservoir the lower Ash River flows into the Stamp River and from there into the Somass River before meeting the ocean at Port Alberni. There are three lakes on the Ash River mainstem, Oshinow, Elsie and Dickson Lakes, and several smaller lakes on tributaries.

The Ash River basin is in the transition zone between the wet west coast and drier east coast climates of Vancouver Island. The basin is affected by frontal storms arriving from the southwest off the Pacific Ocean. Monthly rainfall can be as high as 800-900 mm between November and March. Peak inflow occurs from May to July from snow melt, whereas August and September are low flow months.

The Ash River project, completed in 1958 by the B.C. Power Commission, consists of Elsie Dam at the outlet of Elsie Lake Reservoir and four saddle dams. Water is diverted from Elsie Lake Reservoir through a 7.8 km tunnel and penstock to a powerhouse on the shoreline of Great Central Lake (Figure 2). The plant usually operates at maximum capacity of 27



MW ( $10.7 \text{ m}^3/\text{s}$ ), except in late summer when inflows are low, and during an annual maintenance period (normally 1-2 weeks). Flows are released down the Ash River from Elsie Dam to support fish and other objectives, according to operations described in the Ash River Project Water Use Plan (BC Hydro 2004). Minimum flow requirements are  $3.5 \text{ m}^3/\text{s}$  from May 1 to October 31;  $5 \text{ m}^3/\text{s}$  from November 1 to April 30; and three separate pulse flows for adult steelhead migration, of  $\sim 9 \text{ m}^3/\text{s}$  for 48 hours between August 1 and September 30.

The watershed has a diverse group of users. Industry uses other than hydro-electric generation include forestry and mineral exploration. The watershed is used recreationally by hunters, fishers, campers and off-road motorized recreationists. The Ash River Watershed is in the traditional territories of the Hupacasath, K'ómoks, Tseshah, We Wai Kai and Wei Wai Kum First Nations.

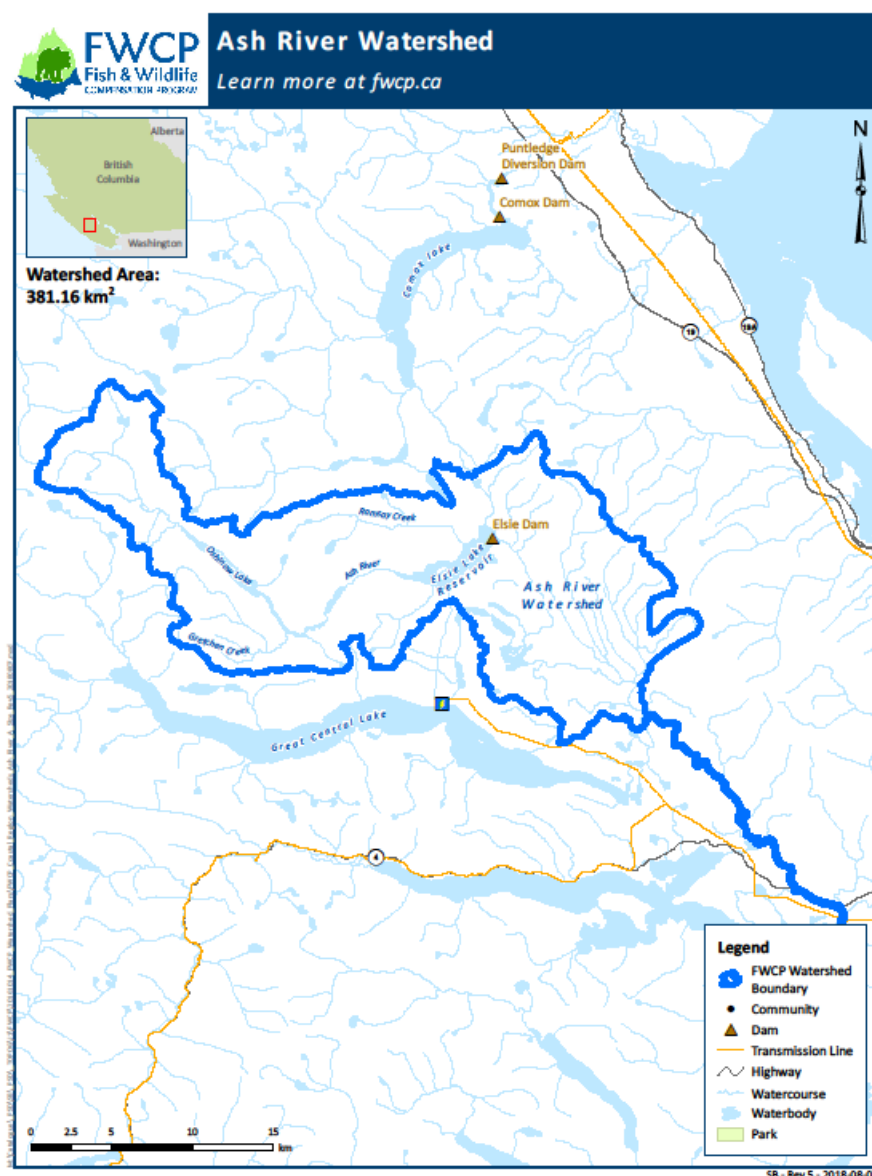


Figure 2: The FWCP Ash River watershed boundary.

