



CLAYTON FALLS WATERSHED ACTION PLAN

FINAL November 14, 2017
(Rev. 5Nov20)

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 existing BC Hydro dams.



The Fish & Wildlife Compensation Program is conserving and enhancing fish and wildlife impacted by BC Hydro dam construction in this watershed. Above photo: Clayton Falls Creek hydroelectric project, Credit: BC Hydro. Cover photo: Northern Goshawk, 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: CLAYTON FALLS 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 Clayton Falls watershed. The focus of the next five-year period will be Priority Actions identified for fish, wildlife, and habitats in three broad ecosystem categories:

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

These ecosystem categories are described in the Ecosystem chapters and proposed Priority Actions are in the [Action Table](#) at the end of this document. The Priority Actions are intended to support FWCP's strategic objectives of conservation, sustainable use and community engagement.

Priority actions eligible for FWCP funding fall into one or more of the following action types:

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

This Action Plan, 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 www.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

TABLE OF CONTENTS

Executive Summary: Clayton Falls Watershed Action Plan	3
Table of Contents	5
Clayton Falls Watershed Background	6
Introduction	6
Setting	6
Land Ownership in the Clayton Falls Watershed	7
Impacts and Threats.....	8
Objectives for the Clayton Falls Watershed.....	8
FWCP Projects Implemented: Clayton Falls Watershed	9
Interactions with Other Ongoing Processes	9
Ecosystem Chapter: Rivers, Lakes & Reservoirs	11
Actions for Rivers, Lakes & Reservoirs	11
Aquatic Habitat in the Clayton Falls Watershed	11
Limiting Factors.....	11
Knowledge Status.....	11
Objectives and Measures.....	12
Ecosystem Chapter: Wetland & Riparian Areas.....	13
Actions for Wetland & Riparian Areas	13
Wetland and Riparian Areas in the Clayton Falls Watershed	13
Limiting Factors.....	13
Knowledge Status.....	14
Objectives and Measures.....	14
Ecosystem Chapter: Upland & Dryland.....	15
Actions for Uplands & Drylands	15
Upland and Dryland in the Clayton Falls Watershed	15
Limiting Factors.....	15
Knowledge Status.....	15
Objectives and Measures.....	16
Action Table	17
References	25

CLAYTON FALLS 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 on the process that was followed to develop Action Plans. The structure of this Action Plan is shown in Figure 1.

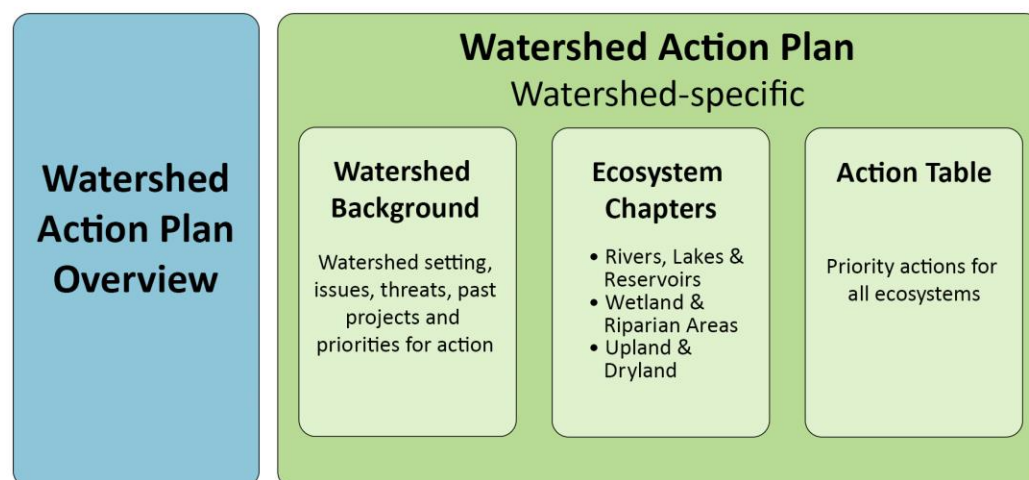


Figure 1: Structure of FWCP Action Plan Overview and Action Plan components.

