Environment and Climate Change Canada

Canada Nature Fund: Community-Nominated Priority Places for Species at Risk

Kootenay Connect: CW Columbia Wetlands:

Restoration of habitats and Species at Risk in Columbia Valley

March 31, 2024. Final Report: Year 5

Columbia Wetlands: Summary report

Environment and Climate Change Canada | Environnement et Changement climatique Canada

5CW Summary overview of projects in Columbia Valley Year 5

By

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The Columbia Wetlands Stewardship Partners (CWSP) received funding from Kootenay Connect ECCC for three projects in Columbia Valley, BC. The projects in year 5 of the KC /ECCC projects continue the work from the year 4, providing more detailed science, more on the ground conservation actions and more community involvement.

The projects included **the 5CW Conservation & Mitigation of Wetland Basins Vulnerable to Drought (5CW Hydro & Beaver**) which is composed of 5 main topics: a) assessment of the impact of beaver dams in the Columbia Wetlands, and selection and construction of artificial beaver dams to mitigate the loss of water overwinter on species at risk (SAR) and waterbirds. b) an assessment of the status of benchland wetlands along the western side of Columbia Valley and restoration of degraded beaver dams to restore wetlands in the uplands of Columbia Valley. c) a hydrological evaluation of wetland vulnerability to climate change in Columbia Wetlands and d). assessment of hydrologic vulnerability of upland wetlands to determine priority wetlands where management actions like conservation or mitigation should be implemented. f) analysis of macroinvertebrates (using eDNA) in the Columbia Wetlands.

The second subproject, **5CW Western Painted Turtle and SAR (5CW WP Turtle & SAR)** project, sought to enhance conservation actions that would benefit American badger, western painted turtle, Lewis's woodpecker, and osprey. The third subproject **5CW Conservation Lands** has identified and ranked important biodiversity hotspots in riparian and upland habitat in Columbia Valley (CV). It has described the conservation values and challenges to conservation in four important wildlife corridors in CV. It also sought to identify and initiate conservation actions in important wildlife corridors and biodiversity hotspots in CV.

Overall, all our projects were very successful.

Here are a few highlights of our projects with a brief summary of each project below.

- Our projects aim to raise awareness around species at risk in the Columbia Valley and to enhance, restore, and manage the large riparian and wetland complex of the Columbia Wetlands and Valley to support the recovery of target species at risk.

- We identified 4 main types of floodplain wetlands based on their hydrology and geomorphology and assessed their vulnerability to ensure that a suite of them can retain permanent water bodies over winter for migrating birds in the spring.
- Beaver dams and the size of the gaps in the natural levees are responsible for ~ 60% of the variation in water levels in Columbia Wetlands. Without beaver dams the waters in CW would drain out overwinter. We continued our monitoring program on 37 wetlands with intensive monitoring of 20 wetlands.
- We applied for a permit to construct a beaver dam on a 13-ha site but were rejected by Front Counter BC. We maintained the constructed beaver dam in the 53-ha wetland important for 2 SAR and migrating waterbirds. The dam has been effective in maintaining water and we continued to collect data on effectiveness of the dam in 2023.
- We collected data and worked with ECCC & The Nature Trust of BC to install a dam(s) on one of their sites. ECCC applied for the restoration permit but was rejected. The beavers built 2 dams on that site, and we monitored it for effectiveness.
- Maintenance of flooded wetlands in spring and fall is critical for migrating waterbirds. In 2023 we observed an average of 10 and 15 species in the Partially and Least Connected wetlands respectively compared to only six species in the wetlands Most Connected to the Columbia River. • During the spring and fall migratory waterbird counts at 20 wetlands we recorded 82 species of birds, of which four are SAR, and 17,291 individual birds. Overall, we recorded 142 species of birds in & around the wetlands.
- The hydrologic analysis of CW predicted earlier spring melt and drier summer water levels. And in fact, the 2023 hydrologic year which was very dry matched the predictions from the models. The models showed that to retain water in the wetlands, the levees and beaver dams are essential. The entire Columbia Wetlands is vulnerable to climate change.
- We used eDNA of macroinvertebrates and found that the beaver impounded wetlands had higher species richness of Orders Odonata, Ephemeroptera and Trichoptera (OET) which suggests that decreasing connectivity to the Columbia River may favor these group of species, thus increasing the biodiversity of species in CW.
- We initiated a new wetland program in the western benchlands of Columbia valley to determine the status of benchland wetlands. Based on the Freshwater Atlas of BC (FWA), we identified 349 lake and 479 wetland polygons on the bench between Canal Flats and Spillimacheen and we visited 45% of them via drone or in-person.
- We identified 22 potential wetland restoration sites based on the 371 sites we looked at. We applied for permits with Front Counter BC to construct beaver dam analogues at 2 sites (with 2 dams in each site).