## Land ownership in the Ash River Watershed

The western end of the watershed is protected within Strathcona Provincial Park and the northern portion is privately managed forest land (Island Timberlands LP). The remainder, including the area around Elsie Lake and to the south is Crown land. Proponents should consider land ownership and access when they are developing project proposals.

## Footprint Impacts and Threats

Dam construction, hydropower development, and alterations in the hydraulic 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 expanded the existing Elsie Lake (271 ha) to 658 ha. The reservoir shoreline length is now 22.5 km.

**Habitat Loss:** The reservoir flooded 401ha of hemlock-Douglas fir woodlands and altered lake habitat; as well as 5km of mainstem and 4.6km of tributaries and associated channel (30ha), riparian (30ha) and wetland areas (72ha). Elsie Dam has restricted large woody debris recruitment downstream (but effects on gravel recruitment are likely low because Elsie Dam impounded an existing small lake, which itself would have been a barrier to gravel recruitment). There has also been nutrient loss downstream of Elsie Dam.

**Migration Barriers:** Anadromous fish were not considered present in the original Elsie Lake as they were inhibited by Lanterman and Dickson Falls. Reduced flows may have a positive effect for summer steelhead to access areas above Lanterman and potentially Dickson Falls.

**New Habitat:** Rearing habitat 25 km of downstream of the Elsie dam has benefited from fish flow releases. FWCP invested in the creation of small wetlands near the Ash River.

**Fluctuating Reservoir:** The reservoir fluctuates some 15m, reducing littoral productivity and possibly affecting fish access to tributaries.

**Altered Flow Regime:** Altered flows downstream from the dam may have effects on resident fish. Pulse flows are released for steelhead, which need more water than the minimum flow requirements.

**Diversions:** 10.7m<sup>3</sup>/s are diverted from the Ash to the Great Central Lake.

**Entrainment:** The magnitude is unknown but is being investigated through BC Hydro's Fish Entrainment Strategy.

**Terrestrial Footprint:** Terrestrial impacts have resulted from the footprint of infrastructure associated with the project, including the penstock linking the reservoir with the powerhouse.

### Non-hydro Impacts

Forestry, linear development, and recreation are the major drivers of non-hydro impacts in the watershed. Urbanization and habitat changes in the nearby Alberni estuary have impacted fish and wildlife that use the Ash River Watershed.

## Objectives for the Ash 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. 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 (Chinook, Coho) and Steelhead; and, (b) Resident salmonids (Rainbow and Cutthroat).	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 <a href="#">Action Table</a> 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 <a href="#">Action Table</a> 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: Ash River Watershed

FWCP has been funding projects in the Ash River Watershed since 1999 under the Bridge-Coastal Restoration Program (BCRP) and subsequently under the Fish & Wildlife Compensation Program<sup>1</sup> Coastal Region. A full list of the reports from projects undertaken to date is available online at [www.fwcp.ca](http://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

Two Rivers, Lakes & Reservoirs projects were undertaken in the Ash River Watershed during the 2010/2011 to 2015/2016 FWCP project years with \$59,026 of FWCP funding. Both of these were Research and Information Acquisition projects associated with the priority to develop a fish passage action plan for the Ash River within the context of the Fish Passage Decision Framework. One of these projects was a seed project to initiate the action and the second was a research project to determine the genetic differentiation among samples of Steelhead collected throughout the Stamp/Somass River system. There is concern that any actions to improve fish passage above Dickson and Lanterman falls could have impacts to summer run Steelhead. Genetic analyses showed some genetic differentiation between Steelhead populations, although there was also substantial allocation of Ash River samples to both hatchery and lower Stamp/Somass genotypes.

<sup>1</sup> The Program changed its name in 2011 from the BCRP to the FWCP.

**Wetland & Riparian Areas**

A single project was undertaken during the 2010/2011 to 2015/2016 FWCP project years that addressed Riparian & Wetland Areas species and habitat with \$46,584 of FWCP funding. This project was focused on reservoir wetland enhancement through the installation of artificial islands in Elsie Lake Reservoir that was intended to increase habitat structure and diversity for wildlife. Project success was minimal because the intended enhancements were less successful and more expensive than anticipated.

**Upland & Dryland**

No projects were undertaken during the 2010/2011 to 2015/2016 FWCP project years that addressed Upland & Dryland species or habitats.

**Interactions Other Ongoing Processes**

**Water Use Plan (WUP)** – BC Hydro undertook Water Use Planning on the Ash 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

## ASH RIVER WATERSHED

## ECOSYSTEM CHAPTER: RIVERS, LAKES & RESERVOIRS

### Actions for Rivers, Lakes & Reservoirs

The [Action Table](#) in this document (see page 20) 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 Ash River Watershed

The Ash River is a tributary to the Stamp River, which itself is a tributary to the Somass River. The Stamp and Somass are important salmon streams on the west coast of Vancouver Island, with stocks of Steelhead, Coho, Chinook, Sockeye, Chum and Pink salmon. The Ash River has stocks of Steelhead, Coho, and Chinook, which are restricted to portions of the river downstream of Elsie Dam. There is ongoing debate about the historic occurrence of anadromous salmon above Dickson Falls, which is downstream of Elsie Dam at the outlet of Elsie Lake Reservoir. Detailed habitat surveys of the upper river have not been completed, but BC Ministry of Environment field notes indicate that good rearing and spawning habitat is distributed throughout the mainstem and tributaries, including areas around Oshinow Lake in the upper watershed. Resident species that occur above the dam include Rainbow Trout and Cutthroat Trout. A small population of Kokanee may also be present, although this is not confirmed (Burt & Associates and CBR & Associates 2003).

