FWCP Fish & Wildlife COMPENSATION PROGRAM fwcp.ca

COLUMBIA REGION: WETLANDS & RIPARIAN AREAS ACTION PLAN

August 12, 2021 (V2)

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 in watersheds impacted by BC Hydro dams.

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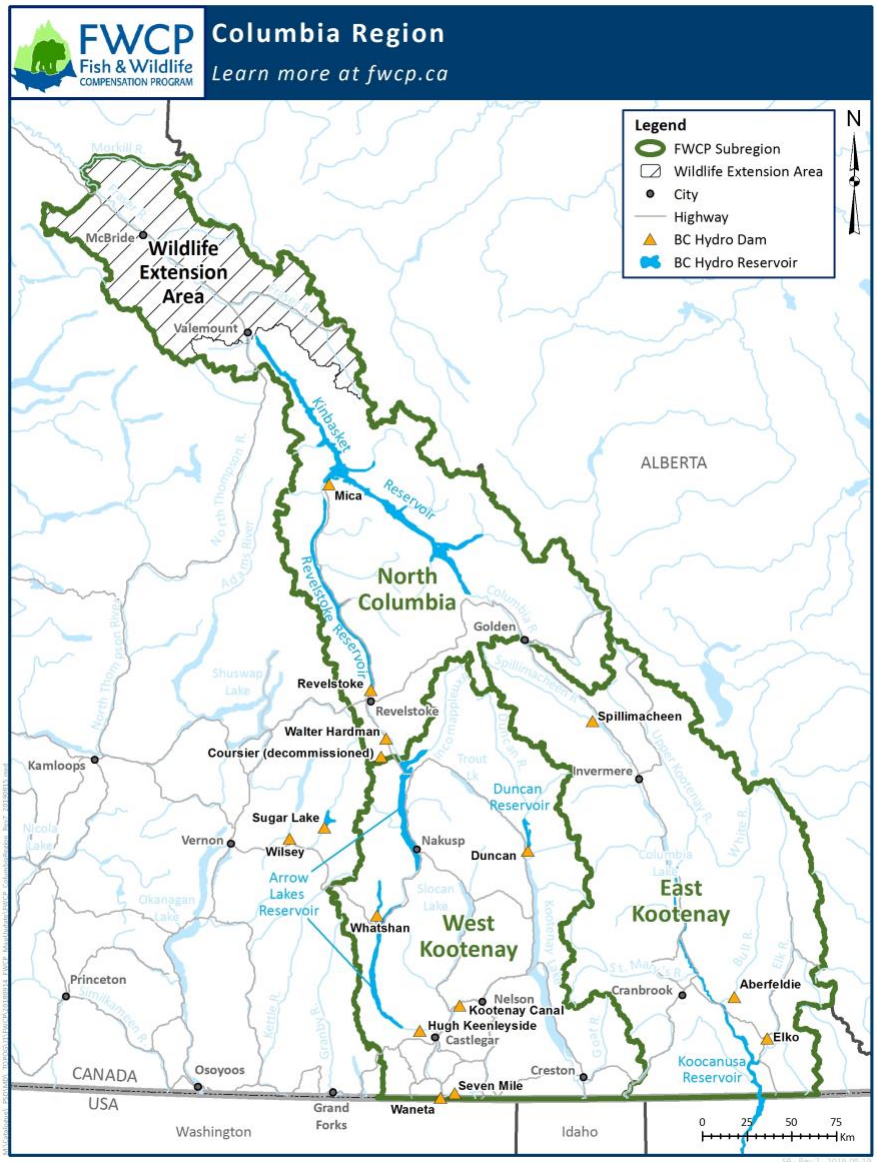

The Fish & Wildlife Compensation Program is conserving and enhancing fish and wildlife in watersheds impacted by construction of BC Hydro dams in the Columbia Region including four major hydroelectric dams built before 1984, two water storage dams that don't generate power, and seven smaller hydroelectric dams. Learn more at bchydro.com/energy-in-bc/operations/our-facilities/columbia.html.
Cover photos clockwise from left: Great Blue Heron, iStock-Y. Gauthier; Western Painted Turtle, A. Glass; Yellow-breasted Chat, iStock-W. Sherman; Northern Leopard Frog, D. Adama; East Kootenay Wetland, J. Dulisse.

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The Fish & Wildlife Compensation Program (FWCP) 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 in watersheds impacted by BC Hydro dams. The FWCP funds projects within its mandate to conserve and enhance fish and wildlife in the Columbia Region ecosystems.

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

EXECUTIVE SUMMARY

Wetlands & Riparian Areas Action Plan

The Fish & Wildlife Compensation Program (FWCP) is a partnership between BC Hydro, the Province of B.C., Fisheries and Oceans Canada (DFO), First Nations, and Public Stakeholders to conserve and enhance fish and wildlife impacted by BC Hydro dams. This Action Plan builds on the FWCP's strategic objectives and is an update to the previous *FWCP Riparian and Wetlands Action Plan* (2014). The Action Plan was developed with input from BC Hydro, DFO, the Province of B.C., participating First Nations, and local communities. It specifies Priority Actions that will conserve, restore, and enhance fish and wildlife species and their wetland and riparian habitats in the Columbia Region.

Priority Actions are in the Action Tables at the end of this document. The Priority Actions are intended to support the FWCP's strategic objectives of conservation, sustainable use, and community engagement. Actions fall into one or more of the following categories for wetland and riparian ecosystems and associated species of interest:

- **Research and Information Acquisition** – These actions will collect information necessary to evaluate, review, and implement subsequent wetlands and riparian areas conservation, restoration, and enhancement actions. Examples include inventory, conservation, and restoration planning, and other activities to address data gaps and information needs to complete other actions.
- **Habitat-based Actions** – These actions will conserve, restore, and enhance wetlands and riparian habitats. Examples include habitat creation, restoration, and enhancement; enhancing habitat connectivity; and invasive species prevention.
- **Monitoring and Evaluation** – These actions will monitor and evaluate FWCP-supported projects in wetlands and riparian areas to understand the effectiveness of habitat- or species-based actions.
- **Land Securement** – These actions will contribute to investigating and prioritizing land securement and stewardship opportunities for conservation purposes, as well as the establishment of easements or covenants and/or the purchase of private land.
- **Species-based Actions** – These actions will alleviate limiting factors for species of interest associated with wetlands and riparian areas. Examples include inventory, restoration planning, captive breeding/rearing, and reintroduction.

This Action Plan sets out Priority Actions for the FWCP that will guide funding decisions for FWCP projects in wetlands and riparian ecosystems of the Columbia Region. The focus of the next five-year period will be Priority Actions identified for fish and wildlife and their habitats in six priority valleys as well as "other" locations in the Columbia Region suitable for compensation- and/or conservation-related FWCP work:

- Upper Columbia Valley
- Elk Valley
- Creston Valley
- Duncan/Lardeau Valley and Revelstoke Reach
- Slocan Valley
- Canoe Reach and Robson Valley

Priority species of interest for wetland and riparian ecosystems include three recovery species: Northern Leopard Frog, Western Screech-Owl and Yellow-breasted Chat, as well as many focal and inventory species.

This Action Plan, and specifically the Action Tables, sets out FWCP priorities for investments in compensation activities within wetland and riparian habitats. However, actions may not translate into funded projects. FWCP funding limitations require priority-setting across the Columbia Region's ecosystems and species of interest. The process of selecting which actions will be implemented in any given year will occur during the annual grant intake and project selection cycle. See fwcp.ca for more information.

Introduction to the FWCP

The Fish & Wildlife Compensation Program (FWCP) 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 in watersheds impacted by construction of BC Hydro dams. The FWCP is funded annually by BC Hydro and directs those funds toward projects that address priority actions across its three regions. BC Hydro has water licence obligations in its Columbia and Peace Regions and has made voluntary commitments to address the impacts of dams in the Coastal Region. BC Hydro fulfills the applicable obligations through the work of the FWCP.

Introduction to this Action Plan

This Action Plan provides important background information about wetland and riparian habitat in the Columbia Region, including hydro development projects by BC Hydro, and conservation and enhancement projects funded by the FWCP. This Action Plan outlines our Priority Actions for fish and wildlife eligible for an FWCP Grant.

Learn more about the FWCP, projects underway now, and how you can apply for a grant at fwcp.ca. Anyone interested in applying for an FWCP grant should review our Priority Actions (see Action Tables) 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 to our free email updates and annual newsletter at fwcp.ca/subscribe and we will keep you posted about our grants and the projects we fund. Contact us anytime at fwcp@bchydro.com or learn more at fwcp.ca.

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INTRODUCTION AND BACKGROUND

FWCP 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 of conservation, sustainable use, and community engagement. Please refer to the Columbia Region Overview & Action Plan document for more information on the process that was followed to develop Action Plans in 2018–2019. Actions Plans have been developed for Reservoirs & Large Lakes; Small Lakes; Rivers & Riparian Areas; Wetlands & Riparian Areas; and Upland & Dryland; some actions may be complementary across the different plans.

This Wetlands & Riparian Areas Action Plan sets out priorities for the FWCP to guide projects within the FWCP Columbia geographic area in support of fish and wildlife. The plan builds on the FWCP's strategic objectives and the FWCP Columbia Region Overview & Action Plan document. The structure of this Wetlands & Riparian Areas Action Plan is shown in Figure 1.

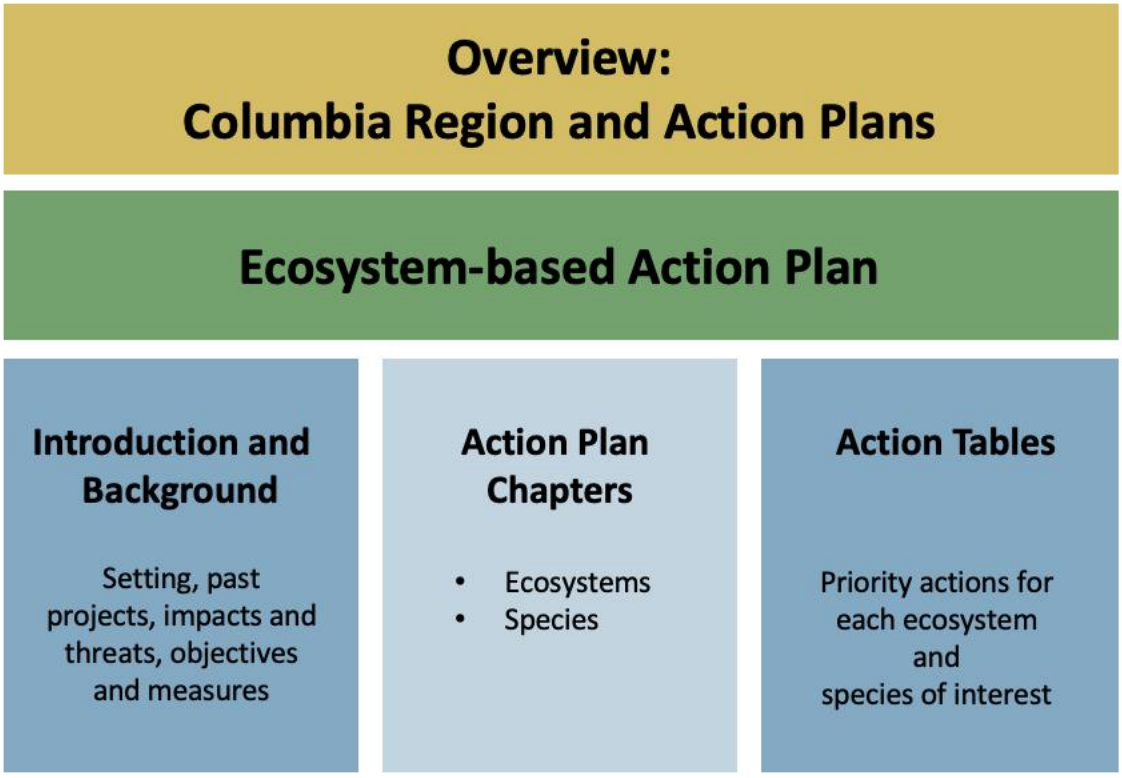

Figure 1: Overview and Action Plan document structure.

The objectives and the Priority Actions described herein have been developed with input from the Province of B.C., Fisheries and Oceans Canada (DFO), BC Hydro, First Nations, and local stakeholders. See Overview document for details of the 2018–2019 engagement process.

It is important to understand; however, that planning priorities within Action Plans may not translate immediately into funded projects. Limited FWCP funding requires that priority setting has to be developed across the FWCP, not just within Action Plans. The process of selecting which actions will be implemented in any given year will occur during the annual implementation planning cycle.