- Drone imagery analysis of vegetation communities found that only 21% (n = 45) of the assessed FWA wetland polygons on the western upland bench are receiving adequate water supply to maintain open water or wetland vegetation.
- 79% of wetlands (n= 169) showed some evidence (e.g., encroachment of shrub and conifers into the wetland) of drying or appear dry from the drone.
- Hydrologic modelling identified vulnerable wetlands based on a number of contributing factors including drainage ratio, watershed road density, riparian disturbance, and equivalent clearcut area (ECA), and we explored potential contributing factors to vulnerability, including location and connectivity.
- There is a strong geographic relationship in wetland vulnerability, as almost all of the vulnerable wetlands, are located in the northern region of the study area (Radium to Spillimacheen).
- Most of the vulnerable wetlands in the southern region (Columbia Lake benchlands) have already disappeared, hence our models do not show the vulnerability since the wetlands are not in the database. In the southern region all the remaining wetlands are connected to a lake or stream, likely due to the increased water deficit that the southern area experiences seasonally.
- The southern region (Columbia Lake benchlands) has historically had double the water deficit experienced by the northern extent of the region. Under climate change, this seasonal water loss is expected to get even worse.
- We continued to improve and enhance the large western painted turtle (WPT) nesting bed from predators.
- A small new nesting bed was created along the roadside before the historic nesting bed to try to intercept the turtles from reaching the historic nesting bed.
- We monitored turtles on the historic and 2 created nesting beds with 5 wildlife cameras.
- A total of 88 turtle observations were made, including 32 turtle road crossings to reach the historic nesting area. Predation and mortality continue to be high.
- Inventories for American Badger burrows continued to establish new badger WHFs and WHAs in areas identified as critical badger habitat. There were 614 central burrow point locations (representing 2,164 individual burrows) submitted for WHFs in the Columbia Valley from 2022 and 2023 inventory work. 510 of those 614 locations submitted were uploaded by government to the provincial WSI Survey Observations layer in March 2024.
- Additional work was done regarding WHAs and WHFs, including pursuing the three WHAs submitted in 2021 for at-risk alkali-saltgrass ecological communities. The boundaries for those three WHAs are now officially recognized in the provincial database as ‘proposed WHAs’, at 233.7 hectares combined. Two Mountain Goat mineral lick WHF submissions made in 2020 are designated as WHFs at 736 hectares. A third goat mineral lick was surveyed in 2023 with subsequent WHF

application made in 2024 at 246.6 hectares. In total, 1279.5 hectares of land within the study area has been approved or in progress for WHA or WHF status, due to this ongoing project.

- We provided Kootenay Connect/CWSP data and maps and worked with the Columbia Valley Recreational Planning Initiative to try to protect the Forster Watershed and its high value wildlife habitat and wildlife corridor.
- We identified 187,000ha of habitat critical to wildlife and wrote a report recommending that the BC government protect it using Non-Motorized Access Management regulations.
- We updated our rankings of conservations values of 144 biodiversity hotspots and updated the information on the four cross-valley wildlife corridors. We installed wildlife cameras in the Radium/Steamboat corridor to get data to support our recommendations to the Steamboat Recreational Planning Initiative.
- We would like to acknowledge the support of Living Lakes Canada and the Lake Windermere District Rod & Gun Club , the CWSP Partners as well as our funders (ECCC/KC, CBT, RDEK, Coors, BCWF).