### Limiting Factors

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

- **Habitat Area:** Alterations in flow have affected the wetted area below the dam and in the reservoir, and have likely affected the availability of spawning and rearing habitat. This may be offset by improved passage at Lanterman and Dickson Falls, especially for Steelhead. Former spawning, rearing and overwintering areas in the reservoir are permanently lost or seasonally reduced by dam footprint, reservoir drawdown and flooding, and diversions. Urban development in the lower watershed (mostly in the Stamp and Somass) has reduced off-channel, riparian, wetland and estuarine habitat.
- **Habitat Quality:** Physical habitat quality below the dam may be altered by reduced wood and gravel recruitment however effects on gravel recruitment are likely minimal. Habitat quality in the estuary has been altered by urban development and industrial waste releases. High water temperatures in summer and early fall are a substantial concern in the Stamp and Somass rivers, however, temperature effects from the diversion are unlikely.
- **Access:** Dams block access to formerly useable habitat, and altered flow regimes and reservoir elevations affect fish passage in some locations. There remains ongoing debate regarding the historic occurrence of anadromous salmon in Elsie and Oshinow Lakes (Hatfield and Bos 2007). Passage conditions at Dickson Falls have improved for Steelhead as a result of the Water Use Plan pulse flows (Lewis et al. 2010).
- **Nutrient limitations:** The Ash River has a naturally low nutrient content, and therefore low productivity of fish and other biological components.

## Knowledge Status

### Habitat

Changes in operations as part the Ash River Water Use Plan have been implemented to improve habitat conditions, particularly downstream of the Elsie Dam (BC Hydro 2004). Monitoring showed that pulse flows of 10 cms have assisted in moving fish past Lanterman and Dickson Falls, and fish flows have improved rearing habitat (BC Hydro 2010). Since 2000, FWCP has conducted nutrient enhancement to increase biological productivity, developed a side channel in the lower Ash river (below Lanterman Falls) and has initiated several assessments related to fish passage that enhance access to habitat.

### Knowledge Gaps

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

- There remain uncertainties about the historical range of anadromous salmonids, and whether they were able to regularly ascend above Dickson Falls (Hatfield and Bos 2007).
- There is also interest, particularly from First Nations, to facilitate passage through Lanterman and Dickson Falls for Coho. However, there are also uncertainties about how this might affect Steelhead, which are the only anadromous fish to regularly access those areas.
- To help set priorities for restoration, the FWCP needs a better understanding of limiting factors that can be addressed by restoration initiatives, and a better understanding of the effects of previous restoration efforts.
- Information on Rainbow Trout and Cutthroat Trout populations is limited, as is the understanding of habitat limitations and opportunities for restoration for these species.

## 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. As additional context, it should be noted that fisheries management agencies have an overall responsibility to manage the fisheries resource at a level of abundance and distribution to support First Nations' traditional uses and rights. These responsibilities are met through other ongoing processes and it is not the direct responsibility of FWCP to accommodate First Nations treaty rights and aboriginal interests. That being said, First Nations' interests in overall conservation and sustainable use benefits have been incorporated into the development of this plan.

**Measures** — There are no specific measures required at this time, aside from those associated with Objective 1 and 2. As part of their overall management responsibilities, DFO uses information such as abundance trends and escapement estimates to regulate angling and commercial harvest. MoE collects information on angler days, catch per unit effort, and number of fishing licences sold in the region, which informs decisions related to angling regulations.



## ECOSYSTEM CHAPTER: WETLAND & RIPARIAN AREAS

### Actions for Wetland and Riparian Areas

The [Action Table](#) in this document (see page 20) 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 Ash 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. 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
<b>Category 1</b> – Natural riparian or wetland habitat	Largely intact ecosystems with natural disturbances sufficient to maintain subclimax communities and processes characteristics of wetlands and riparian ecosystems.
<b>Category 2</b> – 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.
<b>Category 3</b> – 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, forestry, and other stressors. There has also been habitat loss associated with conversion for forestry uses or success to different habitat types.

Restoration work has been conducted and small wetland areas have been established in coordination with Island Timberland. However, it is unknown if forestry activity on adjacent lands may threaten capacity and productivity of wetlands. There may be additional opportunities to work with the company to help identify and develop riparian and wetland areas.

### Knowledge Gaps

While wetland restoration and creation projects have been undertaken, there is not a comprehensive understanding of the wetland and riparian areas, nor the potential for their restoration or construction and securement. While wetland restoration and creation projects have been undertaken, the effectiveness of these projects in meeting management objectives has yet to be determined.