Wetlands & Riparian Areas Introduction

Wetland and riparian areas are among the most diverse and biologically rich ecosystems in BC and are considered highly valuable from an ecological standpoint. The blend of streambed, water, trees, shrubs, and grasses directly influences and provides habitat for fish and wildlife. The abundance, distribution, and condition of wetland and riparian habitats may be limiting factors for many species, especially amphibians, which depend upon them either for the majority of their lifecycles or for key periods such as breeding. Riparian and wetland habitats are often critical in terms of maintaining function and structure for natural systems, including helping to support trophic level functioning and genetic diversity, as well as providing key ecological services such as erosion control, flood control, assimilation of nutrients, and water purification. Furthermore, many wetland and riparian species are the focus of sustainable use activities.

The development of BC Hydro dams and reservoirs in the Columbia Region resulted in the inundation of wetland and riparian area habitat (primarily valley bottom, low gradient). The larger reservoirs that have taken their place are fundamentally different than natural wetland and riparian corridor habitat, resulting in direct and indirect impacts to a number of fish and wildlife species. By making investments in wetlands and riparian areas, the FWCP contributes to improving the status of priority species by improving the habitats many of the species depend on.

Setting

A wetland is an area of land where the soil is saturated with moisture either permanently or seasonally. Where water occurs on the surface, marshes, bogs, and swamps occur. In the Columbia Region, there are large numbers of small wetlands, bogs, and ponds in the alpine and at higher elevations (Machmer et al. 2004); lesser numbers at mid elevations; and high numbers at low elevations, on the benches in the major valleys and on the floodplains of major rivers. Most bench wetlands are found in the Rocky Mountain Trench in the East Kootenay sub-region. Wetlands in the West Kootenay sub-region are very rare due to the lack of extensive benchlands in the valleys. There are floodplain wetlands along mid-elevation tributaries in each of the priority valleys addressed in this plan (See Figure 2). At low elevations throughout the Columbia Region, there are extensive wetlands on the floodplains of the major rivers. These were the largest and most productive wetlands pre-settlement and have been most affected by hydro-electric developments and other human activities. They are the focus of this Action Plan.

There are three general categories of riparian and wetland habitats defined for the Columbia Region:

Category 1 Natural riparian or wetland habitat	Largely intact and functioning ecosystems with natural disturbances sufficient to maintain subclimax communities and process characteristic of wetlands and riparian ecosystems (e.g. the wetland floodplain complex in the Columbia wetland).
Category 2 Managed 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.
Category 3 Disclimax or degraded wetland or riparian habitat	Formerly natural wetland or riparian ecosystems that have lost most of their natural disturbance regime and are no longer functioning effectively as wetland or riparian habitat. These areas are candidates for restoration to category 1 or 2 habitats.

Riparian habitat is defined as an area adjacent to a waterbody (e.g. wetland, lake, river, or stream) that differs from the surrounding upland habitat in the diversity of plant and animals found and in the overall productivity of the site. This occurs as a result of groundwater exchange, shading by trees, and other proximity-related riparian habitat elements. Riparian areas occur in two forms in the Columbia Region: riparian zones and floodplain riparian zones.

Where mountain slopes decline steeply into waterbodies, there is a narrow riparian zone of vegetation that is affected by the nearby presence of waterbodies. These zones occur along the edge of all major lakes, reservoirs, rivers, and streams, but in most areas form a very narrow zone. There are also floodplain riparian areas throughout the Columbia Region where flat areas occur along major rivers and streams. The floodplain riparian zone in such areas can be kilometres wide. These

systems support three major riparian habitats. Wetlands occur on these floodplains where the water table is close to the surface; they are generally classified as shallow water, marsh, swamps, bogs, and fens. At slightly higher elevations, where the groundwater level is lower, wet meadow systems develop, dominated by sedges and grasses, interspersed with an overstorey of shrub species. Higher still, where the ground is less saturated with water, riparian forests develop. Cottonwood stands dominate in many areas, although in some areas the final seral stage is conifer dominated. Along rivers the annual spring freshet and major flood events create conditions where cottonwood stands can dominate for long periods. Together, these three major types form floodplain complexes where habitat types can change based on very minor variations in elevation.

The ecological processes that drive each of these wetland types are different in each of the sub-regions of the Columbia, and these, in turn, provide different options for conservation and enhancement. All of these systems provide important values to human society, including seasonal water storage, flood abatement, and, in some systems, net carbon storage.

Priority Areas

To address historic impacts within the Columbia Region, the FWCP will invest in the securement, creation, and enhancement of wetlands and riparian areas in the region. Six priority valleys were defined for this region using an elevational cut-off to generally identify areas of interest (Figure 2):

- **Upper Columbia Valley (including Columbia River Wetlands):** This area comprises the Columbia River valley from Golden in the north to the confluence of the Columbia and Kootenay Rivers in the south. Extensive, naturally functioning wetlands and riparian areas exist along much of its length, constituting one of the largest wetland complexes in Canada. The area is recognized as a wetland of international importance under the RAMSAR Convention. The Columbia National Wildlife Area covers ~1,000 hectares and is managed by the Canadian Wildlife Service. The remaining habitat is a mix of Provincial crown and private land.
- **Elk Valley:** This valley runs north from Elko Dam along the Elk River and east along the Highway 3 corridor. Riparian islands and other riparian habitat are relatively common along the Elk River's length, and there are significant wetlands near Elkford.
- **Creston Valley:** The Creston Valley comprises a large floodplain at the south end of Kootenay Lake. Historically, the valley flooded seasonally with the spring freshet, but most of the bottomland was reclaimed for agriculture. Much of the remaining habitat in the northwest portion of the valley was protected under a provincial statute with the creation of the Creston Valley Wildlife Management Area (CVWMA) in 1968. Ducks Unlimited Canada diked most of the CVWMA in the early 1970s, creating several impoundments. Other small impoundments have been created on lands controlled by the Lower Kootenay Band.
- **Duncan/Lardeau Valley and Revelstoke Reach:** This priority area includes the Lardeau Valley from Duncan Dam north to Beaton, and the Revelstoke Reach of Upper Arrow Lake north to the city of Revelstoke. There is extensive riparian habitat in the lower Lardeau, and several conservation properties owned by the Province of B.C. and the Nature Trust are located in the area. Wetland and riparian habitats are limited elsewhere in these areas because the valleys are relatively steep-sided and narrow.
- **Slocan Valley:** This valley runs from Summit Lake and Bonanza Creek south to Slocan Lake, and then along Slocan River to where it meets the Kootenay River west of Nelson. The Slocan River is associated with extensive riparian islands and other riparian areas, many of which are privately owned.
- **Canoe Reach and Robson Valley:** This valley includes the northern portion of Canoe Reach (Kinbasket Reservoir), as well as the Robson Valley north as far as Tete Jaune Cache. The valley is primarily forested with some agriculture. The FWCP Wildlife Extension Area (see Overview document) is located in this region of the Columbia and extends northwest from Tete Jaune Cache to north of McBride and east to the Alberta border (including Mount Robson Provincial Park).

- **Other:** Note that actions in this Wetlands & Riparian Areas Action Plan are not restricted solely to the six priority valleys described above. In fact, this Action Plan contains some actions that are best considered at the region-wide scale or implemented at site-specific areas as opportunities are identified.

These six valleys (as well as other potential areas) are where most remaining riparian and wetland habitat occurs; where significant investments have been made by FWCP; or where significant, known opportunities for investment occur. A brief overview of each of these priority valleys is provided below along with recommended actions. The priority valleys discussed here vary greatly in terms of both the functional processes that drive these systems and the impacts of human activity on these systems.

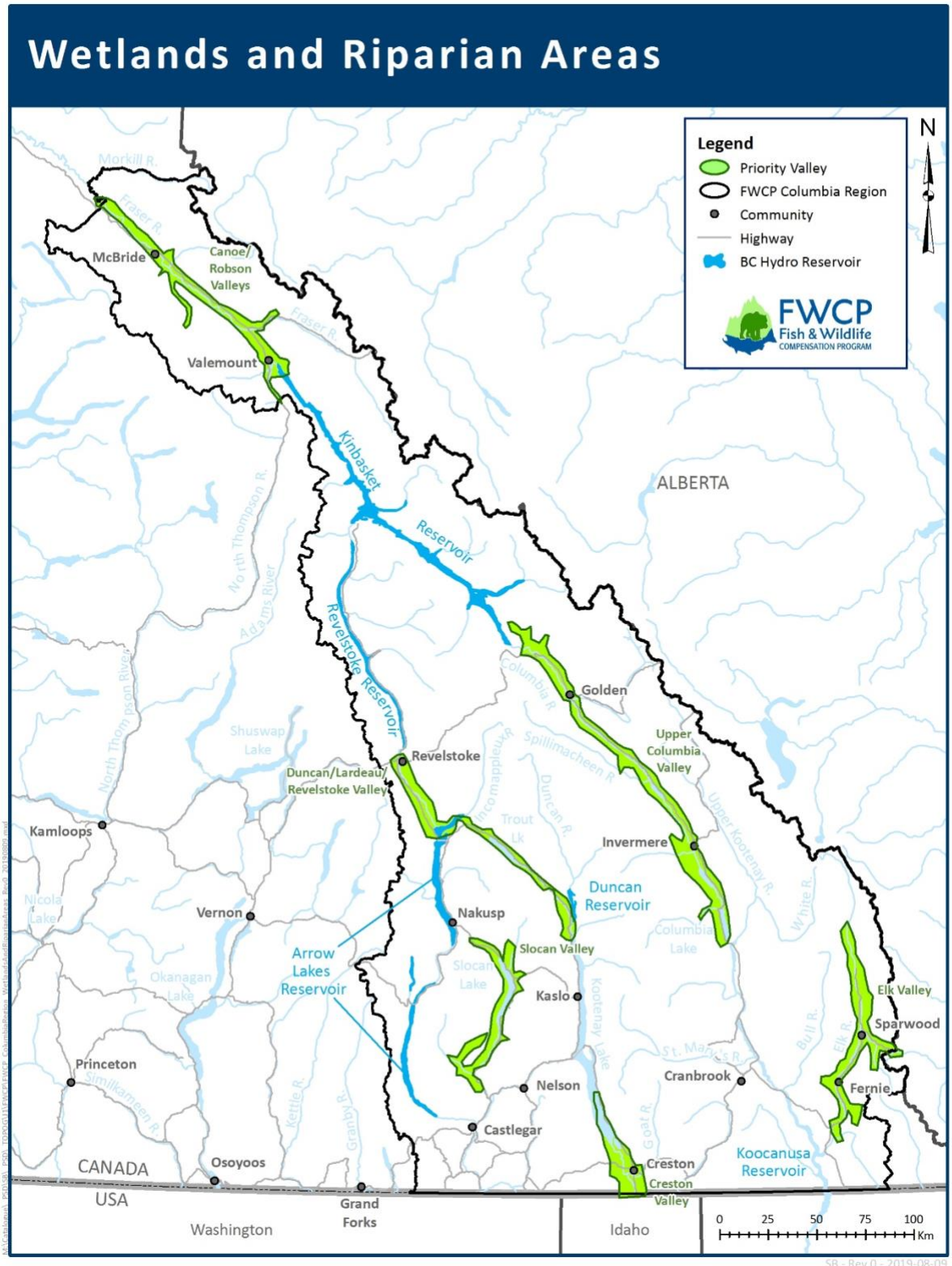

Figure 2: Priority valleys for wetlands & riparian areas in the Columbia Region.

Footprint Impacts and Threats – Upper Columbia Valley

Hydro-related Impacts

Significant wetland and riparian habitat impacts occurred as a result of the construction of Mica Dam and associated Kinbasket Reservoir located downstream from this priority valley (Utzig and Schmidt 2011). A total of 7,859 hectares (5,653 hectares of wetland, 1,651 hectares of cottonwood, and 555 hectares of shallow water) were flooded as a result of dam construction (Utzig and Schmidt 2011). The impacts from hydro development are minimal within the actual priority valley.

The Spillimacheen Dam is a run-of-the-river dam with little storage capacity and the hydrograph below the dam is close to natural. One important species, Kokanee (*Oncorhynchus nerka*), has expanded substantially in the system following the development of Mica Dam (Oliver 1995). It is likely that the entire range of species that prey on Kokanee as a food source has increased over time. It is important to remember that there have been significant changes in the fisheries and nutrient flows in the Upper Columbia River since the construction of Grand Coulee Dam in 1942. Prior to that date, salmon spawned at several sites in the Upper Columbia. These impacts will not be addressed in this document.