Overview Summaries of the Columbia Wetlands Projects are below. Detailed reports for each of the subprojects are available on google drive.

5CW Subproject Conservation & Mitigation of Wetland Basins Vulnerable to Drought

Columbia Wetlands Hydrology and the Role of Beaver Dams.

The Columbia Wetlands are a complex system shaped by many different processes. They provide habitat for many species and ecosystem services for people including a source of water and a place for recreation. They face several multiple threats including climate change. Better understanding of the Columbia Wetlands will allow us to make more informed decisions about conservation and restoration strategies for the area.

Our research has found three groups of wetlands within the Columbia Wetlands complex, which can be characterised by their connectivity to the Columbia River as Most Connected, Partially Connected, and Least Connected. In some years, the Partially Connected group can be further separated into Partially Connected – Bigger Gaps and Partially Connected – Smaller Gaps. These wetlands differ hydrologically, particularly in their response to the Columbia River flood pulse, which is the major driving force in the Columbia Wetlands complex due to the undammed nature of this part of the river.

Most Connected wetlands respond rapidly to the rise and fall of the Columbia River and increase their water levels on average 2m with the flood pulse. They do not retain their water as the Columbia River recedes, resulting in very shallow water levels or completely dry in the late fall, winter and early spring. Least Connected wetlands respond less rapidly to water

level rise and fall. They retain water all year round, having on average 1m of water still present in the wetlands in the late fall and early spring, and increasing only 1m in response to the flood pulse. Partially Connected wetlands are midway between these two groups and are the most variable between years due to complex interactions between the flood pulse and the size, location, and condition of beaver dams present in these wetlands.

There is variation between years due to the variability in size, timing, and duration of the Columbia River flood pulse. Despite variation between years, we were able to assign Modal Wetland Groups to 35 wetlands, which are the group a wetland was in for at least two of three years of our study, thus indicating that our groups are persistent across years and are a meaningful way to categorise these wetlands.

2023 was a low water year with a very early flood pulse, which is reflected in our data. The flood pulse was a month early, with water depths being highest on May 24th 2023 (Day 144), whereas in 2020, 2021, and 2022 it was highest on June 29th (Day 180) or later. Mean maximum depth reached across our study wetlands in 2023 was just over 2m as opposed to over 2.5m in the other three years. This (2023) was an extremely dry year and the river/wetlands responded similar to the climate projections predicted for 2020-2100 time periods in our vulnerability assessment below (Report # 4).

Despite the Partially Connected group containing the most individual wetland floodbasins (16 of 35, or 46%), the Most Connected group contains the largest area of wetland, with 11.92km^2 or 51% of the studied wetland area being in this group. The Least Connected group has the smallest number of wetlands both by count (8 of 36, or 23%) and by area (3.12km^2 or only 13%). While our study wetlands comprise just over 10% of the entire Columbia Wetlands complex (study wetlands are 23.32km^2 of the total 200km^2), we believe they are a good representation of the whole area. This suggests that > 50% of the Columbia Wetlands are Most Connected wetlands, rising and falling rapidly as the river does, and not retaining relatively little water when the river is low. A cursory calculation of the 20,000ha suggests that ~75% of the CW are Most Connected and hence drain to low levels each year.

We identified 205 beaver dams within 30m of our study wetlands. 26 dams were directly impacting one of the wetlands, and 21 wetlands were directly impacted by one or more dams. Of the remaining 17 wetlands, 10 had levee gaps that were undammed by beavers and seven were entirely enclosed by natural levees without any gaps. The longest dam was recorded in Site 49 at 150m long, and the shortest dam was in Site 39 and was only 1.7m long. Five wetlands had dams over 100m long, and eight wetlands had dams that were less than 10m long. The tallest dam we found was at Site 21 and was 1.83m high. The widest dam was in Site 62 and was 6.68m wide. We found active dams in 16 wetlands, with signs of recent beaver maintenance such as new sticks or new mud being added to the structure.

