Environment and Climate Change Canada

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

Kootenay Connect: 6CW Columbia Wetlands:

Wetlands West of Columbia Lake

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1. Executive Summary

In 2024, CWSP conducted two areas of research in wetlands on the upland bench west of Columbia Lake. This area was identified in previous work as particularly vulnerable to climate change. We first visited 17 wetlands and conducted vegetation and soil surveys in collaboration with The Nature Trust of British Columbia. We then focused on the upper reaches of Marion Creek and assessed the impact of beaver dams.

We found that of the 17 wetlands we visited, only five had surface water present, and only two were considered to have water with a permanent hydroperiod, meaning they will be wet all year round. Of the other wetlands, six had a seasonal hydroperiod, four had an ephemeral hydroperiod, three had a temporary hydroperiod, and two were in fact not wetlands. One of these non-wetland areas was mapped in the BC Freshwater Atlas, suggesting that in the time since the FWA was produced, the area has dried and become non-wetland. 12 of the 17 wetlands were palustrine, meaning they are particularly vulnerable to climate change as they are not associated with a water source such as a lake or a stream, so water input is limited. One of the wetlands was lacustrine, along the shores of Spur Lake, while two were riverine; one of these riverine sites is along Marion Creek and we later assessed beaver dams in this area in detail.

This supports our findings from 2023 of the greater moisture deficits in this area, as clearly many of the wetlands in this area are only wet for portions of the year rather than being permanently wet and are likely to be vulnerable to climate change due to drought. We also found evidence of both historic and current disturbance due to agriculture, such as earthworks, water diversions, and cattle trampling, further complicating wetland persistence and restoration in this area. We did not find any rare wetlands or alkaline salt flats that would be suitable for fencing, although we found a lot of destruction of wetland soils and vegetation from cattle grazing.

We conducted more detailed surveys of beaver dams and lodged in the Upper Marion Creek West Wetlands and found 46 beaver dams, 24 of which were active, and nine beaver lodges, five of which were active. The largest dam was 122 m long and the shortest 1 m long. These active dams hold approximately 33,447 m^3 of water on the landscape, create marsh, swamp, and fen wetland habitat, and help regulate the flow and temperature of Marion Creek, all of which increases biodiversity and is important for species such as the provincially Blue-listed listed and designated as Special Concern under COSEWIC Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*) found in Marion Creek. Given our above findings about the lack of

permanently inundated wetlands in this area, these wetlands and the beaver dams that maintain them are particularly important in providing wetland habitat and water on the landscape.

2. Introduction

In previous work, CWSP found that the upland bench west of Lake Windermere and Columbia Lake has a greater moisture deficit than the upland benchlands further north, resulting in a higher potential for wetlands that are vulnerable to climate change (MacDonald Hydrology Consultants Ltd., 2024; Holden *et al.*, 2024). This area is also an area of active conservation management, with much of the land area being managed by either the Nature Trust (BC) or the Nature Conservancy of Canada (BC), with some areas managed in collaboration with Thunder Hill Ranch. Active conservation projects in this area include the Sqlewúlécw/Sun Creek restoration project, led by ʔakisq̓nuk First Nation with support by Rewilding Water & Earth, BC Wildlife Federation, The Nature Trust of BC and the Ministry of Water, Land and Resource Stewardship, and the Marion Creek wetland and creek restoration project, led by the Nature Conservancy of Canada. Thus, there are a variety of stakeholders in the area, including agricultural, recreational, and conservation, and as such understanding the current state of wetlands in the area and making predictions for the future is important for the continuing benefit of all these stakeholders.