Non-hydro Impacts

The marsh, levee, and water portion of the Columbia Wetlands system has seen relatively few impacts from human use and remain in a close to natural condition that is maintained by a natural river hydrograph, except where the grade of the Canadian Pacific Railway bisects the floodplain. There are four bridges with elevated roadways that restrict the downstream floodwaters between Invermere and Golden; however, there does not seem to be a significant alteration in the wetland communities downstream of roadways (Carli 2011). Several of the alluvial fans portions of the system have been developed for agriculture, industrial use, and human settlement. Human communities have expanded substantially since the 1970s in the Golden and Invermere areas, but less development has occurred along the wetlands between these two communities. Agriculture is small-scale through most of this area with only a few larger ranches. Cattle grazing is present in a few areas on the floodplain and some portions of the west bench. Major impacts to the wetlands on the west bench have been in the form of logging, with settlement around some lakes and ponds near Invermere.

Limiting Factors

Natural factors: The productivity of the wetlands in the Upper Columbia Valley is driven by the annual spring freshet, variation in flood intensity, and wetland depth and duration across the floodplain, the turbidity of the water during such events, and the temperature and nutrient status of the sediment and water that flows into the wetlands during such events. This system is at higher elevation (770 m) relative to the similar wetlands at Creston and the Lardeau Valley (530 m), which may reduce overall productivity. Marshes that are more isolated from the flooding contain different communities than those more frequently exposed to the scouring action and sediments associated with the flood pulse. The annual spring freshet occurs during the middle of the waterfowl nesting season (early July) and may have an impact on duck recruitment in wetlands that are subject to annual flooding (Jamieson and Hennan 1998). Perched wetlands (defined as wetlands that are not directly connected to the river and are flooded only during major flood events) are less affected. It is not known what impact this freshet timing issue has on amphibians and other wildlife. The bench wetlands occur at slightly higher elevations (1,000–1,200 m), are not subject to flooding, and are more productive for waterfowl.

Human-driven factors: A management plan for the Columbia Wetlands was developed, based on significant public input, in 1998 (Jamieson and Hennan 1998). At that time, there was no public support for the development of diked wetlands in the Columbia Wetlands area. This lack of public support seriously limits options for such activities in this system. On the alluvial fan portions of the floodplain area, private land ownership is a major limiting factor. To date, aquatic invasive species have not had a major impact on ecological process in the wetlands (R. Darvill, pers. comm.). Terrestrial invasive plants are a concern in many adjacent areas. Wild rice (*Zizania* sp.) is present in at least one marsh in the wetlands. It does not appear to be invasive, to date, and is heavily used by waterfowl. There is minimal data on the presence of Reed Canary Grass or other invasive grass/reed species that may have an impact on wetland and riparian function. The impact of road and railway culverts on fish movement is not known.

Footprint Impacts and Threats – Elk Valley

Hydro-related Impacts

The impacts from hydro development are minimal in the Elk Valley. Elko Dam is a run-of-the-river dam with little storage capacity and is located below the major floodplain area in the Fernie area. The Elk River floodplain system does provide options for enhancement that are relatively close (10 km) to the Koocanusa Reservoir. Losses of wetland and riparian cottonwood habitats in the Koocanusa Reservoir were 108 hectares of wetland, 655 hectares of cottonwood stands, and 211 hectares of shallow water, a total of 974 hectares (Utzig and Schmidt 2011).

Non-hydro Impacts

In the lower portion of the system (south of the community of Elkford), the major impacts on the floodplain are settlement, agriculture, gravel mining, and transportation corridors. Increased tourism development in the last two decades has resulted in more human settlement in the area, some of which has occurred on or adjacent to the floodplain. In the upper portion of the watershed, coal mining is the dominant impact on the landscape. Floodplain habitats on the Fording River have been lost, but this area is outside of the Elk Valley boundary. In recent years, concerns have arisen with selenium and other heavy metals entering the watercourses in the upper Elk River from mining operations. There are indications that this may have implications for wetlands and side channel habitats. New mines are proposed in portions of the upper drainage.

Limiting Factors

Natural factors: This floodplain system is at a relatively high elevation and is likely less productive, in terms of overall photosynthetic production/hectares, than similar systems at lower elevations. Heat units over the growing season and the frost-free period in the Elk Valley are much less than those found in the Creston Valley. The parent material in the Elk Valley is based on softer sedimentary rocks found along the continental divide, including coal and phosphate-bearing rocks. Carbon and phosphorus levels in the soils in this area are likely higher than those found in other floodplains. Precipitation is relatively high during the growing season in the lower portion of the floodplain and groundwater flows maintain high soil-moisture levels. These factors are expressed in the development of floodplain forests made up of multiple tree species and complex shrub and grass/forb communities. Mature timber stands on this floodplain contain very large trees in some areas.

Human-driven factors: The extent of the floodplain in this valley is limited in some areas by linear developments (e.g. rail lines and highways). There is more recent diking for flood protection along the Elk River in the Fernie and Sparwood areas. Human settlement has occurred on the floodplain in several areas. Further development is limited to some degree by regional district regulations. There are no known aquatic invasive species in the river, though knapweed and other terrestrial invasive plants are present on the floodplain. Reed Canary Grass is a growing issue in this system (S. Rood, pers. comm.). Other land uses and the presence of extensive areas of private land are other major limiting factors in this system. Direct mining impacts in this watershed, though extensive, are outside the priority valley boundary.

Footprint Impacts and Threats – Creston Valley

Hydro-related Impacts

There have been large impacts on both the Kootenay River and the floodplain as a result of flow regulation through Libby Dam, Duncan Dam, Corra Linn Dam, etc. Nutrient and sediment flows in this portion of the river and floodplain have been altered substantially since the construction of Libby Dam in 1975. Nutrient addition programs in the South arm of Kootenay Lake and in the Idaho portion of the Kootenay River upstream of Bonner's Ferry are currently being implemented. The impact of these programs on wetlands and riparian habitats is poorly known; however, the loss of sediment is expected to be important. Most of the wetlands in the Creston portion of this priority valley are diked and therefore are independent of river flow dynamics in all but major flood years. During major flood events, water levels are increased to reduce the differential between river levels and wetland levels to ensure that dike breaches do not occur (M. Beaucher, pers. comm.).

Portions of the CVWMA and other areas are not diked and flow management at Libby Dam, regulated levels in Kootenay Lake, and the unregulated flows from the Goat River drive the ecological dynamics of these areas.

Non-hydro Impacts

The major impact on the pre-settlement wetlands was the diking of the Kootenay River and the development of agriculture across much of the floodplain. Nutrient flows from croplands and cattle operations likely contribute phosphorous and nitrogen to the river and some wetlands areas but there are no data available. A Canadian Pacific Rail line is routed across the wetlands near Kootenay Lake, effectively acting as a dike for some of the wetlands. Industrial sites include a mine above Duck Lake and a logging mill at Wyndell. There have been ongoing river channel alterations for flood control on the lower Goat River that have had an impact on fisheries and floodplain habitats in that area.

Limiting Factors

Natural factors: The wetlands in this area are likely the most productive in the Canadian portion of the Columbia Region, due to low elevation, high heat units, and stable water levels in the diked wetlands. For example, Northern Leopard Frog tadpole development occurs two to three weeks earlier at Creston than at Bummer's Flats (a wetland area north of Cranbrook near Fort Steele). For both the wetland areas outside the dikes and in the diked wetlands, flow regulation and major storm events can result in the flooding of bird nests and lost recruitment. There is also a long-term shift from meadow systems to deciduous trees and shrubs occurring. Many former sedge-dominated areas are now occupied by Goldenrod (*Solidago canadensis*) on the CVWMA.

Human-driven factors: A major limiting factor for creating diked wetlands in the future is the cost of constructing such systems and maintaining them over time. In addition, there are costs associated with maintaining open water habitat in such marshes when emergent macrophytes take over the entire area of the marsh. Human settlement and agriculture now limit wetland and floodplain systems to the CVWMA and the Yaqan Nukiy lands. These wetland and floodplain systems have several invasive species issues. Plains Cottonwood (*Populus deltoides*) was introduced at Bonner's Ferry several decades ago and is now a significant component of cottonwood stands along the Kootenay River. There are no data on the degree to which this species competes with or replaces the native Black Cottonwood (*Populus trichocarpa*). It would appear that Plains Cottonwood is functionally similar to Black Cottonwood in terms of nesting habitat for songbirds and other values, but this supposition has not been tested. Reed Canary Grass (*Phalaris arundinacea*) and Common Reed Grass (*Phragmites australis* subsp. *australis*) present a similar problem. Both are large grass species that occur on floodplains and in wetlands. It would appear that in both cases, the native species have hybridized with the Eurasian species and have become more invasive as a result. Work in other systems has indicated that the presence of these grasses on point bars is limiting cottonwood recruitment. Their value as nesting habitat for ducks, compared to native sedge and other plant communities, is not known. Wild rice is present in the Corn Creek marsh and one other compartment (introduced by CVWMA staff in earlier decades). Wild rice is extensive in these marshes and is a preferred species for waterfowl. It is reseeded annually and can be controlled by manipulating water levels during its seeding phase. Terrestrial invasive weeds are endemic in the Creston Valley, especially knapweed. Yellow Flag Iris is a problem in the CWMWA. Eurasian Watermilfoil (*Myriophyllum spicatum*) is an aquatic plant species that displaces native aquatic plant communities. It has been documented in the Kootenai River but not on the Kootenai National Wildlife Refuge or the CVWMA.

Footprint Impacts and Threats – Duncan/Lardeau Valley and Revelstoke Reach

Hydro-related Impacts

The impacts from hydro development in the Duncan/Lardeau Valley portion relate to habitat losses in the storage reservoir and the altered hydrograph below Duncan Dam. Losses of wetland and riparian cottonwood habitats in this reservoir (Utzig and Schmidt 2011) were a total of 2,605 hectares (1,007 hectares of wetland, 1,426 hectares of cottonwood stands, and 172 hectares of shallow water). The degree to which the partial control of flows in this system, (below the inflow of the Duncan River) has altered the lower floodplain system is not well understood and is the subject of several studies being carried out as part of the Duncan Dam Water Use Plan. The role of water level regulation in Kootenay Lake is also a factor in the lower portion of the floodplain but has not been studied extensively. In the Revelstoke Reach portion of the

priority valley, flow regulation below Revelstoke Dam and the flooding of the main valley below Revelstoke by the Arrow Lakes Reservoir have had major impacts. A total of 2,291 hectares (479 hectares of wetland, 1,709 hectares of cottonwood, and 103 hectares of shallow water) were inundated by this reservoir (Utzig and Schmidt 2011).

Non-hydro Impacts

In the lower portion of the Duncan/Lardeau system (south of Howser), the major impacts on the floodplain are settlement, agriculture, mill site development, and transportation corridors. The decline in logging in this area in recent decades has resulted in the closure of mills in this valley and a major decline in the human population. Agriculture is small-scale. Mining was a major industry here in the 1800s, but there are no active mines at present. In the Revelstoke Valley portion of the priority area, most of the floodplain and adjacent benchlands are now part of the community of Revelstoke. A portion of the floodplain of the lower Illecilewaet River is diked.

Limiting Factors

Natural factors: The Duncan/Lardeau and Revelstoke floodplain system is at relatively low elevation and is likely very productive relative to other systems at higher elevations. The wetland systems between Trout Lake and Armstrong Lake are at higher elevation.

Human-driven factors: The altered hydrograph and loss of nutrients and sediment from the Duncan system have had some unknown effect on the lower floodplain. There are no known aquatic invasive species in the river, though Knapweed species and other terrestrial invasives are present on the floodplain. Reed Canary Grass is present on at least one site (M. Polzin, pers. comm.). Russian Thistle is a concern in the old-field portions of some of the conservation properties (G. Trower, pers. comm.). In Revelstoke Reach, management options are limited by human settlement adjacent to the rivers and floodplains there. Management options are also limited by the extreme water level fluctuations of Arrow Lakes Reservoir.

Footprint Impacts and Threats – Slocan Valley

Hydro-related Impacts

The impacts from hydro development are minimal in this priority valley, other than the historic loss of salmon due to the construction of Grand Coulee Dam.

Non-hydro Impacts

Pre-settlement, this system supported stands of very large Western Red Cedar, with cottonwood and other species. Today, it is a mix of small farm holdings and many small natural areas along the river, including several side channels and oxbows. There are several small human communities on or adjacent to the lower floodplain. The floodplain wetland complexes in the Little Slocan have seen few impacts from human use and remain in a close to natural condition. Human communities occupy the alluvial fans of the creeks coming into Slocan Lake. Logging occurs in many areas in the watershed; however, there are also two major park areas. Mining has had major impacts in the past.

Limiting Factors

Natural factors: The lower Slocan floodplain wetlands are potentially very productive, given the elevation and heat units in the valley. However, the river is nutrient poor and groundwater flows into the floodplain wetlands are likely to be nutrient poor, in contrast to their historic condition when salmon spawned in the system.