## 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 20) 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 Ash 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 Ash River Watershed, elevations range from sea level to 2000 m. At lower elevations, the climatic conditions are typified by moist, mild winters and warm but relatively dry summers. Upper elevations experience cooler temperatures, greater snowfall, and a shorter growing season. The watershed lies within the Georgian Depression Ecoprovince (Demarchi 1996) and variants of the Coastal Western Hemlock very dry maritime (CWHxm2) and moist maritime (CWHmm1 and CWHmm2) subzones at low elevations. 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

Forestry has a long history in the Ash River Watershed and remains the dominant habitat impact. Forestry altered the distribution of forest ages and species composition, and has resulted in a road network and associated direct and indirect impacts. The existence of hydroelectric infrastructure for nearly 60 years has had a more limited impact, beyond

the direct footprint of the Elsie reservoir, associated dams and penstock. Inundation from the reservoir resulted in a loss of 401 ha of terrestrial land (including riparian habitat) but the extent of other habitat changes has not been specifically quantified.

### Knowledge Gaps

Knowledge of species and ecosystems in the Ash River Watershed is limited. There have not been extensive inventories specifically targeting the Ash and the eastern half of the watershed is privately owned land.

## 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., fishing, 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.

ASH 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	ASH-ALL-RIA.01.01 <b>Develop a current habitat assessment map-P1</b>	1	Fish & Wildlife	<p>Develop a <b>current habitat assessment map</b> for priority fish &amp; wildlife species in the watershed. Habitats to be assessed &amp; mapped include:</p> <ul style="list-style-type: none"> <li>• Wetlands</li> <li>• Riparian Areas</li> <li>• Stream Habitats</li> <li>• Estuary Habitats</li> <li>• Connectivity Corridors</li> <li>• Forested Ecosystems (e.g., seral stage distribution)</li> <li>• Over-wintering habitat for species that utilize talus or rock features (e.g., bats, snakes)</li> <li>• Culturally Important Areas</li> </ul> <p>Mapping is to include as much on-the-ground information as possible relevant to the subject fish &amp; 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.</p>	Improved strategic planning for conservation and restoration opportunities.	Directed	Throughout



ASH 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
2	All	Research & Information Acquisition	ASH.ALL.RI.02.01 Conduct a limiting factors analysis-Lower Middle Ash River P1	1	Fish & Wildlife	<p><b>Conduct a limiting factors analysis</b> for priority fish and/or wildlife for the Ash 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 habitat-based actions proposed by the FWCP, and should be considerate of the root causes of degraded habitats and limitations to productive potential. This work could include baseline surveys (e.g., snorkel surveys) for population status assessment. For fish, sub-basins for assessment include the Lower and Middle Ash River (Priority 1), the Elsie Lake Reservoir/Upper Ash (Priority 2), the Stamp and Somass (Priority 2), and the Alberni estuary (Priority 1). Analyses should build upon previous projects 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. Work should be done in cooperation with private landowners and other land managers.</p> <p>*Please note that the FWCP may develop templates for this work. Please check with FWCP to see if these templates are available.</p>	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.	Directed	Throughout
			ASH.ALL.RI.02.02 Conduct a limiting factors analysis-Elsie Lake Reservoir/Upper Ash-P2	2					
			ASH.ALL.RI.02.03 Conduct a limiting factors analysis-Stamp and Somass-P2	2					
			ASH.ALL.RI.02.04 Conduct a limiting factors analysis-Alberni Estuary-P1	1					
			ASH.ALL.RI.02.05 Conduct a limiting factors analysis-Ash River watershed-P2	2					
3	All	Research & Information Acquisition	ASH.ALL.RI.03.01 Develop comprehensive habitat restoration/protection plan-Low Middle Ash Riv-P1	1	Fish & Wildlife	<p><b>Develop a comprehensive habitat restoration and protection plan</b> for fish and/or wildlife for the Ash 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</p>	To determine high priority, cost-effective habitat and/or species-based actions that can be supported by the FWCP.	Directed	Throughout

ASH 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
3 cont.			ASH.ALL.RI.03.02 Develop comprehensive habitat restoration/protection plan-Elsie Lake Res/Upper Ash-P2	2		<p>that protect important habitat from further degradation. Plans must include:</p> <ul style="list-style-type: none"> <li>• Baseline description of the watershed (hydrology, climate, topography);</li> <li>• Priorities of local First Nations for conservation and restoration;</li> <li>• Previous assessment and restoration works;</li> <li>• Distribution, timing, biological and critical habitat requirements and status of species in the watershed;</li> <li>• Clear goals and objectives based on a desired future condition;</li> <li>• Summary of habitat indicators and limiting factors (based on analyses of habitat pressure indicators, habitat state indicators, limiting factors analysis);</li> <li>• Knowledge gaps and recommended research and/or assessment priorities;</li> <li>• Restoration priorities with rationale/discussion;</li> <li>• Selected indicators and performance standards for effectiveness monitoring program; and,</li> <li>• Monitoring protocol and schedule.</li> </ul> <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 Steelhead and Coho and Chinook Salmon.</p>			
			ASH.ALL.RI.03.03 Develop comprehensive habitat restoration/protection plan-Stamp&Somass-P2	2					
			ASH.ALL.RI.03.04 Develop comprehensive habitat restoration/protection plan-Alberni Estuary-P1	1					