Setting

Clayton Falls Creek watershed is immediately west of Bella Coola and flows north into North Bentinck Arm (Figure 2). The drainage basin is approximately 93 km² and experiences a typical coastal climate. Inflows are primarily rainfall driven, although snow at higher elevations provides increased flows during the spring freshet, and glaciers provide a continual flow during the summer. It is a highly variable system, with winter flows normally being the lowest, except during rain events when peak flows occur.

The Clayton Falls Creek hydroelectric project is not part of BC Hydro's integrated generation system, which provides electricity to most of the province. The facility is located about four kilometres (km) west of Bella Coola on Clayton Falls Creek. The Clayton Falls Creek project is a run-of-river facility that is controlled remotely from Ah-Sin-Heek Diesel Generating Station. The hydroelectric project consists of Clayton Falls headpond (which has negligible storage capacity), dam and generating station. The dam is located approximately 720 m upstream from the mouth of Clayton Falls Creek. Water flows from intakes in the headpond via a penstock to two generating turbines in the powerhouse with a total of 2 MW capacity. Water from the turbines is discharged into a 60 m long tailrace, which also serves as a spawning channel for Pink and Chum Salmon.

The watershed is of interest to the community of Bella Coola and the Nuxalk First Nation.

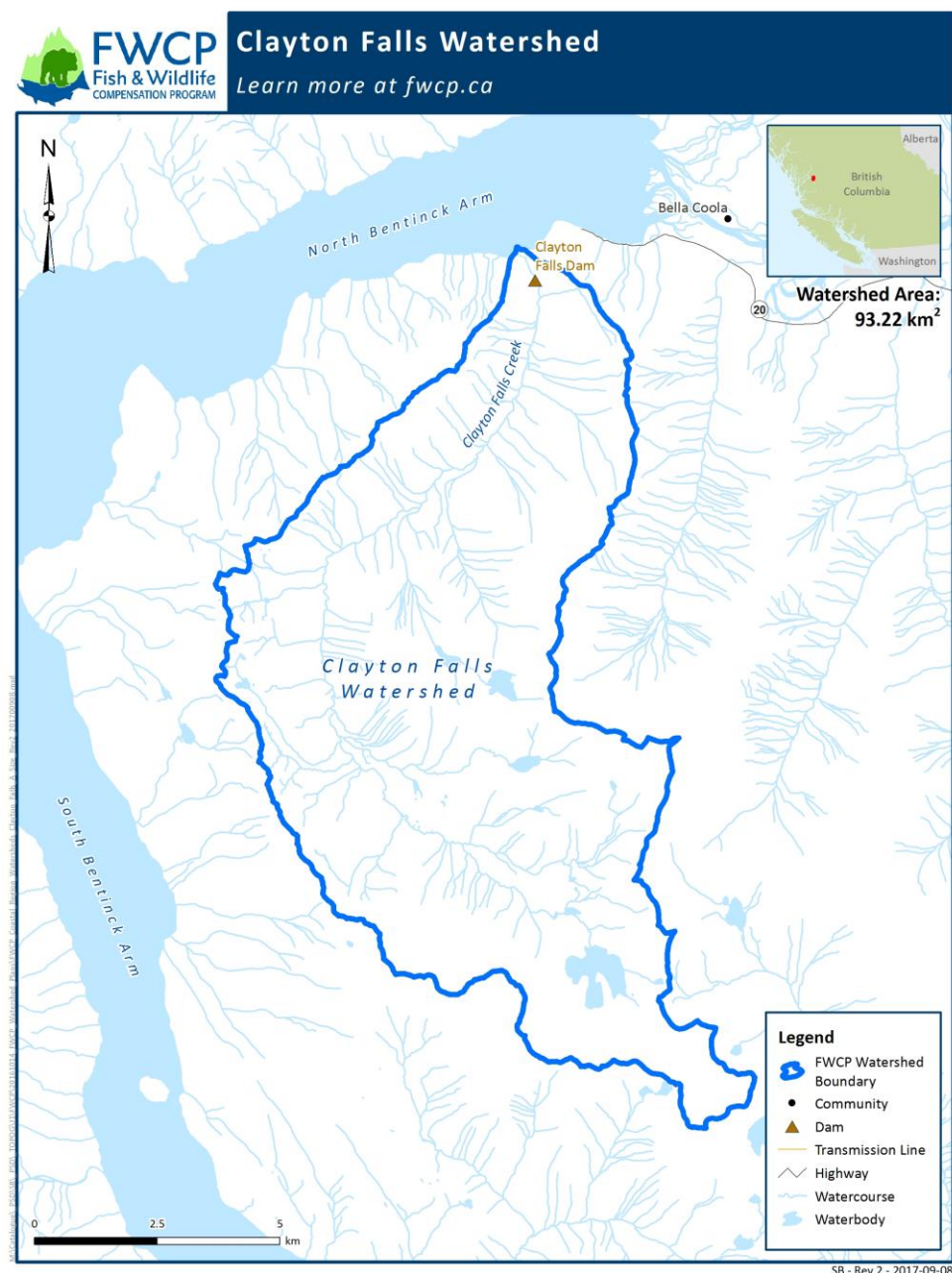


Figure 2: The FWCP Clayton Falls Watershed boundary.

Land Ownership in the Clayton Falls Watershed

The Clayton Falls Watershed is almost entirely Crown land, the northern half is within the Bella Coola Community Forest and the southern half is within BC Parks' Clayton Falls Conservancy (created in 2008, 5047 hectares in size). Hiking, skiing, and snowmobiling are all common activities within the conservancy. BC Hydro owns a small amount of land around its facilities. 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.

Impacts and Threats

Fish and wildlife habitat and, consequently, species have been significantly altered due to the construction of the dams, the development of hydropower, and alterations in the hydrologic regimes of the systems.

Hydro-related Impacts

Inundation: The dam inundated less than one hectare (ha) of land.

Habitat loss: 2 ha of riparian habitat. Small areas of spawning habitat and rearing habitat downstream of the falls may be seasonally altered due to operations or from natural events. There is reduced recruitment of sediment and large woody debris.

Migration barriers: The falls are 200m from the mouth and presented a natural barrier to fish.

Altered Flow Regime: Alterations in the flow regime have likely impacted fish productivity in the river below the dam.

Non-hydro Impacts

Impacts to wildlife in the watershed are mostly from forestry operations and roads which increases human access to the watershed.