Human-driven factors: Human settlement and small-scale agriculture on the various floodplains is the dominant land use in this system. The lower floodplain is almost entirely private land. Stream temperature appears to be limiting for salmonids (Corbett 2006). Nutrient levels and river temperature may have some impact on wetlands adjacent to the river. Terrestrial invasive plants are a concern. For example, Reed Canary Grass is a significant factor limiting restoration options along the river. Japanese Knotweed is also a concern.

Footprint Impacts and Threats – Canoe Reach and Robson Valley

Hydro-related Impacts

The impacts from hydro development are minimal in the Fraser River portion of this valley. However, major portions of the Canoe River system were inundated when Mica Dam was constructed. A total of 7,859 hectares (5,653 hectares of wetland, 1,651 hectares of cottonwood, and 555 hectares of shallow water) were inundated (Utzig and Schmidt 2011). This was the largest loss from any of the reservoirs in the region. One important species, Kokanee, has expanded substantially in the Canoe River system following the development of Mica Dam (Oliver 1995).

Non-hydro Impacts

The Robson Valley supports small-scale agriculture and tourism but is primarily a forestry dependent valley. There is a combination of private land-logging activities and agriculture fields on the Fraser River floodplain. Most of these activities occur on the first bench, some 10–30 m above the active floodplain and river. The McLennan Creek and Canoe floodplains have less of both activities. In general, the railway and highways in this valley are on this first bench with minor impacts on the active floodplain except in the wetland area just downstream of Tete Jaune Cache.

Limiting Factors

Natural factors: The floodplain wetlands in this area are at higher elevation and far to the north compared to the wetlands in the remainder of the FWCP's Columbia geographic area. The valley is in the boreal zone and the cooler climate results in more extensive fens and bog systems compared to areas further south.

Human-driven factors: Much of the Fraser River floodplain below Tete Jaune Cache is private land. There are little data on aquatic and terrestrial invasive species in this valley.

Knowledge Status and Gaps

The priority valleys vary greatly in terms of both the functional processes that drive these systems and the impacts of human activity on these systems. Extensive areas have been secured in the past (1960s to the 1970s in the Upper Columbia and Creston Valleys), in the form of Wildlife Management Areas. In recent years, securement in the form of private land acquisition and stewardship has occurred in partnership with the Kootenay Conservation Program (KCP) and land trusts, including the Nature Trust of BC (NTBC), the Nature Conservancy of Canada (NCC), and Valhalla Foundation for Ecology. Priorities for land securement are identified in collaboration with the KCP Securement Committee.

Very few options for habitat creation on a large scale exist, due to technical, logistical, cost, and capacity constraints. The creation of new wetlands in the future will need to focus on new and novel approaches to wetland restoration that are cost-effective. Restoration of degraded wetlands may provide a cheaper and more effective strategy. The wetland and riparian systems in the Columbia Region are unique in the degree to which stewardship groups have evolved independently to address issues in these systems. Funding small-scale wetland and riparian projects from groups, communities, and individuals will likely be an important approach for meeting riparian habitat goals.

Three of the seven recovery species are strongly associated with wetland and riparian habitats (Fish & Wildlife Compensation Program 2011a). Habitat actions directed at recovery or focal species will also support general wetland and riparian goals. Long-term monitoring data are generally unavailable for wetland and riparian associated fish and wildlife species in the Columbia Region. As a result, the knowledge of pre-dam populations is limited to anecdotal accounts or inferences made from habitat impacts. Trend information for some species (e.g. amphibians, waterfowl) has become more available over the past 30 years. More recently, a focus on threatened and endangered wildlife has improved our knowledge of the distribution and abundance of these species; however, there remain significant gaps. Fisheries issues (e.g. rearing habitat in wetlands and side channels) also need to be considered. Identifying linkages between actions in this plan and those in other plans (e.g. Small Lakes Action Plan, Rivers & Riparian Areas Action Plan) should be explored.

Previously Implemented FWCP Projects

A variety of species-specific and habitat-specific projects supported by FWCP have addressed trends in the abundance, distribution and productivity of wetlands and riparian areas habitats, as well as the species dependent on them. A full list of the reports from projects undertaken to date is available online at fwcp.ca/results. Work undertaken during recent project years (2013 to 2017), since the last round of Action Plan updates, focused on:

- Restoration and enhancements;
- species of interest recovery; and
- control of invasive species.

The Wetlands & Riparian Areas Action Plan re-affirms the primary importance of wildlife habitat restoration in valley-bottom ecosystems, specifically through the annual and ongoing Wetland Riparian Enhancement Program, Northern Leopard Frog Recovery Program, and various grant projects as the primary near-term means to offset the losses of overall riparian and wetland habitat loss due to footprint impacts. Overall, between 2013 and 2017, over $4 million of FWCP investments primarily addressed wetland and riparian actions. This project work targeted five of the priority areas, with projects occurring most frequently in the Duncan/Lardeau and Revelstoke Valleys. The majority of wetland and riparian projects were multi-year, most of them being annual and ongoing programs that contributed to small and large ecosystem-restoration projects (e.g. restoration plan development, on-the-ground habitat outcome, and effectiveness monitoring), land securement, and recovery efforts for wetland-associated wildlife species (e.g. Northern Leopard Frog) across the priority valleys outlined for compensation investment prioritization.

From 2013 to 2017, large investments were made toward land securement; the direct acquisition of ~6,862 hectares of land, primarily in the East and West Kootenay sub-regions, was supported. Another 78 hectares of wetland and riparian habitat was restored; 70 hectares was treated for invasive plants; wildlife habitat enhancements (e.g. nest boxes, Western Painted Turtle nesting habitat, Western Toad highway passing structures) were created; and four land-management plans and 12 ecosystem restoration plans were developed.

The vast majority of wetlands and riparian areas projects targeted wildlife species (e.g. birds and amphibians), so future inventory and assessment of wetland-present fish populations (e.g. rearing habitat, side channels, reservoir flooded habitat) and their status/importance could be addressed and linked to other Action Plans. The North Columbia subregion, including the Wildlife Extension Area, was not well-studied and very few funded projects were conducted here. This area of the Columbia Region contains considerable wetland and riparian habitat in Canoe Reach and Robson Valley, as well as several listed wetland-associated species (e.g. Western Toad, American Bittern, Great Blue Heron, multiple ungulate species). Further, Robson Valley and Upper Columbia Valley also received less attention than the southern Kootenay portion of the Columbia Region.

WETLANDS AND RIPARIAN AREAS ACTION PLAN OBJECTIVES

Clear and realistic objectives are necessary to guide information acquisition and prioritize actions. Priority actions and information needs will change as both improvements to the system are realized and information is gained. The current Action Plan reflects the information available and values expressed by FWCP partners.

The Wetlands & Riparian Areas Action Plan has four objectives, which are high-level statements of desired future conditions (outcomes), consistent with FWCP strategic objectives, partner mandates, and policies. Each objective has associated sub-objectives, which provide more specific direction on desired future conditions, including detailed performance measures that can direct specific projects. Priority actions in the Action Tables align with the objectives and sub-objectives.

Objectives and Measures

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

Wetland & Riparian Areas Action Plan

Strategic Objectives	Objectives	Sub-objectives	Performance Measures
Conservation	Maintain productive and diverse ecosystems	Secure or identify areas of priority wetland and riparian habitat threatened with land conversion or loss of habitat connectivity.	Hectares of secured habitat annually.
		Improve degraded or create new wetland and riparian habitat.	Hectares of wetland and riparian habitat improved (restored, created, or enhanced).
		Reduce threats to wetland and riparian habitat.	Ecosystem restoration plans developed (or updated) for priority areas and/or specific sites.
	Maintain or improve the status of species of interest	Improve the distribution, abundance, and/or trend of species of interest.	Increases in distribution and abundance of species of interest in restored or secured wetland and riparian habitats.
		Characterize and monitor the status of species of interest.	Increased knowledge of the status of species of interest (i.e. baseline data).
Sustainable Use	Maintain or improve opportunities for sustainable use	Support actions addressing conservation of species and ecosystems to help inform decision-making on sustainable use activities, including culturally important resources.	Viable populations of a range of species that will support hunting, fishing, trapping, wildlife viewing, etc.
Community Engagement	Maintain and improve opportunities for community engagement	Build, maintain and improve relationships with Indigenous communities and local stakeholders and support conservation and sustainable use projects that increase awareness regarding threats and challenges to wetland and riparian ecosystems.	Engagement of Indigenous communities and local stakeholders in FWCP-funded wetland and riparian projects that support healthy fish and wildlife populations and ecosystems (e.g. local volunteers, sharing results, raising awareness of FWCP projects, hosting events).

Figure 3: Wetlands & Riparian Areas Action Plan objectives and measures.

ACTION PLAN CHAPTERS

The Action Tables in this document identify FWCP Priority Actions to conserve and enhance fish and wildlife in wetland and riparian ecosystems in the Columbia Region. See Overview document for additional information on Action Table format and funding application process.

Priority Actions are organized by cross plan actions, ecosystem, and species, and by action type: Research and Information Acquisition, Habitat-based Actions, Monitoring and Evaluation, Land Securement, and Species-based Actions are assigned a priority ranking from 1 (highest priority) to 3 (lowest priority).

There are six priority valleys in the Wetlands & Riparian Areas Action Plan:

- Upper Columbia Valley
- Elk Valley
- Creston Valley
- Duncan/Lardeau Valley and Revelstoke Reach
- Slocan Valley
- Canoe Reach and Robson Valley

Species of interest for wetland and riparian areas are outlined in this Action Plan. There are three priority recovery species of interest (listed below) as well as focal and inventory species of interest associated with wetland and riparian habitats for the Columbia Region:

1. Northern Leopard Frog
2. Western Screech-Owl
3. Yellow-breasted Chat

Cross Plan Actions

Several broad cross plan actions are relevant to all terrestrial and aquatic Action Plans but are not readily nested under any particular sub-objective. Projects that address these actions will require the consideration of multiple ecosystems.

Wetlands & Riparian Areas Ecosystems

Riparian habitat is defined as an area adjacent to a river or stream that differs from surrounding uplands in the diversity and productivity of its plant and animal species. A wetland is an area of land whose soil is saturated with moisture either permanently or seasonally. Riparian areas and wetlands provide habitat for a disproportionately large number of species, and because they are usually associated with bottomlands, impacts from dam construction and operations have resulted in significant losses.

Restoring degraded wetlands and creating “new” wetlands are seen as key (priority 1) habitat actions. Implementing these actions on a broad scale is expected to be a formidable challenge due to technical, logistical, cost, and capacity constraints. Creating wetlands is particularly difficult and the first step is to do feasibility studies for some potential projects in order to understand costs and risks. In areas where created (category 3) wetlands already exist, uncertainties are reduced, and targets are more readily established and met. Land securement actions are also expected to be achievable, largely limited by cost capacity of land-trust non-government organizations and opportunity. Small-scale wetland and riparian projects from groups, communities, and individuals will likely be an important approach for meeting riparian habitat goals, although these projects will also benefit from an inventory that maps wetlands and identifies restoration opportunities that are achievable.

Priority Valleys

The opportunity to restore wetlands and riparian habitats directly affected by dam construction is extensive. The FWCP directs investments toward the best opportunities for improving the condition and productivity of priority native wetland and riparian habitats, creating new wetland areas, and securing land within the Columbia Region to protect and conserve

wetland and riparian areas. Descriptions of the six priority valleys that have been identified for FWCP project work are provided below.

Upper Columbia Valley

There are five wetland and riparian systems in the Upper Columbia Valley:

- the floodplain complex along the Columbia River, including marshes, sedge meadow/shrub complexes, and riparian cottonwood and spruce systems;
- riparian cottonwood and conifer systems along the levees of the main river and the alluvial fans that protrude into the wetlands;
- marshes, fens, and bogs on the benches west and north of the main river floodplain;
- Ducks Unlimited Canada wetland projects with stable water levels (two on the Columbia River floodplain and four on the west benches); and
- mid-elevation riparian zones along the various stream courses joining the Columbia River.

The low-elevation systems along the major rivers, i.e. floodplain systems, have been the systems most impacted by hydro development.

Elk Valley

There are three wetland and riparian systems in Elk Valley:

- the floodplain wetlands that have developed in the side channels and oxbows along the Elk River;
- riparian cottonwood and conifer systems on the floodplain of the main Elk River; and
- low-elevation riparian zones along the various tributaries.

The floodplain system between the communities of Elko and Elkford is the most important riparian system within the priority area. There are few cottonwood-dominated floodplain systems with an unaltered hydrograph and natural cottonwood recruitment remaining in BC, Western Canada, or the Columbia Region.