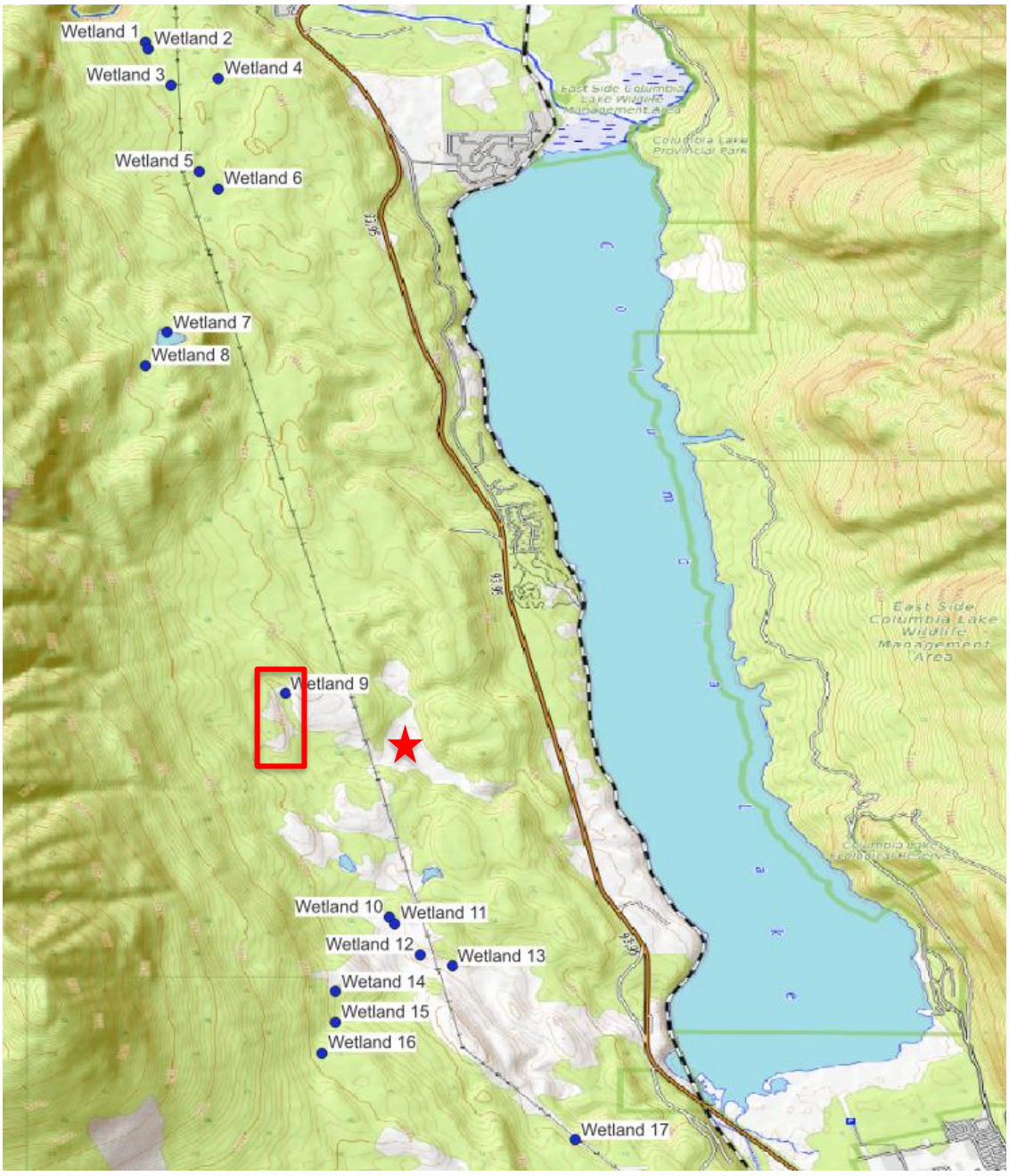

Figure 1: Area of interest to the west of Columbia Lake. Wetlands surveyed are indicated in blue, while area surveyed intensively for beaver dams is indicated with a red box. Approximate location of upcoming Marion Creek wetland and creek restoration project on is indicated with a red star.

3. Wetland Surveys

3.1 Methods

In collaboration with NTBC, we conducted vegetation and soil surveys in wetlands west of Columbia Lake in July 2024. Sites were initially mapped by EcoLogic and classified as wetland or non-wetland. We then visited 17 wetland sites (Figure 1) and surveyed 35 plots in-person to identify vegetation and soil types and classify wetland communities, with between one and four plots per wetland. This work used ecosystem field forms from the Ministry of Forests and Range and Ministry of Environment, as well as site visit forms from the Ministry of Forests and Range. Given time constraints, we prioritized wetland polygons representing diverse wetland types, especially those clustered together, to maximize data collection, and sites that met the Canadian National Wetland Inventory's (CWI) size criteria.