Objectives for the Clayton Falls 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. The objectives and sub-objectives provide details needed to translate policy and plans into actions and to evaluate the consequences of these actions. 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 (Chum, Pink, and Coho); and, (b) Dolly Varden and Rainbow Trout.	Maintain and, where feasible, increase the abundance and distribution of species of interest (e.g., federally listed species-at-risk listed species and species identified through government, community, and First Nations engagement). See Action Table for specific species.	Maintain and, where feasible, increase the abundance and distribution of species of interest (e.g., federally listed species-at-risk listed species 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: Clayton Falls Watershed

FWCP has been funding projects in the Clayton Falls Watershed since 1999 under the Bridge-Coastal Restoration Program (BCRP) and subsequently under the Fish & Wildlife Compensation Program¹ 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

No projects were undertaken during the 2010/2011 to 2015/2016 FWCP project years that addressed aquatic species or habitats in the Clayton Falls Watershed.

Wetland & Riparian Areas

A project in 2014 detected Western Toads, Coastal Tailed Frogs, Roughskin Newts, and Northwestern Salamanders in the wetland and riparian areas of the Clayton Falls Watershed. Currently no Wetland and Riparian species have been identified as high priority, although bats, which are a high priority species group included in the Upland and Dryland chapter, would likely benefit from wetland and riparian restoration.

Upland & Dryland

A single project was undertaken in the Clayton Falls Watershed during the 2010/2011 to 2015/2016 FWCP project years that addressed Upland and Dryland species or habitat. This project was focused on inventory of bats (high priority) and Northern Goshawk (medium priority), and resulted in a proposed Northern Goshawk Wildlife Habitat Area. Occurrence data for various amphibians, reptiles, birds and mammals were also collected.

Interactions with Other Ongoing Processes

Water Use Plan (WUP) – BC Hydro undertook Water Use Planning in Clayton Falls 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.

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

ECOSYSTEM CHAPTERS

CLAYTON FALLS WATERSHED

ECOSYSTEM CHAPTER: RIVERS, LAKES & RESERVOIRS

Actions for Rivers, Lakes & Reservoirs

The [Action Table](#) in this document (see page 17) 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 Clayton Falls Watershed

Clayton Falls Creek drains into the North Bentinck Arm near Bella Coola and has a drainage area of 93 km². The current anadromous stream length is roughly 200 m from the mouth, and includes an estuarine section, 100m of stream habitat up to the confluence with the tailrace, a 30m tailrace, and 51 m of stream habitat from the tailrace to Clayton Falls (Kynoch Resources 2009). A waterfall on Clayton Falls Creek blocks upstream migration of salmon, although anecdotal evidence suggests that salmon once may have made it upstream of the waterfall (prior to a rockfall event). The watershed hosts populations of Coho, Chum, Pink, Rainbow Trout/Steelhead, and Dolly Varden.