Creston Valley

There are four wetland and riparian systems in Creston Valley:

- diked wetlands in the CVWMA and on the Yaqan Nukiy (also known as the Lower Kootenay Band) lands (the Yaqan Nukiy wetlands project);
- floodplain wetland systems along the Kootenay and Goat Rivers that flood during high water events;
- floodplain cottonwood systems on portions of the floodplain and the alluvial fans of Summit Creek and Goat River; and
- cottonwood-dominated systems along the dikes and levees of the Kootenay River.

There are two small pothole wetlands in the Canyon/Lister area on the elevated benches on the east side of the valley south of Creston.

Duncan/Lardeau Valley and Revelstoke Reach

There are five wetland and riparian systems in the Duncan/Lardeau Valley:

- the floodplain/wetland complex along the lower Lardeau River;
- riparian spruce systems on the floodplain of the Lardeau River from the townsites of Marblehead/Howser to Trout Lake;
- mid-elevation floodplain wetland complexes at the upper end of the Lardeau system, above Trout Lake and adjacent to Staubert and Armstrong Lakes in the nearby watershed that flows into the Arrow Lakes watershed;
- wetlands on the west bench above Arrow Lakes Reservoir; and
- low-elevation riparian zones along the various tributaries in the priority area.

There are three wetland and floodplain systems in the Revelstoke Reach:

- wetlands that have developed in the drawdown zone of the Arrow Lakes Reservoir, just south of Revelstoke;
- riparian cottonwood systems on the floodplain of the Illecillewaet River where it flows through Revelstoke; and
- riparian areas along the mainstem of the Columbia River.

The extensive wetlands that have developed in the drawdown zone of the Arrow Lakes Reservoir just south of Revelstoke are a component of the ongoing work through the Columbia Water Use Plan.

Slocan Valley

There are six wetland and riparian systems in this priority area:

- floodplain wetlands along the lower Slocan River;
- riparian cottonwood/spruce/cedar systems on portions of the lower Slocan floodplain;
- two small bench wetlands on the slopes above the little Slocan Valley;
- alluvial fans on the shores of Slocan Lake;
- low-elevation floodplain systems in the Little Slocan Lakes area and other small wetlands at slightly higher elevation above Slocan Lake in the upper watershed; and
- mid-elevation riparian zones along all the various stream courses in the area and surrounding lakes and wetlands.

Canoe Reach and Robson Valley

Canoe Reach and Robson Valley includes four separate watersheds:

- lower Canoe River watershed;
- McLennan Creek watershed (between Valemount and Tete Jaune Cache);
- Swift Creek watershed (near Valemount and Tete Jaune Cache); and
- the much larger floodplain system along the Fraser River from the Mt. Robson area downstream to Crescent Spur.

There are several wetland and floodplain systems in Canoe Reach and Robson Valley, including:

- two diked wetlands (Cranberry Marsh near Valemount and Horseshoe Lake near McBride);
- floodplain wetlands along the Fraser River (100 km+), McLennan Creek (20 km), and the Canoe River (8 km), mostly in the form of old oxbows;
- riparian spruce/aspen/cottonwood systems on the floodplains of each of these watersheds;
- several small wetlands on the benches above the Fraser River;
- a mid-elevation floodplain system on the Rausch River; and
- mid-elevation riparian zones along all the various stream courses in the area.

Species of Interest in Wetlands & Riparian Areas

Species of interest in wetlands and riparian ecosystems are both aquatic and terrestrial species or guilds that are important to communities or are of conservation concern but may not be adequately addressed by ecosystem-based actions. These include some species at risk (SAR) or species used for food or cultural purposes.

The FWCP uses three general categories of species of interest: recovery, focal, and inventory.

Recovery Species	Recovery species are those of highest priority and conservation concern that have been adversely impacted by dam construction and/or operation. These species have formally been classified as either threatened or endangered by Canada or B.C., and recovery and/or management plans are either in place or under development by Federal or Provincial management agencies. Actions for recovery species are directly coordinated with recovery strategies and plans.

Focal Species	Focal species have a strong linkage to dam footprint impacts and are of regional interest. Actions proposed for species in this category should be developed in the context of restoring/improving/enhancing suitable habitats in the relevant ecosystems. Focal species with a high conservation concern (i.e. species at risk) may be considered a higher priority for actions.
Inventory Species	Inventory species have also been affected by dams, but detailed inventory and/or trend monitoring is required to support the development of more detailed actions. Actions proposed for species in this category should aim to provide the basis for future compensation actions. Inventory species with a high conservation concern (i.e. species at risk) may be considered a higher priority for actions.

Species that would benefit most from FWCP investment and that also depend on wetlands and riparian areas more than any other type of habitat are presented below. These are the species that have been heavily impacted by dam footprint on wetlands and for which there is a regional conservation concern and/or high local interest. Actions are presented that will directly benefit species that utilize wetlands and riparian areas. In addition, wetlands and riparian areas may also represent supporting habitat; that is, these species occur in wetlands and riparian areas, but they occur more often or are more dependent on one or more other habitat types. Actions taken on wetlands and riparian areas may benefit these species, but actions on their primary habitat are likely to provide greater benefit.

Recovery Species

There are several recovery species of interest (Table 1) associated with wetlands and riparian areas within the Columbia Region, three of which (described below) occupy wetlands and/or riparian habitats as their primary habitat. Actions for these species align with Federal and/or Provincial recovery strategies and management plans.

Northern Leopard Frog (*Lithobates pipiens*)

The Northern Leopard Frog is one of several leopard frog species that are widely distributed throughout North America. However, many Western populations have declined significantly or disappeared (Ohanjanian and Paige 2004). The BC population, referred to as the Rocky Mountain population, is listed as Endangered on Schedule 1 of the Species at Risk Act (Environment and Climate Change Canada 2017) and it is on the BC Red List (B.C. CDC 2019). Currently, this species occurs at only three sites in the province, all in the Columbia Region: Creston Valley Wildlife Management Area (Ohanjanian 1997), Bummer's Flats, and Columbia Wetlands.

The FWCP Columbia has supported recovery efforts for Northern Leopard Frog since 2000. A captive-rearing and reintroduction program ran from 2001 to 2005, and since then the focus has been monitoring the Creston population, protecting wild egg masses from predators, helping to establish a captive assurance colony at the Vancouver Aquarium, and conducting reintroductions (Adama and Beaucher 2006; Houston 2018).

One action is presented for Northern Leopard Frog to support strategies and initiatives outlined in the federal and provincial recovery strategies (Environment and Climate Change Canada 2017).

Western Screech-Owl (*Megascops kennicottii macfarlanei*)

Western Screech-Owls are non-migratory raptors and recovery planning is led by the Province of B.C. (Western Screech-Owl Recovery Team 2008). Population size in BC is estimated at 50–200 individuals. The centre of the species distribution is in the southern Okanagan. Approximately 20% of the known detection sites of this species occur in the Columbia Region and these locations are confined to the southernmost portions of the East and West Kootenay sub-regions (Hausleitner et al. 2015).

This sub-species of Screech-Owl occurs year-round in low-elevation riparian habitat in the southern interior of BC. Mature cottonwood habitat is consistently identified as the core-nesting habitat for this species, and they will often forage in surrounding upland habitat (e.g. coniferous habitat, meadows).

The FWCP has supported work on this species since 2003. Work completed to date includes inventory, radio telemetry, stewardship, Wildlife Habitat Area submissions, and wildlife tree restoration for cavity-nesting species. One action is presented for Western Screech-Owl to support strategies and initiatives outlined in the provincial recovery strategies (B.C. Ministry of Environment 2016). Ecosystem actions presented in this plan, as well as in the Rivers & Riparian Areas Action Plan, will also benefit Western Screech-Owl.

Yellow-breasted Chat (*Icteria virens auricollis*)

The Yellow-breasted Chat is widespread throughout the United States and central Mexico, but its distribution in Canada is restricted to southern BC, Alberta, Saskatchewan, and Ontario (Gebauer 2004). In BC, breeding Yellow-breasted Chats are found only in the extreme south Okanagan and Similkameen Valleys (Campbell et al. 2001) and at two sites in the Columbia Region (Machmer and Ogle 2006). In addition, singing males are occasionally reported from Creston (Gebauer 2004) and Revelstoke Reach (B.C. CDC 2019). The BC population is likely 200 pairs (B.C. CDC 2019).

Yellow-breasted Chats nest in riparian habitats and adjacent upland shrub and are highly dependent on riparian conditions. Loss of riparian habitat is the main threat to this species. Pesticide spraying, predation, and nest parasitism by Brown-headed Cowbirds (*Molothrus ater*) may be significant problems (Gebauer 2004). In the Pend d'Oreille River area, chats breed in upland shrub habitats near Waneta Reservoir and associated transmission line rights of way.

One action is presented for the Yellow-breasted Chat to support strategies and initiatives outlined in the federal and provincial recovery strategies (Environment and Climate Change Canada 2016). Ecosystem actions presented in this plan, as well as in the Rivers & Riparian Areas Action Plan, will also benefit Yellow-breasted Chat.

Focal Species

Focal species have been identified and prioritized by the FWCP Columbia Region using the Species Rating and Database Tool (Fish & Wildlife Compensation Program 2011b) and the following steps:

1. Identifying species that have known habitat-based or species-based actions that could be implemented immediately (i.e. where the species distribution, abundance, and limiting factors are sufficiently understood); and
2. Removing species that are not of a high local or conservation concern, as defined by consultation and by the British Columbia Conservation Framework, and/or those that were not ranked high in the Columbia Basin dam impacts studies (e.g. Manley and Krebs 2009).

Table 2 lists the focal species cross-referenced with the priority (dark green) and supporting (light green) ecosystem Action Plans. The FWCP considers projects targeting focal species and their habitats as priorities for consideration where clear habitat-, land-, or species-based actions are available for implementation.

Inventory Species

Inventory species are those for which inventory/data acquisition is the primary compensation action identified by the FWCP and in the Columbia Basin dam impacts reports (e.g. Manley and Krebs 2009). Table 3 lists the inventory species that are primarily associated with wetland and riparian habitat, which have been identified as highly impacted by dam construction or operation. Before further actions are developed and implemented for these species, some baseline inventory work is required to determine their distribution and abundance and/or trend within the Columbia Region.

The FWCP considers projects targeting inventory species as priorities for consideration where clear outcomes leading to habitat-, land-, or species-based actions are practically achievable. Projects are prioritized during the annual operational planning cycle.

Culturally Important Species

Culturally important plant and animal species occur in the Columbia Region and are a recognized component of wetland and riparian ecosystem function and resiliency, as well as a part of a holistic approach to current and future fish and wildlife compensation actions. First Nations should be consulted where projects overlap with identified culturally

important species. FWCP-funded work for culturally important wetland and riparian associated species may occur under cross plan actions, or as part of other ecosystem or species actions in this plan.

Invasive Species

The FWCP Columbia Region supports work that prevents and/or controls the spread and effects of invasive species that have the potential to negatively impact projects previously supported by the FWCP, such as restoration sites and/or conservation properties. Any work to address invasive species should be completed in collaboration with the Province of B.C. and regional invasive species councils and societies as appropriate. Invasive species priority and watch lists vary by region, location, and year; therefore, grant applicants should refer to the appropriate regional and/or Provincial organization when developing funding applications.