The presence of beaver dams and levee gap predicts 60% of the variation between these wetland groups. Most Connected wetlands have open levee gaps, while Partially and Least Connected wetlands have beaver dams built across these levee gaps or levees

without gaps, thus allowing for water to be retained within the wetlands. The remaining 40% of variation is likely due to variables that our analysis did not include, such as groundwater and precipitation. In 2019, isotopic analysis of our sites indicated the varying but important role of groundwater in the Columbia Wetlands (Remmer *et al.*, 2023).

The ability to predict 60% of the variation in wetland groups is indicative of how important beaver dams are to this system despite other highly variable contributing factors (year, precipitation, heat, evaporation, seasonality, groundwater, land use) and the complex interactions between the Columbia River and the levee gaps and beaver dams. As in many other wetland and riverine systems, beavers have an outsize impact for their size, greatly affecting the Columbia Wetlands complex. Beaver dams are present in 21 of our 38 study wetlands, all of which are Partially or Least Connected wetlands. Without these beaver dams, these wetlands would be Most Connected, with nothing preventing the free flow of river water in and out of the wetland. Without beaver dams, there would be less diversity in wetland types and therefore less habitat diversity and less biodiversity within the Columbia Wetlands. Beaver dams are essential for the complex, beautiful, and biodiverse wetlands that we see today in the Columbia Valley.

As well as differing hydrologically and morphologically, these wetland groups differ ecologically. There are different communities of submerged aquatic vegetation in the different wetland groups, with the Partially and Least Connected wetlands providing more stable habitat, with less scour and without the challenge of drying due to water draw down post-flood pulse. *Nymphaea tetragona*, a Blue-Listed species in BC, was only found in Partially or Least Connected wetlands.

We have recorded 142 bird species in and around our study wetlands either during dedicated waterbird counts or incidentally while working in the wetlands. 13 of these are Species at Risk. During the spring and fall migratory waterbird counts at 20 sites we recorded 82 species of birds, of which four are SAR, and 17,291 individual birds. Of these, Mallard was the most commonly observed species, being observed on 172 occasions and totaling 3232 individuals.

We are particularly interested in the use of wetlands by migratory waterbirds in the spring, as these species migrate through before the water levels rise when the wetlands are at their lowest. During our spring 2023 migratory waterbird counts, we recorded 33 species of waterbird, four species of raptor, and 4817 individual birds. This was slightly lower but similar in magnitude to spring 2022 when we recorded 34 species of waterbird, five species of raptor, and 5049 individual birds.

While mean number of individual birds does not differ across wetland groups, mean number of species do. In 2023 we observed an average of 10 and 15 species in Partially and Least Connected wetlands respectively and only six in Most Connected wetlands. The difference in what kind of birds use each wetland group is striking, with only four species that feed by diving underwater (such as Bufflehead) recorded in Most Connected Wetlands, while we observed 14 in Partially Connected Wetlands and 15 in least Connected wetlands.

Partially and Least Connected wetlands are clearly essential for many species, with species such as Pied-billed Grebes and Ring-necked Ducks simply not being found in Most Connected wetlands during spring migration due to the low water levels in these wetlands. Without them, these species would be unable to feed successfully, and their migration through the Columbia Wetlands would likely be negatively impacted.

As the Partially and Least Connected wetlands are a smaller percentage of the overall Columbia Wetlands but provide such important habitat, conservation actions to maintain these wetlands on the landscape are justified. In 2021, we built a beaver dam analogue in Site 38, where an old beaver dam had just blown out. This restored 53 hectares of wetland, raising the water levels by approximately m0.6m which increased the volume of water held within the wetland by 324,000m^3. In 2023, a new beaver dam in Site 71 showed immediate results, with an increase of 0.25m in water depth despite 2023 being a low water year. Over the whole wetland area, this is an estimated increase of 27,500m^3.

Going forward, we will build beaver dam analogues in Site 145 and Site 24 and monitor pre- and post- restoration for both these sites. In Site 145, we aim to increase water levels by 1.35m, which will result in an increase of 175,500m^3 of water being held in the wetland, and will additionally allow more water to be retained in Site 144, thus restoring the capability for water retention and increasing water on the landscape in 32ha of wetland, which will result in an additional of 432,000m^3 of water being retained.