ASH 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
3 cont.			ASH.ALL.RI.03.05 Develop comprehensive habitat restoration/protection plan-Ash River Watershed-P2	2		<p>High priority wildlife includes bats, amphibians, and riparian-associated mammals and birds, and high priority wildlife habitat includes Category 1 wetland and riparian areas. Note that all estuary, riparian and wetland projects should include inventory of rare plants and invertebrates to prevent the destruction of at-risk habitats while carrying out other projects. Plans should be developed in association with local agency, First Nation and BC Hydro staff, landowners and other land managers.</p> <p>Sub-basins for fish plans include the Lower and Middle Ash (Priority 1), the Elsie Lake Reservoir/Upper Ash (Priority 2), the Stamp and Somass (Priority 2) and the Alberni estuary (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.</p> <p>Fish restoration plans should also build upon previous work in the watershed such as in FWCP Projects 02.AS.46, 05.AS.03, 06.ASH.02 and 07.ASH.03. For wildlife plans, build upon previous projects (e.g., Inventory &amp; Restoration Prescriptions of Wildlife Habitat (02.AS.45), Feasibility Assessment for Wildlife Restoration Activities in the Ash River Watershed (07.W.ASH.02) and Elsie Lake Amphibian Habitat Design Overview (11.W.ASH.03). This watershed is within the Canadian Wildlife Service's National Wetland Conservation Fund priority areas for Wetland Restoration and Enhancement.</p> <p>*Please note that the FWCP may develop templates for this work. Please check with FWCP to see if these templates are available.</p>			

ASH 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
4	All	Habitat-based Actions	ASH.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 ( <b>Action 1</b> ), inventory ( <b>Action 17</b> ), or by the restoration and protection plan ( <b>Action 3</b> ) 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	ASH.ALL.SB.04.02 Implement high priority species-based actions - P1	1					
5	All	Habitat-based Actions	ASH.ALL.HB.05.01 Implement restoration actions in Alberni estuary-P1	1	Fish & Wildlife	Implement restoration actions in the Alberni estuary for the benefit of fish & wildlife. If a restoration plan has been completed under action 3, please reference that plan for more information. Proponents should also contact the Barkley Salmon Working Group ( <a href="http://barkleysalmon.westcoastaquatic.ca/?page_id=10">http://barkleysalmon.westcoastaquatic.ca/?page_id=10</a> ) for potential priority projects. Examples of potential projects include: 1) restoration and maintenance of the Shoemaking marsh bench; 2) restoration of the City's old sewage lagoon; and 3) restore and enhance estuary intertidal plant communities as informed by the habitat assessment mapping (action 1).	Sustain and restore habitat capacity of the Alberni estuary.	Open	Alberni Estuary
6	All	Land Securement	ASH.ALL.LP.06.01 Conduct an options assessment conservation land purchase/protection-P1	1	Fish & Wildlife	Considering ecosystem, conservation and/or local management objectives, <b>conduct an options assessment for conservation land purchase/protection</b> that establishes priority area to be protected and identifies feasible mechanisms (e.g., fee-simple purchase, covenants, WHAs, etc.). In particular, identify opportunities to purchase/protect category 1 areas in the Ash River watershed, in partnership with other organizations. If a restoration plan has been completed under <b>Action 3</b> , please reference that plan for more information.	Prioritize locations and secure partnerships for land securement.	Open	Throughout

ASH 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
7	All	Land Securement	ASH.ALL.LP.07.01 <b>Land purchase/protect ion-P1</b>	1	Fish & Wildlife	<b>Land purchase/protection</b> in association with partner organizations to address fish and wildlife management objectives or to support habitat-based actions proposed by the FWCP. Land purchase/protection could address ecosystem function objectives across the watershed plan chapters of Rivers, Lakes & Reservoirs, Riparian/Wetland, and Upland/Dryland. Priority habitats include lands that play key roles in landscape connectivity for wildlife, wetlands and old growth forests (consider acquisition of older second-growth forests that will eventually acquire old-growth forest characteristics). Refer to options assessment findings, above in <b>Action 6</b> , before conducting land purchase/protection activities.	Conserve, protect and restore ecosystem function and resilience through land securement.	Open	Throughout
8	All	Monitoring & Evaluation	ASH.ALL.ME.08.01 <b>Develop and implement an integrated monitoring plan-P1</b>	1	Fish & Wildlife	Develop and implement an <b>integrated monitoring plan</b> for fish and/or wildlife in the Ash watershed or sub-basins in relation to existing agency monitoring programs, limiting factors analyses ( <b>Action 2</b> ), restoration plans ( <b>Action 3</b> ) 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
9	All	Monitoring & Evaluation	ASH.ALL.ME.09.01 <b>Assess success of habitat-based actions supported by FWCP-P1</b>	1	Fish & Wildlife	<b>Assess success of habitat-based actions supported by the FWCP.</b> 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