Limiting Factors

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

1. **Habitat area:** Spawning and rearing habitat area for anadromous salmonids in the Clayton Falls Creek is limited by the short section of river present below the falls to the confluence with the North Bentinck Arm. Small areas of spawning habitat and rearing habitat downstream of the falls may be seasonally altered due to operations or from natural events. Above the falls, the dam resulted in 2 ha of riparian habitat loss.
2. **Habitat quality:** Appropriately sized substrate for spawning of pink and chum is limited in the upstream channel near the falls, tailrace, and lower reach of Clayton Falls Creek. Due to the high energy nature of the stream, habitat refugia (e.g., large woody debris) are limiting for juvenile salmon. Alterations in the flow regime have likely impacted fish productivity in the river below the dam, including reduced recruitment of sediment and large woody debris.
3. **Access:** The original falls are 200 m from the mouth and presented a natural barrier to fish.
4. **Water quality:** Water quality is generally considered pristine in Clayton Falls Creek. Increased turbidity from natural erosion or mass wasting events in the upper watershed and/or during periods of heavy rain or rapid snowmelt can increase turbidity in the stream (Sigma Engineering 2004).

Knowledge Status

Habitat

The stream below the dam at Clayton Falls Creek has a steep gradient and is a high energy stream. Nevertheless, the lower 200 m provide intertidal and stream spawning habitat for pink and chum salmon. Most of the spawning takes place in the tailrace channel; however, Pink and Chum Salmon also migrate upstream as far as the base of the falls to spawn. Spawning success in the mainstem is limited by the availability of suitable gravels, which account for only small portions of the substrate. Current maintenance activities by BC Hydro at a water intake site above the falls result in the removal of gravel sediments that accumulate around the intake screen and hinder the effectiveness of water delivery. This intake is used to deliver minimum 'fish water' flow in the Clayton Falls Creek Generating Station tailrace when both generating units are not in operation. The lower reaches provide good rearing habitat with boulders, cascades and a high gradient for Rainbow Trout/Steelhead, Coho Salmon and Dolly Varden.

Knowledge Gaps

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

- There is relatively little known about the abundance of species in the watershed. Before further actions can be taken, further species inventory is required. For example, recent surveys have not documented rainbow trout/steelhead in the watershed (Kynoch Resources 2009).
- Appropriately sized substrate and habitat refugia (e.g., large woody debris) are limiting in the anadromous reach below the falls. However, there is uncertainty associated with the cost vs benefit of habitat-based actions to improve spawning and rearing habitat for salmonids.
- There is uncertainty associated with the habitat capacity of the estuary for juvenile rearing and whether any habitat-based actions could be undertaken in the estuary to improve productivity.

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:

- **Sustain and increase the population viability of anadromous salmon**
Anadromous salmon (i.e., Chum, Pink, and Coho) are important species in the Clayton Falls system.

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

- **Sustain and increase the population viability of resident salmonids**
Dolly Varden reside in Clayton Falls Creek below and above the anadromous barrier.

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

Objective 3: Maintain or improve opportunities for sustainable use.

This objective reflects the important sustainable use benefits that can be derived from healthy fish populations. Many salmonid species are the focus of First Nations, commercial and recreational fisheries. Consequently, any actions aimed at achieving the above objective also support this sustainable use objective. 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 treaty rights and aboriginal interests. In addition, 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 & Riparian Areas

The [Action Table](#) in this document (see page 17) 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 Clayton Falls 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 system, 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. In the Clayton Falls Watershed, there has been little impact on wetland and riparian areas because only a very small amount was inundated by impoundments (<1 ha) and there is very little wetland or riparian habitat downstream of the dam.

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 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, soil conditions, (e.g., Atkinson et al. 2010).