We have communicated with the public in various ways, including with a CBC interview broadcast on television and radio in January 2024, and with presentations to community groups. We are also advising BC Parks and Ducks Unlimited on wetland restoration at Burgess James Gadsden Provincial Park and are a part of the Columbia Valley Recreational Planning Initiative, Recreational Plan for Forester Watershed group. Dr. Suzanne Bayley and Catriona Leven were also co-authors on the paper “The Importance of Groundwater to the Upper Columbia River Floodplain Wetlands”, along with Dr. Casey Remmer and Dr. Rebecca Rooney, published in the Canadian Water Resources Journal in July 2023. Our CWSP team also made a video available on some of our work which was provided to Kootenay Connect and CBT earlier in the year.

Wetlands on the Upland Benches of Columbia Valley: status of restoration

Global concerns are rising regarding the current state of the world’s wetlands. A recent review of 189 reports found that 54-57% of the global wetland area has been lost, with rates increasing during the 20th and 21st centuries (Davidson, 2014). The risks posed to various wetland types differ based on their ecology, location, and commonly associated human impacts. Valley-bottom floodplain wetlands are vulnerable to human development (e.g., hydroelectric dams, agriculture), but upland wetlands with smaller catchment areas dependent on precipitation or ground water supply are at a higher risk of drought (Winter, 2007; Hupp *et al.,* 2009). Small (globally averaging 3.9 ha) non-floodplain wetlands

comprise approximately 53% of globally identified wetlands and contribute important ecosystem services and to landscape resilience - including actions such as buffering aquifer dynamics and base stream flow (McLaughlin *et al.,* 2014; Lane *et al.,* 2023).

The western upland bench of the Columbia Valley provides a suitable landscape for many small wetland features where minimal investigative work has been completed. The Freshwater Atlas of BC (FWA), an open-source database that maps provincial freshwater attributes, identifies 349 lake and 479 wetland polygons on the bench between Canal Flats and Spillimacheen. In 2023, we visited 371 of the 828 (45%) mapped polygons either via drone or in-person to generate a summary of wetland status and identify potential restoration sites. To assess wetland status, we recorded the presence/absence of vegetation communities (e.g., open water, wetland vegetation, shrub, conifer) and noted the dominant and subdominant community for 94% (350 out of 371) of the visited wetland and lake polygons.

Our drone imagery analysis found that 21% (n = 45) of the assessed FWA wetland polygons on the western upland bench are receiving adequate water supply to maintain open water or wetland vegetation. The other 79% of wetlands (n= 169) showed some evidence (e.g., encroachment of shrub and conifers) of drying or appear dry from the drone. For example, 24% (n = 51) of the assessed polygons did not have any detectable signs of water and are either dryer wetland types with conifer overstory or are now dry features on the landscape. Lastly, 55% of the assessed wetlands are in an intermediate stage of succession and are a mix of dryer vegetation types but still maintain evidence of some water and wetland vegetation. Of the three geomorphic wetland types identified (i.e., lake-edge, isolated, stream channel), stream channel wetlands exhibited the most signs of drying (e.g., 63% dominated by hydrophobic vegetation communities). In 2024, field visits classifying wetland characteristics will be done to document the current state of these wetland categories.

Our project goal is to restore 5 - 10 hectares of wetlands on the upland bench of the Columbia Valley using Beaver Dam Analogues – in 2023, we identified 22 potential sites that are suitable for restoration with this method. We focused on collecting detailed information for permit applications and effectiveness monitoring at nine of these sites, which would allow us to flood 13 ha within the FWA mapped boundaries. Our measurements include stream flow and water quality, the size of the remnant beaver dam gap needing repair, estimated flood area, bathymetry, vegetation community mapping, vegetation plots, and orthomosaic drone imagery. In early 2024, we submitted permit applications for two of these sites and are currently waiting for feedback from the provincial government. If we restore these 2 sites this year (pending permits) we will accomplish our project goal and flood approximately 6.3 hectares of wetland. In our intensive surveys of potential restoration sites, we found 56 plant species. Lastly, we used

the Conservation Data Centre to identify 21 wildlife species at risk/red listed species that may occur within our study area - some of which we may monitor in 2024.