ASH 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
9 cont.						In particular, determine effectiveness of past wetland restoration activities. Potential projects to monitor include the Small Wetland Inventory and Construction in the Ash River Watershed (08.W.ASH.01) and Reservoir Wetland Enhancement in the Ash River Watershed (11.W.ASH.03).			
10	All	Monitoring & Evaluation	ASH.ALL.ME.10.01 Conduct condition assessments &/or maintenance on habitat enhancements-P2	2	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
11	Rivers, Lakes & Reservoirs	Research & Information Acquisition	ASH.RLR.RI.11.01 Benefits of a fertilization program-P1	1	Anadromous & Resident Salmonids	Undertake a quantitative assessment of the <b>benefits of a fertilization program</b> in the Lower and Middle Ash River and tributaries.	Assess priority of future actions associated with fertilization.	Open	Lower & Middle Ash
12	Rivers, Lakes & Reservoirs	Research & Information Acquisition	ASH.RLR.RI.12.01 Preliminary risk assessment of fish passage Lower and Middle Ash River-P2	2	Anadromous & Resident Salmonids	Develop a <b>preliminary risk assessment of fish passage improvements to the Lower and Middle Ash River</b> . Risk assessment would review the risks to resident fish and habitat displacement, of disease and aquatic invasive introduction. A high-level cost-benefit assessment of habitat-based actions to compare fish passage options in the Lower and Middle Ash (e.g., past Lanternman and Dixon falls) with other habitat enhancement options should be included in this risk assessment.	Assess trade-offs for fish passage in the Lower and Middle Ash and provide plan to increase passage if assessment indicates sufficient benefit.	Open	Lower & Middle Ash



ASH 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
13	Rivers, Lakes & Reservoirs	Habitat-based Actions	ASH.RLR.HB.13.0 1 Implement habitat restoration, enhancement ...- Lower Middle Ash Riv-P1	1	Anadromous & Resident Salmonids	<b>Implement habitat restoration, enhancement and/or protective measures</b> within sub-basins of the Ash watershed (refer to priorities of sub-basins above) to improve salmonid migration, spawning, incubation or rearing habitat. If a restoration plan has been completed under <b>Action 3</b> , please reference that plan for more information.	Sustain and restore habitat capacity and population viability of anadromous and resident salmonids.	Open	Throughout
			ASH.RLR.HB.13.0 2 Implement habitat restoration, enhancement... Elsie Lake Res/Upper Ash-P2	2					
			ASH.RLR.HB.13.0 3 Implement habitat restoration, enhancement.... - Stamp and Somass - P2	2					
			ASH.RLR.HB.13.0 4 Implement habitat restoration, enhancement... - Alberni Estuary-P1	1					
			ASH.RLR.HB.13.0 5 Implement habitat restoration, enhancement... - Ash River Watershed-P1	2					

ASH 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
14	Rivers, Lakes & Reservoirs	Habitat-based Actions	ASH.RLR.HB.14.0 <b>1 Conduct fertilization program-P2</b>	2	Anadromous & Resident Salmonids	<b>Conduct fertilization program</b> in the Lower and Middle Ash River, if quantitative cost-benefit analysis indicates sufficient benefit.	Improve rearing habitat capacity for anadromous and resident salmonids.	Open	Lower & Middle Ash
15	Rivers, Lakes & Reservoirs	Habitat-based Actions	ASH.RLR.HB.15.0 <b>1 Restore Somass River riparian areas-P2</b>	2	Anadromous & Resident Salmonids	<b>Restore Somass River riparian areas</b> to provide cover and shade for migrating adults, as well as protection for juvenile outmigrants.	Sustain and restore habitat capacity and population viability of anadromous and resident salmonids.	Open	Somass River
16	Rivers, Lakes & Reservoirs	Monitoring & Evaluation	ASH.RLR.ME.16.0 <b>1 Evaluate effectiveness of gravel placement at outlet of Dixon Lake-P2</b>	2	Anadromous & Resident Salmonids	<b>Evaluate effectiveness of gravel placement at outlet of Dixon Lake</b> (see Smith, B. 2004. Spawning gravel placements in Ash and Nanaimo River watersheds, Vancouver Island (2003)).	Monitoring/inventory to inform success of habitat-based actions.	Open	Throughout
17	Wetland & Riparian	Research & Information Acquisition	ASH.WAR.RI.17.0 <b>1 Inventory for species of interest that are likely in the watershed-P2</b>	2	Wildlife	<b>Inventory for species of interest that are likely in the watershed.</b> Inventory actions must meet the following criteria: <ul style="list-style-type: none"> <li>• 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"> <li>- 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;</li> <li>- How the inventory has been specifically designed to fill the above-noted data/knowledge gap; and</li> <li>- The decision-makers' commitment to using the data or information to support a specific decision.</li> </ul> </li> <li>• The data collection is well informed by a clear and specific management objective (land use plan,</li> </ul>	Maintain or, where feasible, increase the abundance of species of interest.	Open	Throughout