Knowledge Status

Habitat

Basin-wide trends in the abundance, distribution and productivity of wetland and riparian habitats have not been compiled. The area of inundation has not increased since dam construction, but the productivity of adjacent habitats has continued to be affected, either directly or indirectly as a result of BC Hydro operations. The estuary area at the base of Clayton Falls Creek may have been negatively impacted by changes in flow as a result of the Clayton Falls Generating Facility. The estuary provides critical habitat for salmonids as they transition from fresh to salt water and for numerous other mammal (e.g., bats) and bird species.

Knowledge Gaps

A full inventory of amphibian species utilizing wetlands and riparian habitat has not taken place in the Clayton Falls Watershed. Presence of at-risk plant species is also of interest.

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 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.

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.

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 Uplands & Drylands

The [Action Table](#) in this document (see page 17) 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 Clayton Falls 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 forests, and alpine ecosystems. Different habitats are associated with distinct species assemblages that react to direct or indirect stressors in their distinct habitat niches.

Lower elevations of the Clayton Falls Watershed lie within the Coastal Western Hemlock Moist Submaritime central (CWHms2) biogeoclimatic variant. Above the CWHms2, the Coastal Western Hemlock Very Wet Maritime Montane variant (CWHvm2) occurs, and above that, the Mountain Hemlock Moist Maritime Windward variant (MHmm1). Upper elevations are within the Coastal Mountain-heather alpine (undifferentiated and parkland; CMAunp) subzone.

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

This watershed is located within the Great Bear Rainforest and thus is managed through an ecosystem-based management approach that maintains ecosystem integrity and improves human well-being concurrently. A Landscape Reserve Design within each Landscape Unit should contribute to the protection and stewardship of Red-Listed Plant Communities, Blue-Listed Plant Communities, habitat important for species at risk, ungulate winter range, and habitat for regionally important wildlife including, but not limited to, Mountain Goats, Grizzly Bears, Northern Goshawks, Tailed Frogs, and Marbled Murrelets.

Knowledge Gaps

Knowledge of species and ecosystems in the Clayton Falls Watershed is limited.

Objectives and Measures

The following objectives have been developed to define the scope of the Upland & Dryland Ecosystem Chapter, which guides funding decisions related conservation, restoration, enhancement and sustainable use. 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 productive and diverse upland and dryland ecosystems.

Actions under this objective are aimed at restoring conditions similar to those that exist under natural and local disturbance regimes, or at protecting/enhancing rare or ecologically significant features.

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

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

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

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

Objective 3: Maintain or improve opportunities for sustainable use.

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

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

ACTION TABLE

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

CLAYTON FALLS WATERSHED ACTION TABLE							Version: 9Aug17		
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
1	All	Research & Information Acquisition	CLA.ALL.RI.01.0 1 Develop a current habitat assessment map-P1	1	Fish & Wildlife	<p>Develop a current habitat assessment map for priority fish & wildlife species in the watershed. Habitats to be assessed & mapped include:</p> <ul style="list-style-type: none">• Wetlands• Riparian Areas• Stream Habitats• Estuary 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 <p>Mapping is to include as much on-the-ground information as possible relevant to the subject wildlife species. The assessment should focus on practical conservation and restoration opportunities. 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.). Ensure products are complimentary to BC Parks long-term monitoring strategies (e.g., alpine monitoring protocols) and can inform conservation strategies. Recommendations should be made through this work for future management actions and assessments.</p>	Improved strategic planning for restoration opportunities.	Directed	Throughout