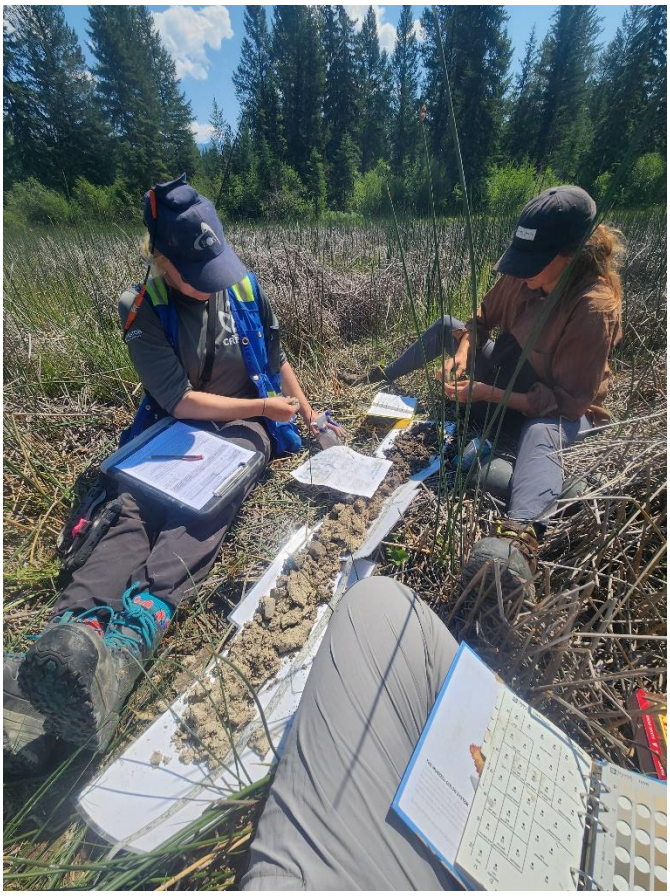

Figure 2: Assessing soil core in Wetland 6.

3.2 Site Summary and Comparison

We surveyed 35 plots in 17 wetlands. All 17 wetlands surveyed were within the IDFdm2 BEC Zone, indicating Kootenay Dry Mild Interior Douglas Fir. The IDF zone occurs in southern British Columbia, and covers approximately 5.5% of the province. In the Rocky Mountain Trench, only 2.1% of this zone is protected land (Centre for Forest Conservation Genetics, n.d.).

We found that of the 17 wetlands we visited, only five had surface water present, and only two were considered to have water a permanent hydroperiod, meaning they will be wet all year round. Of the other wetlands, six had a seasonal hydroperiod, four had an ephemeral hydroperiod, three had a temporary hydroperiod, and two were in fact not wetlands. One of these non-wetland areas was mapped in the BC Freshwater Atlas, suggesting that in the time since the FWA was produced, the area has dried and become non-wetland. 12 of the 17 wetlands were palustrine, meaning they are particularly vulnerable to climate change as they are not associated with a water source such as a lake or a stream, so water input is limited. One of the wetlands was lacustrine, along the shores of Spur Lake, while two were riverine. One of these riverine sites is along Marion Creek and we later assessed beaver dams in this area in detail.

Impacts to the surveyed plots included road construction, poorly maintained culverts, other construction works such as earth berms, invasive species such as Reed Canary Grass (*Phalaris arundinacea*), Canada Thistle (*Cirsium arvense*), and Bull Thistle (*Cirsium vulgare*), trampling by cattle, and indications of drying due to climate change.

Wetland 12 was the Sqlewúlécw/Sun Creek restoration project, led by ʔakisq̓nuk First Nation with support by Rewilding Water & Earth, BC Wildlife Federation, The Nature Trust of BC and the Ministry of Water, Land and Resource Stewardship.