Vulnerability Assessment of the hydrology of Floodplain Wetlands in Columbia Wetlands

Wetlands are vital ecosystems that provide necessary hydrological functions and ecosystem services, including increasing groundwater recharge and low flows (Ferreira et al., 2023; Ferreira et al., 2020), water filtration (Hatvani et al., 2022; Lottig et al., 2013), creating critical habitat for a variety of species (Environment and Climate Change Canada, 2018; Darvill, 2020; Cooper et al., 2017). The Columbia Wetlands are a series of floodplain wetlands at the headwaters of the Columbia River in Southern British Columbia in Canada. These wetlands are largely influenced by the flows of the Columbia River, experiencing a seasonal pulse during spring freshet (MacDonald Hydrology Consultants Ltd. 2020; Carli and Bayley 2015) and may be particularly vulnerable to the effects of climate change due to changes in the local hydrology (Hopkinson et al., 2020; Utzig, 2021).

In the current study, we used empirical and modelling approaches to evaluate the effects of climate change on the flows of the Columbia River, linking these changes to the different types of wetlands outlined in MacDonald et al. (2023). We found that the Columbia Wetlands are vulnerable to the effects of climate change, as they will experience an early surge in stream water inputs from the Columbia and an earlier and longer drying season, requiring that they have enough storage capacity to withstand the increases in prolonged evaporation throughout the summer. We made a number of recommendations to improve climate resilience of the Columbia Wetlands.

Vulnerability Assessment of the Wetlands along the western bench lands of Columbia Valley

The bench wetlands in the Columbia Valley are a series of wetlands that occur on a benched hillside on the west side of the Rocky Mountain Trench that have already begun to feel the effects of climate change.

In this study, we identified vulnerable wetlands based on a number of contributing factors including drainage ratio, watershed road density, riparian disturbance, and equivalent clearcut area (ECA), and we explored potential contributing factors to vulnerability, including location and connectivity. We then modelled water budget inputs into wetland locations along a north-south gradient to determine the effect of climate change on evaporation and precipitation throughout the study area. We found that the majority of wetlands within the bench are small and roughly 10% are considered vulnerable to the effects of climate change. Air photo analysis suggests approximately 79% of the mapped bench wetlands might be drying. Geospatial analysis demonstrates about 10% of these wetlands are highly vulnerable with a high degree of disturbance and low contributing areas. Further work to determine the extent to which wetlands have changed over time is

required to understand how likely recovery efforts are to be successful. There is a strong geographic relationship, as almost all of the wetlands, particularly the vulnerable wetlands, are located in the northern region of the study area, partially because so many of the wetlands in the southern region have already disappeared. We also found that connectivity to a water is a strong factor in wetland resilience, particularly in the southern region where all the remaining wetlands are connected to a lake or stream. This is likely due to the increased water deficit that this southern area experiences seasonally, which has historically double the water deficit experienced by the northern extent of the region. Under climate change, this seasonal water loss is expected to get even worse. We made a number of recommendations to better understand and improve wetland resilience to climate change in this region and recommend that we do not attempt to remediate wetlands that are not connected to a stream or lake in the southern portion of the study area.

Effectiveness Monitoring using eDNA of macroinvertebrates.

Our project aims to restore ecosystem functions of the wetlands to aid in the conservation of Species at Risk (SARA) that are dependent on these wetlands. Restoration techniques include the use of beaver dam analogues to improve habitat for Species at Risk.

We provide a basis for effectiveness monitoring using environmental DNA (eDNA) metabarcoding to investigate climate change vulnerability of wetlands and restoration effectiveness. The eDNA method allows estimation of species richness from collected benthic samples without the need for traditional microscopic taxonomic identification. We use the eDNA metabarcoding method to quantify the genetic composition and the biodiversity of vulnerable wetlands and assess the effects of restoration activities in the context of an adaptive-management framework.

eDNA monitoring includes analysis of samples for macroinvertebrates, fish, and diatom genomic sequences to evaluate use of these taxa as a component of wetland effectiveness monitoring. In addition, to the genomics work we are monitoring other key ecosystem attributes including hydrology, SARA-listed species, migratory birds and vegetation and mapping.