CLAYTON FALLS WATERSHED ACTION TABLE								Version: 9Aug17	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
2	All	Research & Information Acquisition	CLA.ALL.RI.02.0 1 Conduct a limiting factors analysis-Lower Clayton Falls Creek downstream of the dam-P1	1	Fish & Wildlife	<p>Conduct a limiting factors analysis for priority fish and/or wildlife for the Clayton Falls watershed or sub-basins to support prioritization of future projects. This will include an assessment of population status, habitat status or habitat capacity and/or a cost-benefit analysis of any habitat-based actions proposed by the program, and should be considerate of the root causes of degraded habitats and limitations to productive potential. For fish, sub-basins for assessment include the Lower Clayton Falls Creek downstream of the dam (Priority 1), the Upper Clayton Falls Creek upstream of the dam (Priority 3), and the estuary (Priority 2). Analyses should build upon previous and ongoing assessments, including the Water Use Plan studies, in association with local agency, First Nation and/or 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.	Open	Throughout
			CLA.ALL.RI.02.0 2 Conduct a limiting factors analysis-Upper Clayton Falls Creek upstream of the dam-P3	3					
			CLA.ALL.RI.02.0 3 Conduct a limiting factors analysis-Clayton Falls Creek estuary-P2	2					
			CLA.ALL.RI.02.0 4 Conduct a limiting factors analysis-Clayton Falls Watershed-P3	3					
3	All	Research & Information Acquisition	CLA.ALL.RI.03.0 1 Develop a comprehensive restoration & protection Plan-Lower Clayton Falls Crk downstream of the dam-P1	1	Fish & Wildlife	<p>Develop a comprehensive restoration and protection plan for fish and/or wildlife in the Clayton Falls watershed or sub-basins in relation to limiting factors analyses and assessment of population status/habitat capacity. Restoration refers to habitat or species-based actions that restore habitat capacity or population viability, while protection includes habitat-based actions or land securement that protect important habitat from further degradation. Plans must include:</p> <ul style="list-style-type: none"> • Baseline description of the watershed (hydrology, climate, 	To determine high priority, cost-effective habitat and/or species-based actions that can be supported by the FWCP.	Directed	Throughout

CLAYTON FALLS WATERSHED ACTION TABLE							Version: 9Aug17		
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
3 cont.			CLA.ALL.RI.03.0 2 Develop a comprehensive restoration & protection plan- Upper Clayton Falls Creek upstream of the dam-P3	3		<p>topography);</p> <ul style="list-style-type: none"> • Priorities of local First Nations for conservation and restoration; • Previous assessment and restoration works; • Distribution, timing, biological and critical habitat requirements and status of species in the watershed; • Clear goals and objectives based on a desired future condition; • Summary of habitat indicators and limiting factors (based on analyses of habitat pressure indicators, habitat state indicators, limiting factors analysis); • Knowledge gaps and recommended research and/or assessment priorities; • Restoration priorities with rationale/discussion; • Selected indicators and performance standards for effectiveness monitoring program; and, • Monitoring protocol and schedule. <p>Plans may be multi-species and habitat-based or they may be focused on individual high priority species in the watershed. High priority fish species include Chum, Pink and Coho Salmon. High priority wildlife include bats, amphibians, and riparian-associated mammals and birds. 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 Clayton Falls Creek downstream of the dam (Priority 1), the Upper Clayton Falls Creek upstream of the dam (Priority 3), and the estuary (Priority 2). Restoration plans are best developed as 'living documents' so that they can be updated over time.</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>			
			CLA.ALL.RI.03.0 3 Develop a comprehensive restoration and protection plan- Clayton Falls Creek estuary-P2	2					
			CLA.ALL.RI.03.0 4 Develop a comprehensive restoration and protection plan- Clayton Falls Watershed-P3	3					

CLAYTON FALLS WATERSHED ACTION TABLE								Version: 9Aug17	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
4	All	Habitat-based Actions	CLA.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 13), 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	CLA.ALL.SB.04.02 Implement high priority species-based actions-P1	1					
5	All	Monitoring & Evaluation	CLA.ALL.ME.05.01 Develop and implement an integrated monitoring plan-P2	2	Fish & Wildlife	Develop and implement an integrated monitoring plan for fish and/or wildlife in the Clayton 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 undertaken 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
6	All	Monitoring & Evaluation	CLA.ALL.ME.06.01 Assess success of habitat-based actions supported by FWCP-P2	2	Fish & Wildlife	Assess success of habitat-based actions once they are 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 restoration actions and support future planning and prioritization.	Open	Throughout
7	All	Monitoring & Evaluation	CLA.ALL.ME.07.01 Conduct condition assessments and/or maintenance on habitat enhancements-P3	3	Fish & Wildlife	Conduct condition assessments and/or maintenance on habitat enhancements once they are 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