Table 1: Recovery species of interest associated with wetlands & riparian areas in the Columbia Region. *This list is based on species that are of highest priority and conservation concern and have been adversely impacted by dam construction and/or operation. Coloured cells represent the ordered relationship between species and the ecosystem-based action plans. ✔with dark green = primary habitat, light green = supporting habitat.*

Fish Wildlife	Guild	Common Name	Species Name	Federal	Provincial	Wetlands & Riparian	Reservoirs & Large Lakes	Small Lakes	Rivers & Riparian	Upland & Dryland
Wildlife	Amphibian	Northern Leopard Frog	*Lithobates sylvatica*	Endangered	Red-listed	✔				
Wildlife	Bird - Raptor	Western Screech-Owl	*Megascops kennicottii macfarlanei*	Threatened	Blue-listed	✔			✔	
Wildlife	Bird - Songbird	Yellow-breasted Chat	*Icteria virens auricollis*	Endangered	Red-listed	✔			✔	

Table 2: Focal species of interest associated with wetlands & riparian areas in the Columbia Region. *The list is based on species for which there are habitat-based or species-based actions that can be implemented immediately (i.e. where the species distribution, abundance and limiting factors are sufficiently understood) and dam impacts are known to be high. Coloured cells represent the ordered relationship between species and the ecosystem-based action plans: ✔with dark green = primary habitat, light green = supporting habitat.*

Fish Wildlife	Guild	Common Name	Species Name	Federal	Provincial	Wetlands & Riparian	Reservoirs & Large Lakes	Small Lakes	Rivers & Riparian	Upland & Dryland
Wildlife	Amphibian	Columbia Spotted Frog	*Rana luteiventris*	Not at Risk	Yellow-listed	✔				
Wildlife	Amphibian	Western Toad	*Anaxyrus boreas*	Special Concern	Yellow-listed	✔		✔		
Wildlife	Bird - Aerial Insectivore	Vaux's Swift	*Chaetura vauxi*		Yellow-listed	✔				
Wildlife	Bird - Raptor	Osprey	*Pandion haliaetus*		Yellow-listed	✔				
Wildlife	Bird - Shorebird	Long-billed Curlew	*Numenius americanus*	Special Concern	Blue-listed					✔
Wildlife	Bird - Shorebird	Spotted Sandpiper	*Actitis macularius*		Yellow-listed			✔		
Wildlife	Bird - Songbird	Bobolink	*Dolichonyx oryzivorus*	Threatened	Blue-listed	✔				
Wildlife	Bird - Songbird	Yellow Warbler	*Setophaga petechia*		Yellow-listed					✔
Wildlife	Bird - Wader	American Bittern	*Botaurus lentiginosus*		Blue-listed	✔				
Wildlife	Bird - Wader	Great Blue Heron	*Ardea herodias herodias*		Blue-listed	✔				
Wildlife	Bird - Water	American White Pelican	*Pelecanus erythrorhynchos*		Red-listed			✔		
Wildlife	Bird - Water	Western Grebe	*Aechmophorus occidentalis*	Special Concern	Red-listed			✔		
Wildlife	Mammal - Bat	Silver-haired Bat	*Lasionycteris noctivagans*		Yellow-listed					✔
Wildlife	Mammal - Bat	Townsends Big-eared Bat	*Corynorhinus townsendii*		Blue-listed					✔
Wildlife	Mammal - Carnivore	Cougar	*Puma concolor*		Yellow-listed					✔
Wildlife	Mammal - Carnivore	Grey Wolf	*Canis lupus*	Not at Risk	Yellow-listed					✔
Wildlife	Mammal - Carnivore	Grizzly Bear	*Ursus arctos*	Special Concern	Blue-listed					✔
Wildlife	Mammal - Ungulate	Elk	*Cervus canadensis*		Yellow-listed					✔
Wildlife	Mammal - Ungulate	Moose	*Alces americanus*		Yellow-listed	✔				
Wildlife	Mammal - Ungulate	Mule Deer	*Odocoileus hemionus*		Yellow-listed					✔
Wildlife	Mammal - Ungulate	White-tailed Deer	*Odocoileus virginianus*		Yellow-listed					✔
Wildlife	Reptile	Western Painted Turtle	*Chrysemys picta bellii*	Special Concern	Blue-listed	✔		✔		

Table 3: Inventory species of interest associated with wetlands & riparian areas in the Columbia Region. *The list is based on species for which dam impacts are known to be high, but baseline information is required before habitat- or species-based action can be implemented. Coloured cells represent the ordered relationship between species and the ecosystem-based action plans: ✔ with dark green = primary habitat, light green = supporting habitat.*

Fish Wildlife	Guild	Common Name	Species Name	Federal	Provincial	Wetlands & Riparian	Reservoirs & Large Lakes	Small Lakes	Rivers & Riparian	Upland & Dryland
Wildlife	Amphibian	Wood Frog	*Lithobates sylvaticus*		Yellow-listed	✔				
Wildlife	Bird - Aerial Insectivore	Bank Swallow	*Riparia riparia*	Threatened	Yellow-listed	✔			✔	
Wildlife	Bird - Aerial Insectivore	Barn Swallow	*Hirundo rustica*	Threatened	Blue-listed	✔				
Wildlife	Bird - Aerial Insectivore	Black Swift	*Cypseloides niger*	Endangered	Blue-listed	✔			✔	
Wildlife	Bird - Aerial Insectivore	Cliff Swallow	*Petrochelidon pyrrhonota*		Yellow-listed	✔				
Wildlife	Bird - Aerial Insectivore	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*		Yellow-listed	✔				
Wildlife	Bird - Aerial Insectivore	Tree Swallow	*Tachycineta bicolor*		Yellow-listed	✔				
Wildlife	Bird - Aerial Insectivore	Violet-green Swallow	*Tachycineta thalassina*		Yellow-listed	✔				
Wildlife	Bird - Hummingbird	Rufous Hummingbird	*Selasphorus rufus*		Yellow-listed					✔
Wildlife	Bird - Raptor	Bald Eagle	*Haliaeetus leucocephalus*	Not at Risk	Yellow-listed		✔			
Wildlife	Bird - Raptor	Barred Owl	*Strix varia*		Yellow-listed					✔
Wildlife	Bird - Raptor	Broad-winged Hawk	*Buteo platypterus*		Blue-listed					✔
Wildlife	Bird - Raptor	Northern Harrier	*Circus hudsonius*	Not at Risk	Yellow-listed	✔				
Wildlife	Bird - Raptor	Short-eared Owl	*Asio flammeus*	Special Concern	Blue-listed	✔				
Wildlife	Bird - Shorebird	Black Tern	*Chlidonias niger*	Not at Risk	Yellow-listed	✔				
Wildlife	Bird - Shorebird	Forster's Tern	*Sterna forsteri*	Data Deficient	Red-listed			✔		
Wildlife	Bird - Shorebird	Herring Gull	*Larus argentatus*		Yellow-listed	✔				
Wildlife	Bird - Shorebird	Killdeer	*Charadrius vociferus*		Yellow-listed		✔			
Wildlife	Bird - Shorebird	Wilson's Snipe	*Gallinago delicata*		Yellow-listed	✔				
Wildlife	Bird - Songbird	Alder Flycatcher	*Empidonax alnorum*		Yellow-listed	✔				
Wildlife	Bird - Songbird	American Redstart	*Setophaga ruticilla*		Yellow-listed	✔				
Wildlife	Bird - Songbird	Black-headed Grosbeak	*Pheucticus melanocephalus*		Yellow-listed	✔				
Wildlife	Bird - Songbird	Black-necked Stilt	*Himantopus mexicanus*		No Status	✔				
Wildlife	Bird - Songbird	Common Yellowthroat	*Geothlypis trichas*		Yellow-listed	✔				
Wildlife	Bird - Songbird	Gray Catbird	*Dumetella carolinensis*		Yellow-listed	✔				
Wildlife	Bird - Songbird	Olive-sided Flycatcher	*Contopus cooperi*	Special Concern	Blue-listed					✔
Wildlife	Bird - Songbird	Pacific Wren	*Troglodytes pacificus*		Yellow-listed					✔
Wildlife	Bird - Songbird	Veery	*Catharus fuscescens*		Yellow-listed	✔				
Wildlife	Bird - Wader	Sora	*Porzana carolina*		Yellow-listed	✔				
Wildlife	Bird - Wader	Virginia Rail	*Rallus limicola*		Yellow-listed	✔				
Wildlife	Bird - Water	American Coot	*Fulica americana*		Yellow-listed	✔				
Wildlife	Bird - Water	Barrow's Goldeneye	*Bucephala islandica*		Yellow-listed			✔		
Wildlife	Bird - Water	Belted Kingfisher	*Megaceryle alcyon*		Yellow-listed				✔	
Wildlife	Bird - Water	Blue-winged Teal	*Spatula discors*		Yellow-listed	✔				
Wildlife	Bird - Water	Bufflehead	*Bucephala albeola*		Yellow-listed			✔		
Wildlife	Bird - Water	Canvasback	*Aythya valisineria*		Yellow-listed	✔				

Table 3 Continued

Fish Wildlife	Guild	Common Name	Species Name	Federal	Provincial	Wetlands & Riparian	Reservoirs & Large Lakes	Small Lakes	Rivers & Riparian	Upland & Dryland
Wildlife	Bird - Water	Cinnamon Teal	*Spatula cyanoptera*		Yellow-listed	✔				
Wildlife	Bird - Water	Common Goldeneye	*Bucephala clangula*		Yellow-listed			✔		
Wildlife	Bird - Water	Eared Grebe	*Podiceps nigricollis*		Blue-listed	✔				
Wildlife	Bird - Water	Hooded Merganser	*Lophodytes cucullatus*		Yellow-listed	✔				
Wildlife	Bird - Water	Horned Grebe	*Podiceps auritus*	Special Concern	Yellow-listed	✔				
Wildlife	Bird - Water	Lesser Scaup	*Aythya affinis*		Yellow-listed	✔				
Wildlife	Bird - Water	Northern Pintail	*Anas acuta*		Yellow-listed	✔				
Wildlife	Bird - Water	Pied-billed Grebe	*Podilymbus podiceps*		Yellow-listed	✔				
Wildlife	Bird - Water	Redhead	*Aythya americana*		Yellow-listed	✔				
Wildlife	Bird - Water	Red-necked Grebe	*Podiceps grisegena*	Not at Risk	Yellow-listed	✔				
Wildlife	Bird - Water	Ring-necked Duck	*Aythya collaris*		Yellow-listed	✔				
Wildlife	Bird - Water	Wood Duck	*Aix sponsa*		Yellow-listed	✔				
Wildlife	Mammal - Bat	Big Brown Bat	*Eptesicus fuscus*		Yellow-listed					✔
Wildlife	Mammal - Bat	California Myotis	*Myotis californicus*		Yellow-listed					✔
Wildlife	Mammal - Bat	Eastern Red Bat	*Lasiurus borealis*		Unknown					✔
Wildlife	Mammal - Bat	Fringed Myotis	*Myotis thysanodes*	Data Deficient	Blue-listed					✔
Wildlife	Mammal - Bat	Little Brown Myotis	*Myotis lucifungus*	Endangered	Yellow-listed					✔
Wildlife	Mammal - Bat	Yuma Myotis	*Myotis yumanensis*		Yellow-listed					✔
Wildlife	Mammal - Carnivore	American Mink	*Neovison vison*		Yellow-listed	✔				
Wildlife	Mammal - Carnivore	Fisher	*Martes pennanti*		Blue-listed	✔				✔
Wildlife	Mammal - Carnivore	North American River Otter	*Lontra canadensis*		Yellow-listed				✔	
Wildlife	Mammal - Rodent	American Beaver	*Castor canadensis*		Yellow-listed	✔				
Wildlife	Mammal - Rodent	American Water Shrew	*Sorex palustris*		Blue-listed				✔	
Wildlife	Mammal - Rodent	Meadow Vole	*Microtus pennsylvanicus*		Yellow-listed	✔				

ACTION TABLES

These Action Tables identify the FWCP's Priority Actions to conserve and enhance fish and wildlife in watersheds impacted by BC Hydro dams in wetland and riparian ecosystems in the Columbia Region. 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. Actions identified as **DIRECTED only** are not eligible for a grant. These are projects that our Regional Boards will direct through the appropriate procurement process (e.g. a request for proposal). Please **do not** submit a grant application for a **DIRECTED only** project. Actions identified as **DIRECTED / OPEN are eligible for a grant** or may be projects that our Regional Boards will direct through the appropriate procurement process. Contact us if you are unsure.

Cross Plan Actions

Several broad cross plan actions are relevant to all Action Plans and will require the consideration of multiple ecosystems.