We have conducted spring and summer sampling sessions. In the 2023 spring sampling session, we completed an initial assessment of dominant trends in species richness. We found that a least four replicates per wetland were needed to improve precision and reduce variance to improve the power to detect differences between wetlands. Graphical inspection of percent richness of Orders Odonata, Ephemeroptera and Trichoptera (OET) suggests that decreasing connectivity to the Columbia River may favor these group of species.

We received eDNA data from the summer session on March 10, 2024, which prevented detailed analyses in the current report. Analyses of the 2023 summer session data will

provide more in-depth analyses of the biodiversity of the wetlands. The detailed report presents results from the spring 2023 session.

5CW SAR subproject. Restoration of Habitats and Species at Risk in Columbia Valley

In the fifth year (2023-24) of working on the Kootenay Connect initiative, the Columbia Wetlands Stewardship Partners (CWSP) was contracted to operate the continuation of Years 1-4 (2020-23) of species at risk conservation and inventory work in the Columbia Wetlands. This project was comprised of three main components designed by Goldeneye Ecological Services to: 1) improve Western Painted Turtle (WPT) habitat based on Years 2 and 3 inventories and Year 4 enhancements; 2) continue Years 2-4 monitoring effort for Osprey; and 3) expand Year 4's inventory of American Badger burrows and habitat to inform applications for Badger Wildlife Habitat Features (WHFs) and Wildlife Habitat Areas (WHAs) in regions identified as federally designated critical habitat. Wildlife Habitat Feature and/or WHA submissions were made for American Badger, Mountain Goat mineral licks, and follow-up was done for alkali-saltgrass ecological community WHAs made previously.

Volunteers were coordinated to assist with WPT nesting bed enhancements. Landowners monitored WPT enhancements on two parcels of private land where CWSP enhancements were made. To help prevent road and predation mortality in Spillimacheen, several modifications were made to improve a WPT nesting bed and fence enclosure that was created in 2022 and monitored for its effectiveness. Five wildlife monitoring cameras were installed at various enhancement features. Observations included 11 turtles prospecting on the larger nesting bed, and one nest predation at the smaller roadside nesting bed (indicating that bed has been used for nesting). A total of 88 (+1 possible) turtle observations were made from a camera at a traditional and natural nesting area, including 32 turtle road crossings to reach the area. Both nesting beds created to reduce road crossings were used or prospected, but high nest site fidelity by WPT was driving the majority of turtles to continue to cross the road to nest and many nests were predated. To prevent future road and predation mortality, it is recommended that a larger fenced WPT nesting bed be created ahead of where turtles are crossing the road to the traditionally used nesting area. Vegetation management should continue, as well as effectiveness monitoring using wildlife cameras.

The Osprey project collected baseline data on a bioindicator species of ecosystem health. Seventy-six Osprey nests were identified in 2023, eight of those were tree nests and the remaining 68 were on nest platforms affixed to the top of large wooden poles (often BC Hydro poles), but sometimes poles are installed by private landowners. Forty-six of 76 nests were occupied with incubating adult Osprey during the first round of nest checks. Thirty nests had chicks present during the final visit in August and were deemed

successful. A five-year baseline dataset is now available for Osprey in the Columbia Valley, providing reliable numbers for breeding Osprey in the study area. Breeding population numbers were not available for Osprey in the Columbia Valley prior to this work, nor was any information on the success of their nests. The continuation of annual monitoring is recommended since they are an indicator species; they respond quickly to negative environmental change.

Inventories for American Badger burrows continued to establish new badger WHFs and WHAs in areas identified as critical badger habitat. There were 614 central burrow point locations (representing 2,164 individual burrows) submitted for WHFs in the Columbia Valley from 2022 and 2023 inventory work. 510 of those 614 locations submitted were uploaded by government to the provincial WSI Survey Observations layer in March 2024. Those 510 WHF locations represent the central points within clusters of burrows (up to 45 burrows per point). Boundaries for WHAs designated for American Badgers were based upon burrow locations, buffers around those points and soil classification polygons. Eight badger WHAs with a combined size of 164.1 hectares have been submitted to the provincial government.