CLAYTON FALLS WATERSHED ACTION TABLE								Version: 9Aug17	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
8	Rivers, Lakes & Reservoirs	Research & Information Acquisition	CLA.RLR.RI.08.01 Assess gravel as a limiting factor to fish production-P2	2	Anadromous Salmonids	Assess gravel as a limiting factor to fish production in the tailrace and lower reach of Clayton Falls Creek in consideration of previous assessments in the watershed such as the Water Use Plan studies.	To support gravel enhancement, if required and if cost-benefit indicates sufficient benefit.	Open	Lower Clayton
9	Rivers, Lakes & Reservoirs	Research & Information Acquisition	CLA.RLR.RI.09.01 Assess the potential to add large woody debris-P2	2	Anadromous & Resident Salmonids	Assess the potential to add large woody debris to the lower reaches of Clayton Falls Creek.	To support channel complexing, if required and if cost-benefit indicates sufficient benefit.	Open	Lower Clayton
10	Rivers, Lakes & Reservoirs	Research & Information Acquisition	CLA.RLR.RI.10.01 Assess population status and/or habitat capacity of resident fish-P3	3	Resident Salmonids	Assess population status and/or habitat capacity of resident fish in the Upper Clayton Falls Creek upstream of the dam.	To determine high priority, cost-effective habitat-based actions that can be supported by the FWCP.	Open	Upper Clayton
11	Rivers, Lakes & Reservoirs	Habitat-based Actions	CLA.RLR.HB.11.01 Improve salmon spawning and incubation habitat through gravel placement-P2	2	Anadromous Salmonids	Improve salmon spawning and incubation habitat through gravel placement in the Lower Clayton Falls Creek. Gravel placement actions would be best informed by a restoration plan (e.g., under Action 3) including the development of a maintenance schedule (e.g., under Action 6).	Sustain and increase population viability of anadromous salmonids.	Open	Lower Clayton

CLAYTON FALLS WATERSHED ACTION TABLE								Version: 9Aug17	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
12	Rivers, Lakes & Reservoirs	Habitat-based Actions	CLA.RLR.HB.12.01 Conduct habitat complexing to improve salmonid rearing habitat-P2	2	Anadromous & Resident Salmonids	Conduct habitat complexing to improve salmonid rearing habitat in the Lower Clayton Falls Creek. A cost-benefit analysis should be conducted to address high flow issues in the area before complexing structures are installed.	Sustain and increase population viability of anadromous and resident salmonids.	Open	Lower Clayton
13	Wetland & Riparian	Research & Information Acquisition	CLA.WAR.RI.13.01 Inventory for species of interest that are likely in the watershed-P2	2	Wildlife	<p>Inventory for species of interest that are likely in the watershed. Inventory actions must meet the following criteria:</p> <ul style="list-style-type: none"> • The data collected will clearly inform a specific natural resource management decision or conservation action; this includes a clear understanding of: <ul style="list-style-type: none"> - The data or knowledge gap that is currently limiting a decision-maker or party(ies) from making a conservation decision or undertaking a conservation action; - How the inventory has been specifically designed to fill the above-noted data/knowledge gap; and - The decision-makers' commitment to using the data or information to support a specific decision. • The data collection is well informed by a clear and specific management objective (land use plan, recovery plan etc.) that also informs the management decision or conservation action; this includes clarity of: <ul style="list-style-type: none"> - How the inventory work has been designed to specifically assess the status or condition of the objective; and, - How the data will be used to inform/improve/clarify the management objective. <p>Species of interest reflect engagement from FWCP partners and include, but are not limited to:</p> <ul style="list-style-type: none"> • Mesocarnivores (i.e., Pacific Marten, Wolverine). Conduct risk assessment and evaluate population sustainability through a monitoring program. If necessary, implement enhancement strategies to maintain sustainable populations. If part of a multi-year study, provide information about future objectives and actions. • Porcupines. Evaluate distribution and abundance in coastal forests and examine potential causes for apparent declines over past 25 years. 	Maintain or, where feasible, increase the abundance of species of interest.	Open	Throughout
	Upland & Dryland	Research & Information Acquisition	CLA.UAD.RI.13.02 Inventory for species of interest that are likely in the watershed-P2	2					