ASH 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
17 cont.	Upland & Dryland	Research & Information Acquisition	<b>ASH.UAD.RI.17.0 1 Inventory for species of interest that are likely in the watershed-P2</b>	2		<p>recovery plan etc.) that also informs the management decision or conservation action; this includes clarity of:</p> <ul style="list-style-type: none"> <li>- How the inventory work has been designed to specifically assess the status or condition of the objective; and,</li> <li>- How the data will be used to inform/improve/clarify the management objective.</li> </ul> <p>Species of interest reflect engagement from FWCP partners and include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Wolverine. Conduct genetic analysis on known Vancouver Island wolverine samples and compare to existing samples from mainland populations to assess subspecies designation. Unclear if <i>vancouverensis</i> is a distinct subspecies and warrants COSEWIC assessment and recovery planning. If analysis suggest subspecies difference, conduct inventory in high-probability watersheds.</li> <li>• Mesocarnivores (i.e., Ermine, Pacific Marten, American Mink and North American River Otter). Conduct risk assessment and evaluate population sustainability through a monitoring program. Note that genetic analyses may be needed to determine Ermine subspecies (<i>anguinae</i>) validity. Liaise with Vancouver Island marmot researchers to access their motion-sensitive camera data. If necessary, implement enhancement strategies to maintain sustainable populations. If part of a multi-year study, provide information about future objectives and</li> </ul>			

ASH 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
17 cont.						<p>actions.</p> <ul style="list-style-type: none"> <li>• Western Water Shrew (<i>brooksi</i> subspecies). Inventory through environmental DNA or other innovative methods (e.g., hair collection). Environmental DNA methodology can also be used concurrently to survey for at-risk amphibian species.</li> <li>• Western Screech-Owl, <i>kennicottii</i> subspecies (<i>Megascops kennicottii kennicottii</i>). If present, refer to the Recovery plan for the Western Screech-Owl, <i>kennicottii</i> subspecies in British Columbia (Ministry of Environment 2013) for priority species- and habitat-related conservation actions within the Ash River watershed.</li> <li>• Painted Turtle. Found in Ash watershed in 2010, could be more widespread in backcountry areas than previously known (BCCDC 2016). If present, refer to the Recovery plan for the Painted Turtle – Pacific Coast Population (<i>Chrysemys picta</i> pop. 1), in British Columbia (Western Painted Turtle Recovery Team 2016) for priority species- and habitat-related conservation actions within the Ash River watershed.</li> <li>• Amphibians (species of interest: Wandering Salamander and Western Toad). If present, refer to the Management Plan for the Wandering Salamander (<i>Aneides vagrans</i>) in British Columbia (BC Ministry of Environment 2017) and the Management plan for the Western Toad (<i>Anaxyrus boreas</i>) in British Columbia (Provincial Western Toad Working Group 2014) for conservation actions.</li> </ul>			
18	Wetland & Riparian	Habitat-based Actions	ASH.WAR.HB.18.01 Implement priority species- and habitat-related conservation actions...-P1	1	Wildlife Species at Risk	<b>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.</b> Conservation actions must be well informed by a clear and specific management objective and must be well informed by previous	Stable or increasing population of at-risk species. Habitat enhancement opportunities.	Open	Throughout

ASH 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
18 cont.	Upland & Dryland	Habitat-based Actions	ASH.UAD.HB.18.0 <b>2 Implement priority species- and habitat-related conservation actions...-P1</b>	1		inventory in the watershed.  <ul style="list-style-type: none"> <li>• Management Plan for Roosevelt Elk in British Columbia (Ministry of Forests, Lands and Natural Resource Operations 2015).</li> <li>• Recovery Strategy for the Vancouver Island Marmot (<i>Marmota vancouverensis</i>) in British Columbia (Vancouver Island Marmot Recovery Team 2008; being updated 2017).</li> <li>• Recovery Strategy for the Common Nighthawk (<i>Chordeiles minor</i>) in Canada (Environment Canada 2016).</li> <li>• Management Plan for the Northern Red-legged Frog (<i>Rana aurora</i>) in Canada [Proposed] (Environment Canada 2016).</li> </ul>			
19	Upland & Dryland	Habitat-based Actions	ASH.UAD.HB.19.0 <b>1 Determine presence, identify/protect bat Maternity roosts &amp; winter hibernacula-P1</b>	1	Bats	1) <b>Determine presence</b> of bat species, especially those species potentially vulnerable to White Nose Syndrome; 2) Through acoustic monitoring or other methods (e.g., radio-tracking, DNA), <b>identify bat maternity roosts and winter hibernacula</b> ; and 3) <b>Pursue protection of bat hibernacula and maternity roosts</b> (e.g., critical habitat, WHAs or wildlife habitat feature designations) that are identified.	Maintain or, where feasible, increase the abundance of species of interest. Identification of which species are present in the watershed. This work should lead to identification and protection of maternity roosts and hibernacula.	Open	Throughout