Additional work was done regarding WHAs and WHFs, including pursuing the three WHAs submitted in 2021 for at-risk alkali-saltgrass ecological communities. The boundaries for those three WHAs are now officially recognized in the provincial database as 'proposed WHAs', at 233.7 hectares combined. Two Mountain Goat mineral lick WHF submissions made in 2020 are designated as WHFs at 736 hectares. A third goat mineral lick was surveyed in 2023 with subsequent WHF application made in 2024 at 246.6 hectares. In total, 1279.5 hectares of land within the study area has been approved or in progress for WHA or WHF status, due to this ongoing project.

5CW Conservation Lands Subproject for 2023-2024 Summary

In the 2023-2024 funding cycle Cirque Ecological worked to refine the conservation analysis and recommendations for the 4 primary wildlife corridors that cross the Columbia Wetlands and connect the Purcell and Rocky Mountain ranges of the Rocky Mountain Trench.

Cirque worked to address edits needed on the previous years draft reports analyzing habitats and impacts in all four of the focal corridors. Updates were made to accommodate mapping changes, newly acquired data, adjustments in corridor boundaries and feedback received from the KCP – KC and CWSP science team. This is provided in detailed reports # C 2-6.

The Report on the Radium Corridor was completely revised to focus on the Functionality of the Radium Corridor. Desktop research analysed potential impacts to migratory species that are known to occur. Field data collection using motion triggered wildlife cameras was

initiated and with up to three months of data was collected targeting migratory and winter habitat use. A summary report was compiled detailing the initial findings of this research. The is included in a Reports C 1 & 5 from Cirque Ecological.

A call for proposals was made by the Ministry of Water Land and Resource Stewardship (WLRS) in the summer of 2023 for motorised access management areas. Cirque worked with the CWSP partners and science team to assemble a proposal that reflected the pressures and habitat values that exist in the four corridors. This proposal was shared with WLRS, some of the CWSP partner organisations and community groups in the region. Meetings and consultation with impacted user groups occurred following the development of the proposal. The proposal was shared with and discussed with the Golden and Area A Trails Alliance. The CWSP Access Management recommendations were presented to WLRS. It is attached in report # 7 from Cirque Ecological.

Forest harvest plans and tenure application submitted in the project focal areas were screened and commented on to assist in promoting conservation-based actions by forest licensees and tenure holders or applicants. A new trail development promoting dog friendly winter recreation in the core of ungulate winter range has been progressing in the Donald Corridor. Cirque met with the organisers of the development and shared information about the wildlife and habitat values that exist and are at risk of degradation if this development progresses.

The Biodiversity Conservation Opportunity (BCO) database used to analyze and value properties in the project focal area was updated to integrate up- to-date data and was expanded to include more properties outside of the originally targeted properties. This version of the BCO database created a more query friendly approach that will provide that ability to run a property analysis of many more properties more efficiently. The updated database assessed and ranked every property over 10ha in the project focal area using algorithms ran trough QGIS mapping software.

Outline of the Detailed Reports in Google Drive

5CW Outline of Detailed Reports

A. 5CW Beaver Hydrology Subproject

1. Columbia Wetlands Floodplain Hydrology and Role of Beaver Dams
    1. Columbia Wetlands Floodplain Hydrology and the Role of Beaver Dams Additional Appendices
2. Wetlands on the Western Upland Bench of the Columbia Valley
3. Effectiveness Monitoring in the Columbia Wetlands: e-DNA Metabarcoding Pilot Study
4. Vulnerability Assessment of the Columbia Floodplain Wetlands
5. Vulnerability Assessment of the Bench Wetlands in the Upper Columbia River Basin

B. 5CW Restoration of Habitats and Species At Risk

1. Restoration of Habitats and Species at Risk in the Columbia Valley

C. 5CW Conservation Lands

1. Corridor BCO and BCO Project Summary
2. The Donald Multi-Species Corridor Description
3. The Spillimacheen-Brisco Corridor Description
4. The Radium Multi-Species Corridor Description
5. The Radium Corridor Functionality Assessment
6. The Fairmont-Canal Flats Multi-Species Corridor Description
7. Access Management Areas in Columbia Valley