CLAYTON FALLS WATERSHED ACTION TABLE								Version: 9Aug17	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
14	Wetland & Riparian	Habitat-based Actions	CLA.WAR.HB.14.01 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.	Stable or increasing population of at-risk species. Habitat enhancement opportunities.	Open	Throughout
	Upland & Dryland	Habitat-based Actions	CLA.UAD.HB.14.01 Implement priority species- and habitat-related conservation actions-P1	1		<ul style="list-style-type: none"> Management plan for the Mountain Goat (<i>Oreamnos americanus</i>) in British Columbia (Mountain Goat Management Team 2010). Large population declines are believed to have occurred on the coast. Refer to the Ecosystem-Based Management objectives for the Great Bear Rainforest. Management Plan for the Coastal Tailed Frog (<i>Ascaphus truei</i>) in British Columbia (B.C. Ministry of Environment 2015). Build on inventories previously conducted by the BC Conservation Corp and FWCP project 14.W.CLA.01 Bat and Goshawk Surveys of the Clayton Falls Watershed. Refer to the Ecosystem-Based Management objectives for the Great Bear Rainforest. Follow-up on proposed Tailed Frog Wildlife Habitat Areas. Management plan for the Western Toad (<i>Anaxyrus boreas</i>) in British Columbia (Provincial Western Toad Working Group 2014). 			
15	Upland & Dryland	Habitat-based Actions	CLA.UAD.HB.15.01 Identify & protect....bat maternity roosts and winter hibernacula-P1	1	Bats	Acoustic monitoring and mist-netting has determined species presence (14.W.CLA.01 Bat and Goshawk Surveys of the Clayton Falls Watershed). Through acoustic monitoring or other methods (e.g., radio-tracking, DNA), identify and protect (e.g., critical habitat, WHAs or wildlife habitat feature designations) bat maternity roosts and winter hibernacula.	Protect and/or restore rare and ecologically significant upland/dryland habitat. Protect and/or restore rare and ecologically significant upland/dryland habitat.	Open	Throughout

CLAYTON FALLS WATERSHED ACTION TABLE								Version: 9Aug17	
Action #	Ecosystem Chapter	Action Type	Priority Action Short Description	Priority	Target Species	Priority Action	Intended Outcome	Delivery Approach	Location
16	Upland & Dryland	Habitat-based Actions	CLA.UAD.HB.16.01 Restore and enhance the supply of cavities in trees for large cavity users-P3	3	Northern Flying Squirrel, Pacific Marten	Restore and enhance the supply of cavities in trees for large cavity users (e.g., Pacific Marten, Flying Squirrels) after multi-mesocarnivore surveys have been completed (under Action 12).	Protect and/or restore rare and ecologically significant upland/dryland habitat.	Open	Throughout
17	All	Habitat-based Actions	CLA.ALL.HB.17.01 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/).	Maintain or, where feasible, increase the abundance of species of interest.	Open	Throughout
18	Wetland & Riparian	Habitat-based Actions	CLA.WAR.HB.18.01 Implement wetland and riparian restoration projects-P2	2	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 Action 3 , please reference that plan for more information. This can include managing invasive plants as needed.	Protect, restore and/or create new wetland and riparian habitat.	Open	Throughout
19	Upland & Dryland	Research & Information Acquisition	CLA.UAD.RI.19.01 Mapping and inventory of Yellow Cedar trees-P2	2	Yellow Cedar	Mapping and inventory of Yellow Cedar trees to monitoring change to species distribution. Yellow Cedar could be used as a marker of climate change. Clayton Falls Creek has the furthest inland coastal Yellow Cedar.	Maintain or, where feasible, increase the abundance of species of interest.	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. 2004. Clayton Falls Project Water Use Plan. Available at:
https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/environment/pdf/wup_clayton_falls_water_use_plan_pdf.pdf
- BC Hydro. 2004. Consultative Committee Report: Clayton Falls Water Use Plan. Executive summary available at:
https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/environment/pdf/wup_clayton_falls_executive_summary_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.
- Kynoch Resources. 2009. Clayton Falls Project Water Use Plan: Aquatic Productivity Monitoring (CLAMON#1). Prepared for BC Hydro, Water License Requirements.
- National Research Council. 2001. Compensating for wetland losses under the Clean Water Act. National Academy Press, Washington, DC.
- Sigma Engineering Ltd. 2004. Clayton Falls Spawning Channel Environmental Assessment. Prepared for the BC Hydro Bridge Coastal Fish and Wildlife Restoration Program.

PREVIOUS STRATEGIC PLANNING DOCUMENTS

- Bridge-Coastal Restoration Program. 2000 Strategic Plan, Volume 2, Watershed Plans, Chapter 16: Clayton Falls Creek River.
- Fish & Wildlife Compensation Program. 2011 Clayton Falls Watershed – Watershed Plan. Final Draft.