CROSS ECOSYSTEM PLAN ACTIONS							Version:AUG2019	
Action #	**Action Type**	**Priority Action Short Description**	**Priority**	**Priority Area**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**
1	Research and Information Acquisition	**COLWRA.CXP.RI.01.01 Indigenous knowledge and values, develop framework-P1**	**1**	All Action Plan Priority Areas	Fish and Wildlife	Develop a framework for incorporating Indigenous knowledge and values into FWCP projects.	Collaboration with Indigenous peoples relating to FWCP projects.	Directed
2	Habitat-based	**COLWRA.CXP.HB.02.01 Indigenous knowledge and values, incorporate based on framework-P1**				Incorporate Indigenous knowledge and values into FWCP projects based on framework developed in Action #1.		Directed / Open
3	Research and Information Acquisition	**COLWRA.CXP.RI.03.01 Climate change strategy-P1**	**1**	All Action Plan Priority Areas	Fish and Wildlife	Develop a framework for the FWCP Columbia Region to incorporate elements of climate change into actions (e.g. research, habitat restoration, land securement and/or monitoring of fish and wildlife populations, ecosystems or habitats).	Increased understanding of climate change impacts on fish and wildlife in the Columbia Region and how FWCP can help support on-the-ground action (e.g. development and implementation of resiliency plans, land securement initiatives, restoration).	Directed
4	Research and Information Acquisition	**COLWRA.CXP.RI.04.01 Responding to emergent issues-P2**	**2**	All Action Plan Priority Areas	Fish and Wildlife	Support project work relating to urgent and emerging issues for the Columbia Region (e.g. emergent diseases, cumulative effects, imminent species declines).	Allows the FWCP to support appropriate organizations and/or support initiatives aimed at emergent issues.	Directed

Continued: Cross Ecosystem Plan Actions

CROSS ECOSYSTEM PLAN ACTIONS							Version:AUG2019	
Action #	**Action Type**	**Priority Action Short Description**	**Priority**	**Priority Area**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**
5	Research and Information Acquisition	**COLWRA.CXP.RI.05.01 Culturally important resources-P1**	**1**	All Action Plan Priority Areas	Fish and Wildlife	Work with appropriate Indigenous groups and organizations to conduct research and inventory to improve the understanding of culturally important plants and animals.	Conservation and increased understanding of culturally important species.	Directed / Open
6	Habitat-based	**COLWRA.CXP.HB.06.01 Connectivity habitat-P1**	**1**	All Action Plan Priority Areas	Fish and Wildlife	Support work towards conservation, improvement of important connectivity habitat and land securement (i.e. linkage areas, including high elevation) both within an ecosystem type (i.e. reservoirs and spawning tributaries, riparian areas) and across ecosystem types (i.e. valley bottoms to montane habitats) for fish and wildlife species (e.g. wide-ranging species, transboundary species, rare species).	Conservation and improvement of connectivity habitats.	Directed / Open

Wetlands & Riparian Areas Ecosystem Actions

WETLAND AND RIPARIAN AREAS ACTION TABLE - ECOSYSTEMS							Version:AUG2019	
Action #	**Action Type**	**Priority Action Short Description**	**Priority**	**Priority Area**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**
7	Research and Information Acquisition	**COLWRA.ECO.RI.07.01 Mapping of wetland and riparian habitat-P1**	**1**	All Priority Valleys	Fish and Wildlife	Determine the distribution, abundance, current function and connectivity of wetland and riparian habitat using provincial mapping data standards to ensure cataloguing consistency among agencies. Identify data gaps. Collaborate and share information.	▪ Comprehensive mapping information (extent and current status) to support feasible targets for wetland and riparian restoration or enhancement. ▪ Improved information sharing to reduce the potential of duplicating efforts.	Directed / Open
8	Research and Information Acquisition	**COLWRA.ECO.RI.08.01 Current ecological wetland conditions-P2**	**2**	All Priority Valleys	Fish and Wildlife	Document and assess habitat to identify current and changing ecological conditions (e.g. functional processes and basic ecological parameters [nutrient levels, water temperature/levels/quality/flow]) in wetland and riparian areas.	▪ Identified changes to wetlands to aid in predicting impacts, their severity and means to improve habitat resiliency in response to climate change. ▪ Systematic approach to monitoring flow and water quality parameters in wetland and riparian areas.	Directed / Open
9	Research and Information Acquisition	**COLWRA.ECO.RI.09.01 Inventory of old growth stands-P1**	**1**	All Priority Valleys	Fish and Wildlife	Inventory and prioritize old growth stands in wetland and riparian areas for conservation action. Prioritize areas that may include old growth cedar or cottonwood stands and floodplain habitats.	Increased understanding of the distribution of old growth areas in the Columbia Region.	Directed / Open
10	Research and Information Acquisition	**COLWRA.ECO.RI.10.01 Cottonwood abundance-P2**	**2**	All Priority Valleys	Fish and Wildlife	Document Black Cottonwood/poplar stands in order to determine the presence and abundance of Black Cottonwood/poplar in wetland and riparian areas, and outline future enhancement opportunities.	Increased understanding of the distribution of cottonwood stands in the Columbia Region.	Open

Continued: Ecosystems Action Table

WETLAND AND RIPARIAN AREAS ACTION TABLE - ECOSYSTEMS							Version:AUG2019	
Action #	**Action Type**	**Priority Action Short Description**	**Priority**	**Priority Area**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**
11	Research and Information Acquisition	**COLWRA.ECO.RI.11.01 Identify candidate wetlands and riparian areas for ecosystem restoration-P1**	**1**	All Priority Valleys	Fish and Wildlife	Identify candidate wetland and riparian areas for the development of ecosystem restoration (ER) plans and/or activities in the Columbia Region and develop strategies for future work as required. This work could include re-evaluating and refining the criteria developed to prioritize wetlands and riparian areas for conservation/restoration/enhancement opportunities. Collaboration with regional agencies/committees, First Nations and/or the Province of B.C. should occur.	▪ Identification of new opportunities for wetland and riparian area restoration. ▪ Strengthened and expanded partnerships and collaborations and enhanced wetland and riparian areas.	Directed / Open
12	Habitat-based	**COLWRA.ECO.HB.12.01 Development of ecosystem restoration plans-P1**	**1**	All Priority Valleys	Fish and Wildlife	Support the development of ecosystem restoration (ER)plans for priority wetland and riparian habitats as per the direction of Action #11. These plans should assess limiting factors, describe opportunities for FWCP investment, guide future work in these areas with specific actions and targets, and describe how results should be monitored. Updates to existing ecosystem plans may be required.	Ecosystem restoration plans will identify future FWCP compensation options and strengthen conservation planning and actions.	Directed / Open
13	Habitat-based	**COLWRA.ECO.HB.13.01 Restore and create wetland/riparian habitat-P1**	**1**	All Priority Valleys	Fish and Wildlife	Restore and create wetland and riparian habitat to address impacted, degraded or lost habitat. Where possible collaborate and engage with the community, and upon project completion share information with appropriate regional organizations and agencies.	▪ Increased availability of wetland and riparian area habitat for a variety of species. ▪ Restored native vegetation and improved function in wetland and riparian areas.	Directed / Open
14	Habitat-based	**COLWRA.ECO.HB.14.01 Prevention and control of invasive species-P1**	**1**	All Priority Valleys	Aquatic & Terrestrial Invasive Species	Contribute to the prevention and control of high priority terrestrial and aquatic invasive species that have the potential to negatively impact FWCP project investments in collaboration with the Province of B.C. and regional invasive species councils and societies as appropriate.	▪ Protection of FWCP investments against invasive species establishment and spread. ▪ Prevention of the introduction and spread of aquatic and terrestrial invasive species.	Open

Continued: Ecosystems Action Table

WETLAND AND RIPARIAN AREAS ACTION TABLE - ECOSYSTEMS							Version:AUG2019	
Action #	**Action Type**	**Priority Action Short Description**	**Priority**	**Priority Area**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**
15	Habitat-based	**COLWRA.ECO.HB.15.01 Cottonwood stand restoration/ recruitment-P1**	**1**	All Priority Valleys	Fish and Wildlife	Support recruitment and restoration of critical cottonwood stands (those that benefit multiple species), including exploring opportunities to work with partners to establish methodology and prioritize action. Evaluate the influence of upland/wetland riparian/river habitat on cottonwood stands. Coordinate efforts with Rivers and Riparian Areas Action #14.	▪ Improved cottonwood habitat and fish and wildlife populations that depend on them. ▪ Strengthened and expanded partnerships and collaborations and enhanced wetland and riparian areas.	Directed / Open
16	Habitat-based	**COLWRA.ECO.HB.16.01 Restore water levels and water quality-P2**	**2**	All Priority Valleys	Fish and Wildlife	Implement habitat-based actions to conserve/restore/enhance water levels and water quality in wetland habitats. Ensure alignment with relevant actions in Rivers and Riparian Areas and Reservoirs and Large Lakes ecosystem plans.	Improved wetland habitat for fish and wildlife.	Open
17	Habitat-based	**COLWRA.ECO.HB.17.01 Improve habitat connectivity-P1**	**1**	All Priority Valleys	Wildlife	Improve habitat connectivity between wetland and river ecosystems, and across roadways that traverse aquatic habitats (wetlands, streams, lakes, and reservoirs), including but not limited to high-value wetlands cut-off by transportation corridors. High priority areas include wetland and riparian areas directly affected by dam impacts, biodiversity hot spots and conservation properties.	Improved connectivity between aquatic ecosystems that will benefit fish and wildlife.	Directed / Open
18	Habitat-based	**COLWRA.ECO.HB.18.01 Create floating islands in wetlands-P2**	**2**	All Priority Valleys	Fish and Wildlife	Support creation of floating islands in wetland areas where deemed a limiting factor. Integrate naturally occurring beaver-influenced activity into restoration initiatives where possible.	Increased available wetland habitat and improved understanding of the potential for fish and wildlife use of these restoration initiatives.	Open
19	Habitat-based	**COLWRA.ECO.HB.19.01 Access management issues-P1**	**1**	All Priority Valleys	Fish and Wildlife	Support work that seeks to resolve access and recreation management issues that affect FWCP supported conservation properties and restoration/enhancement investments.	Protection of FWCP investments and decreases in negative impacts related to access and recreational use.	Directed / Open

Continued: Ecosystems Action Table

WETLAND AND RIPARIAN AREAS ACTION TABLE - ECOSYSTEMS							Version:AUG2021	
Action #	**Action Type**	**Priority Action Short Description**	**Priority**	**Priority Area**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**
20	Habitat-based	**COLWRA.ECO.HB.20.01 Stewardship opportunities to improve habitat-P1**	**1**	All Priority Valleys	Fish and Wildlife	Collaborate with Indigenous groups, stewardship groups, and others to identify potential stewardship opportunities to improve habitat and address threats to critical wetland and riparian areas.	Increased available wetland and riparian habitat and increased community involvement in stewardship activities.	Directed / Open
21	Monitoring and Evaluation	**COLWRA.ECO.ME.21.01 Effectiveness monitoring of past projects-P1**	**1**	All Priority Valleys	Fish and Wildlife	Monitor and evaluate the effectiveness of previous FWCP wetland and riparian restoration projects (for monitoring of species see Action #38 below). Include an approach for adaptive management, documenting and assessing ecological conditions and parameters (pre- and post-restoration), information sharing and collaboration among agencies and the public stakeholders to increase the efficacy of conservation action.	Future actions are effective and documented.	Directed
22	Land Securement	**COLWRA.ECO.LS.22.01 Secure wetland and riparian habitats-P1**	**1**	All Priority Valleys	Fish and Wildlife	Support the securement and protection of important wetland and riparian habitats including those areas identified in Actions #7, 9 and/or 11. Also, identify threats to key habitat connectivity/habitat linkage areas and support land securement opportunities, in order to secure and steward lands with high conservation values for wetland and riparian areas.	▪ Multi-stakeholder collaboration to secure high-value lands that are under threat. ▪ Conservation of aquatic and terrestrial ecosystem habitat and connectivity. ▪ Improved knowledge of threats to inform future land securement and conservation/compensation action.	Directed / Open

Wetlands & Riparian Areas Species of Interest Actions

WETLAND AND RIPARIAN AREAS ACTION TABLE - SPECIES OF INTEREST							Version:AUG2019	
Action #	**Action Type**	**Priority Action Short Description**	**Priority**	**Priority Area**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**
23	Species-based	**COLWRA.SOI.SB.23.01 Northern Leopard Frog Conservation-P1**	**1**	Creston Valley Rocky Mountain Trench	Northern Leopard Frog	Support strategies and initiatives outlined in the BC Recovery Plan for Northern Leopard Frog that relate to compensation for dam impacts. Where possible, link project work to the connectivity of this species across ecosystems and collaborate with recovery team specialists.	Recovery of Northern Leopard Frog.	Directed / Open
24	Species-based	**COLWRA.SOI.SB.24.01 Western Screech-Owl Conservation-P1**	**1**	All Priority Valleys	Western Screech-Owl	Support strategies and initiatives outlined in the BC Recovery Plan for Western Screech-Owl that relate to compensation for dam impacts. Where possible, link project work to the connectivity of this species across ecosystems and collaborate with recovery team specialists.	Recovery of Western Screech-Owl.	Directed / Open
25	Species-based	**COLWRA.SOI.SB.25.01 Yellow-breasted Chat Conservation-P1**	**1**	Pend d'Oreille Other Priority Valleys	Yellow-breasted Chat	Support strategies and initiatives outlined in the SARA Recovery Strategy for Yellow-breasted Chat that relate to compensation for dam impacts. Where possible, link project work to the connectivity of this species across ecosystems and collaborate with recovery team specialists.	Recovery of Yellow-breasted Chat.	Directed / Open
26	Species-based	**COLWRA.SOI.SB.26.01 Focal and Inventory species projects for species at risk-P2**	**2**	All Priority Valleys	Species at Risk	Support surveys, restoration and/or other compensation-related activities for 'focal' and 'inventory' species not covered in other Actions. A clear link must be made between dam impacts and proposed projects.	▪ Changes to species presence are monitored and inform future conservation/ compensation actions. ▪ Improved habitat for fish and wildlife species.	Open
		COLWRA.SOI.SB.26.02 Focal and Inventory species projects for other wildlife-P3	**3**		Other Wildlife			
27	Species-based	**COLWRA.SOI.SB.27.01 Support Grizzly Bear conservation actions-P1**	**1**	All Priority Valleys	Grizzly Bear	Support implementation of stewardship actions in the Columbia Region for important Grizzly Bear management issues, including but not limited to connectivity/linkage corridors, protecting critical food resources, and human–bear conflict issues (e.g. identifying key areas of valley bottom habitat overlaps/conflict areas, road deactivation, electric fencing). Coordinate efforts with Upland and Dryland Action #24.	Contribute to the conservation and protection of Grizzly Bear and their habitats.	Open