ASH 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
20	Upland & Dryland	Habitat-based Actions	ASH.UAD.HB.20.01 Restoration/enhancement of American Marten denning-P2	2	Pacific Marten	Evaluate options and implement restoration/enhancement of American Marten denning (or other) habitats.	Protect and/or restore rare and ecologically significant upland/dryland habitat.	Open	Throughout
21	All	Habitat-based Actions	ASH.ALL.HB.21.01 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: <a href="http://www.pacificbirds.org/nawca-priority-species/">http://www.pacificbirds.org/nawca-priority-species/</a> . Proposed projects should refer to the priority lists and recommended conservation actions/guidance in the implementation plans ( <a href="http://www.pacificbirds.org/science-and-planning/state-or-regional-plans/">http://www.pacificbirds.org/science-and-planning/state-or-regional-plans/</a> ). The Strathcona Provincial Park Important Bird Area (BC265; Bird Studies Canada 2016) overlaps the western side of the Ash watershed (important for White-Tailed Ptarmigan).	Varied types of species and habitat conservation, protection and enhancement opportunities.	Open	Throughout
22	Wetland & Riparian	Habitat-based Actions	ASH.WAR.HB.22.01 Implement wetland and riparian restoration projects-P1	1	Wildlife	Implement wetland and riparian restoration projects that are identified as high priorities through inventory, mapping or assessment. If a restoration plan has been completed under <b>Action 3</b> , 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



ASH 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
23	All	Research & Information Acquisition	<b>ASH.ALL.RI.23.01 Inventory &amp; restoration for at-risk...and/or culturally important plant species-P3</b>	<b>3</b>	At-risk Plants	<b>Inventory and restoration for at-risk (e.g., SARA-listed, red- and blue-listed) and/or culturally important plant species and ecological communities.</b> Potential species of interest: Salish Daisy, Snow Bramble, Olympic Aster, Western Hedysarum, Pointed Rush, Oldgrowth specklebelly, Trematodon asanoi, Olympic Onion, Smooth Douglasia, Sand-dwelling Wallflower, Three-leaved Lewisia, Corrupt Spleenwort, and Upswept Moonwort, Small Spike-rush (around lakes, a blue-listed plant often used for medicinal purposes). All riparian and wetland projects should include inventory of rare plants.	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

## REFERENCES

- Atkinson, R. B., J. E. Perry, G. B. Noe, W. L. Daniels, and J. Cairns, Jr. 2010. Primary productivity in 20-year old created wetlands in southwestern Virginia. *Wetlands* 30:200-210.
- BC Hydro. 2003. Consultative Committee Report: Ash River Water Use Plan. Executive Summary available at: [https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/environment/pdf/wup\\_ash\\_river\\_executive\\_summary\\_pdf.pdf](https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/environment/pdf/wup_ash_river_executive_summary_pdf.pdf).
- BC Hydro. 2004. Ash River Project Water Use Plan. Revised for Acceptance by the Comptroller of Water Rights. Available at: [https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/environment/pdf/wup\\_ash\\_river\\_water\\_use\\_plan\\_pdf.pdf](https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/environment/pdf/wup_ash_river_water_use_plan_pdf.pdf).
- BC Hydro. 2006. BC Hydro Fish Entrainment Strategy. Prepared for BC Hydro Generation Operations, Burnaby, BC.
- BC Hydro. 2016. Fish passage decision framework for BC Hydro facilities.
- BC Hydro. 2010. Annual Report 2010, Ash River Project WUP Monitoring Program and Physical Works, October 30, 2010. Available at: [http://www.bchydro.com/etc/medialib/internet/documents/planning\\_regulatory/wup/vancouver\\_island/2010\\_q4/ash\\_annual\\_report.Par.0001.File.ASH-Annual-Report-2010-Oct-30.pdf](http://www.bchydro.com/etc/medialib/internet/documents/planning_regulatory/wup/vancouver_island/2010_q4/ash_annual_report.Par.0001.File.ASH-Annual-Report-2010-Oct-30.pdf).
- Burt & Associates and CBR & Associates. 2003. Assessment of Fish and Fish Habitat in the Elsie Lake Basin and Identification of Restoration Options. Prepared for Hupacasath First Nations, Port Alberni, with financial support from BC Hydro, Bridge Coastal Fish and Wildlife Restoration Program.
- Green, R.N., and K. Klinka. 1994. A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region. Report Land management handbook #28. British Columbia Ministry of Forests, Burnaby, BC.
- Hatfield, T., and D. Bos. 2007. Assessment of Historic Distribution of Anadromous Salmonids in the Ash River Watershed Using Stable Isotope Analysis of Lake Sediments. BCRP Project 06.Ash.04.
- Lewis, A., H. Wright, K. Healey, and K. Ganshorn. 2010. Ash River WUP Adult Fish Passage Monitoring Program – Year 5 Summary. Consultant’s report prepared for BC Hydro, Vancouver Island Generation, #10 John Hart Rd, Campbell River, BC V9H 1P1.
- McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-42,156 p.
- National Research Council. 2001. Compensating for wetland losses under the Clean Water Act. National Academy Press, Washington, DC.

## PREVIOUS STRATEGIC PLANNING DOCUMENTS

- Bridge-Coastal Restoration Program. 2000 Strategic Plan, Volume 2, Watershed Action Plans, Chapter 5: Ash River.
- Fish & Wildlife Compensation Program. 2011 Ash River Watershed – Watershed Plan. Final Draft.
- Fish & Wildlife Compensation Program. 2011 Ash River Watershed – Riparian and Wetlands Action Plan. Final Draft.
- Fish & Wildlife Compensation Program. 2011 Ash River Watershed – Salmonid Action Plan. Final Draft.
- Fish & Wildlife Compensation Program. 2011 Ash River Watershed – Species of Interest Action Plan. Final Draft.