Continued: Species of Interest Action Table

WETLAND AND RIPARIAN AREAS ACTION TABLE - SPECIES OF INTEREST							Version:AUG2019	
Action #	**Action Type**	**Priority Action Short Description**	**Priority**	**Priority Area**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**
28	Species-based	**COLWRA.SOI.SB.28.01 Support for BC Bat initiatives-P1**	**1**	All Priority Valleys	Bats	Support the conservation of bat species present in the Columbia Region. Examples include baseline data knowledge gaps (including monitoring/inventory), White-nose Syndrome response, habitat protection and restoration, and outreach and stewardship.	Conservation and protection of bat species and their habitats.	Open
29	Species-based	**COLWRA.SOI.SB.29.01 Eradication of American Bullfrog-P1**	**1**	Creston Valley Rocky Mountain Trench	American Bullfrog	Support the monitoring and eradication of invasive American Bullfrogs in priority wetland areas as it relates to Northern Leopard Frog recovery. Combine efforts with the Province of B.C. and other relevant agencies and organizations.	Reduction of threats to Northern Leopard Frog (and other wildlife) populations.	Directed / Open
30	Species-based	**COLWRA.SOI.SB.30.01 Western Painted Turtle action-P2**	**2**	All Priority Valleys	Western Painted Turtle	Contribute to habitat-based enhancement action items and priorities as identified in the Management Plan for the Western Painted Turtle as they relate to footprint impacts.	Contribute to the conservation and protection of Western Painted Turtles and their habitats.	Open
31	Species-based	**COLWRA.SOI.SB.31.01 Western Toad breeding populations and habitat enhancement-P2**	**2**	All Priority Valleys	Western Toad	Inventory Western Toad breeding populations in the Interior Cedar Hemlock zone, including developing methodologies to determine relative breeding population size, mapping breeding locations, and identify population threats to help identify (and implement) future restoration opportunities. Collaborate with the Province of B.C., regional agencies, and other Western Toad initiatives for data sharing. Activities will likely overlap with Upland and Dryland Action #28.	▪ Increased knowledge of seasonal habitat requirements for Western Toad populations. ▪ Improved habitat through restoration and enhancement opportunities.	Directed / Open
32	Species-based	**COLWRA.SOI.SB.32.01 Great Blue Heron stewardship and habitat enhancement-P2**	**2**	All Priority Valleys	Great Blue Heron	Support Great Blue Heron stewardship and outreach activities including, but not limited to, managing public sightings data (and follow up), investigating mortalities and reported disturbances to nesting or foraging areas, providing Best Management Practices and/or potential Great Blue Heron habitat enhancement plans and recommendations to land owners.	Increased stewardship and habitat enhancements for Great Blue Heron populations.	Open

Continued: Species of Interest Action Table

WETLAND AND RIPARIAN AREAS ACTION TABLE - SPECIES OF INTEREST							Version:AUG2019	
Action #	**Action Type**	**Priority Action Short Description**	**Priority**	**Priority Area**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**
33	Species-based	**COLWRA.SOI.SB.33.01 Ungulate habitat enhancements-P1**	**1**	All Priority Valleys	Ungulates	Implement ungulate habitat enhancement projects that are informed by ungulate research (e.g. inventories) for priority riparian areas. Integrate with historic information including movement routes, timing of movement and sources of mortality.	Improved habitat for ungulates.	Directed / Open
34	Research and Information Acquisition	**COLWRA.SOI.RI.34.01 Fish presence and abundance in wetlands-P3**	**3**	All Priority Valleys	Fish	Conduct an information review and inventory/assessment on fish presence and abundance in large wetland complexes, as well as rearing habitat, side channels, and habitat that is flooded seasonally by reservoirs to inform further restoration opportunities.	Increased understanding of fish distribution, and identified data gaps and conservation actions.	Open
35	Research and Information Acquisition	**COLWRA.SOI.RI.35.01 Abundance and nesting success of waterbirds-P2**	**2**	All Priority Valleys	Birds	Inventory abundance and nesting success of waterfowl, migratory shorebird and other species of interest (e.g. estimate trends in population size, age and sex ratios, and level of use in target areas) in order to identify key areas for enhancement opportunities. Integrate with historic information.	Increased understanding of abundance and nesting success of waterfowl and other migratory bird species to inform potential conservation/compensation actions.	Open
36	Habitat-based	**COLWRA.SOI.HB.36.01 Restoration of fish rearing and spawning habitat-P2**	**2**	All Priority Valleys	Fish	Integrate restoration of fish rearing and spawning habitat with wetland and riparian conservation/restoration/enhancement initiatives. Examples include re-establishment of connection with stream/lake habitat, addition of aquatic vegetation or artificial structures to improve cover and habitat complexity and placement of suitable spawning substrate.	Improved fish habitat in alignment with wetland and riparian conservation/restoration/ enhancement efforts.	Open
37	Habitat-based	**COLWRA.SOI.HB.37.01 Enhancing wildlife habitat features-P1**	**1**	All Priority Valleys	Wildlife	Improve available wetland and riparian areas by creating or enhancing wildlife habitat features/structures. Examples could include wildlife trees, raptor platforms, nest boxes, nesting materials, floating platforms, hibernacula.	Increased habitat structures for wildlife in priority valleys.	Open
38	Monitoring and Evaluation	**COLWRA.SOI.ME.38.01 Monitor wildlife use of created/restored habitats-P1**	**1**	All Priority Valleys	Fish and Wildlife	Monitor fish and wildlife species use of improved wetland and riparian habitat that was created or restored with support from the FWCP (i.e. past projects).	Improved awareness of species' use of and effectiveness of restoration actions.	Open

Continued: Species of Interest Action Table

WETLAND AND RIPARIAN AREAS ACTION TABLE - SPECIES OF INTEREST							Version:AUG2019	
Action #	**Action Type**	**Priority Action Short Description**	**Priority**	**Priority Area**	**Target Species**	**Priority Action**	**Intended Outcome**	**Delivery Approach**
39	Monitoring and Evaluation	**COLWRA.SOI.ME.39.01 Support long-term wildlife monitoring programs-P3**	**3**	All Priority Valleys	Fish and Wildlife	Support the implementation of long-term monitoring programs to assess population trends of focal and/or inventory fish and wildlife species in wetland and riparian areas limited to previous FWCP supported projects and conservation properties.	Long-term data sets to inform conservation actions and effectiveness/evaluation of FWCP projects on fish and wildlife populations.	Directed / Open
40	Monitoring and Evaluation	**COLWRA.SOI.ME.40.01 Invertebrate monitoring-P3**	**3**	All Priority Valleys	Invertebrates	Support inventory/monitoring of wetland and riparian-associated invertebrate groups to increase knowledge of community structure and act as an indicator of productivity and ecosystem health/function in areas related to FWCP compensation activities.	Evaluation of the effect of restoration activities on invertebrate community structure.	Open

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GLOSSARY

Action Plan: The Fish & Wildlife Compensation Program has identified conservation priorities for fish and wildlife in each of its three regions and these are reflected in a series of Action Plans. The priorities and plans vary by region.

Best Management Practices (BMPs): In British Columbia, BMPs are science-based recommendations and guidelines that ensure projects or activities meet the necessary legislation, regulations, and policies and are planned and carried out in a manner that considers the consequences to the environment.

Blue List Species: Any species that is of special concern.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): An independent advisory panel to the Minister of Environment and Climate Change Canada that meets twice a year to identify and assess the status of wildlife species at risk of extinction. Members are wildlife biology experts from academia, government, non-governmental organizations, and the private sector responsible for designating wildlife species in danger of disappearing from Canada.

Creston Valley Wildlife Management Area (CVWMA): A 7,000-hectare (17,000-acre) area of Provincial crown land located along the Kootenay River system.

Cross Plan Action: An action relevant to two or more Action Plans that requires the consideration of multiple ecosystems.

Delivery Approach: Priority Actions identified as "Open" are eligible for a grant. Actions identified as "Directed" are not eligible for a grant. These are projects that the FWCP Regional Boards will direct through the appropriate procurement process (e.g. a request for proposal). Actions identified as "Directed / Open" are eligible for a grant or may be projects directed by the FWCP Regional Boards through the appropriate procurement process.

Ecosystem Restoration (ER): The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

Endangered Species: A fish or wildlife species that is facing imminent extirpation or extinction.

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

Floodplain: An area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

Focal Species: Defined by the FWCP Columbia Region as species that have strong linkages to dam footprint impacts and are of regional interest.

Footprint Impacts: The permanent loss of habitat associated with the dam and related infrastructure, including the permanently flooded habitat (below the drawdown zone) resulting from reservoir creation.

Indigenous Knowledge (IK): The United Nations Educational, Scientific and Cultural Organization (UNESCO) refers to IK as the "understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings."

Invasive Species: An organism (plant, animal, fungus, or bacterium) that is not native and has negative effects on our economy, our environment, or our health. Invasive species can spread rapidly to new areas and will often out-compete native species as there are no predators or diseases to keep them under control.

Inventory Species: Defined by the FWCP Columbia Region as species that have been affected by dams, but detailed inventory and/or trend monitoring is still required.

Lake: A naturally occurring body of water deeper than 2 m, classified by FWCP Columbia as small (less than 1,000 hectares) or large (greater than 1,000 hectares).

Priority Areas: Habitats, areas, or ecosystems that have been outlined for each Action Plan and include areas that are deemed as a priority for FWCP Open or Directed projects.

Recovery Species: Defined by the FWCP Columbia Region as species of highest priority and conservation concern that have been adversely impacted by dam construction and/or operation. These species have formally been classified as either threatened or endangered by Canada or B.C., and recovery and/or management plans are either in place or under development by Federal or Provincial management agencies.

Red List Species: Any species that is at risk of being lost (extirpated, endangered, or threatened).

Riparian Habitat: Defined as an area adjacent to a river, stream, wetland, or lake that differs from the surrounding uplands in the diversity of plant and animals found and in the overall productivity of the site.

Species of Interest: Defined by the FWCP as a specific fish and wildlife species of conservation concern (including species at risk) or other regionally important species for compensation or conservation planning process that have been affected by hydro-power development footprint impacts.

Species at Risk (SAR): Specific fish and wildlife species that have been listed by the Provincial (B.C. Conservation Data Centre) or Federal authorities (COSEWIC, SARA) to be of conservation concern for the Columbia Region.

Species at Risk Act (SARA): Proclaimed in 2003, SARA is Government of Canada legislation designed to prevent wildlife species in Canada from disappearing, to provide for the recovery of wildlife species that are extirpated (no longer exist in the wild in Canada), endangered, or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming endangered or threatened.

Species of Special Concern: A fish or wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Strategic Objectives: These objectives support meeting both BC Hydro's water licence conditions in the Peace and Columbia Regions, and its commitment and intent when voluntarily establishing the program in the Coastal Region in partnership with the Province of B.C. and DFO. The strategic objectives address conservation, sustainable use, and community engagement goals.

Threatened Species: A fish or wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.

Wetland: An area of land where the soil is saturated with moisture either permanently or seasonally and where water occurs on the surface (e.g. in marshes, bogs, and swamps).

Wildlife Extension Area (WEA): The FWCP recognizes that opportunities for fish and wildlife habitat enhancement within the Canoe Arm drainage of the Kinbasket Reservoir are extremely limited and better opportunities may exist in the upper drainage of the Fraser River near Valemount. The Columbia Region boundary includes a portion of the Fraser River drainage (i.e. the wildlife extension area) for wildlife projects only. The Policy Committee approved the WEA in 1996. The Wildlife Extension Area includes the area north of Valemount, extending east to the Alberta border, including Mount Robson Provincial Park, and west to north of McBride.

Yellow List Species: Any species that are apparently secure and not at risk of extinction.