3.3 Individual Site Profiles

A summary of our surveys of the 17 wetlands follows. Location of all wetlands can be seen on Figure 1.

3.3.1 Wetland 1

This wetland consisted of a single plot classified as Beaked Sedge-Water Sedge marsh (Wm01) within a palustrine system. It had a temporary hydroperiod, meaning it lacks year-round surface water and is often dry. The site was impacted by a road that bisects the wetland, and the installation of a culvert, which seems to have altered water flow between this site and Wetland 2,

found on the other side of the road and culvert. There are differences in water levels and vegetation composition between the two wetlands. This wetland is not reported in the Freshwater Atlas.

3.3.2 Wetland 2

This wetland also consisted of a single plot classified as a Beaked Sedge-Water Sedge marsh in a palustrine system, with a seasonal hydroperiod. As for Wetland 1, impacts to this wetland included the road and culvert, as well as evidence of a berm that created pooling of water along the road. Wetland 2 had significantly more water than Wetland 1. This wetland is not reported in the Freshwater Atlas.

Figure 3: Photograph of Wetland 2, taken from road, showing pooled water, sedges, and tree cover.

3.3.3 Wetland 3

We surveyed four plots within Wetland 3, of which three are classified as fens and one as a swamp. The swamp plot had greater than 51% tree cover, which was dominated by deciduous species. The wetland was considered to be palustrine, with a mix of seasonal and ephemeral hydroperiods, meaning that some areas within it are seasonally inundated while other areas are inundated for shorter periods of time. Surface water of less than 0.02m deep was recorded in one of the four plots, while the other three plots did not have surface water. In the BC Freshwater Atlas, this wetland is numbered as 705005874. This wetland was impacted by a powerline, roadways, and a history of logging.

Figure 4: Aerial photograph showing mix of habitats, and human impacts, notably the power line.

3.3.4 Wetland 4

In this wetland we surveyed two plots, one of which was classified as a marsh and the other as shallow open water. Both were considered palustrine and seasonally wet, with a maximum water depth of 0.08m recorded in the shallow open water plot. Human impacts to this wetland included the presence of the invasive species Reed Canary Grass (*Phalaris arundinacea*). This wetland is not reported in the BC Freshwater Atlas.

3.3.5 Wetland 5

The single plot we surveyed in this wetland was classified as a swamp. The hydrological system was palustrine, with a temporary hydroperiod. Impacts to the wetland include signs of climate change, such as drying, and evidence of human constructed earthworks and overgrown berms along the south perimeter of the wetland. The BC Freshwater Atlas numbers this wetland as 705006490.

Figure 5: Photograph of wetland, showing lots of Scrub Birch present.

3.3.6 Wetland 6

We surveyed two plots in Wetland 6, both of which were classified as marsh, including one classified specifically as Great Bulrush marsh (Wm06). This wetland was considered seasonally inundated and palustrine. Human impacts observed in this wetland included evidence of drought and climate change affecting the wetland's water availability. The BC Freshwater Atlas numbers this wetland as 705005797.

Figure 6: Photograph of Wetland 6, showing Bulrush and Sedges, as well as dry state of wetland in July 2024.

3.3.7 Wetland 7

Wetland 7 is located around the north perimeter of Spur Lake and is thus considered a lacustrine wetland. Spur Lake is accessible by road and is used by recreationists, such as anglers and kayakers. We surveyed three plots in this wetland, and they were classified as swamp, marsh, and lake. The swamp has a seasonal hydroperiod, while the marsh and lake are permanently inundated, with surface water present all year round. Water depth in the marsh area was 0.13m. While no adverse human impacts were noted, it is likely that this wetland is affected by climate change and that recreation may be having an impact. The BC Freshwater Atlas numbers this wetland as 705005857.

Figure 7: Spur Lake and perimeter wetland.

3.3.8 Wetland 8

We surveyed one plot in Wetland 8. While it was identified as a bog in the field, it is likely that this is a fen, as conditions are not conducive to bog formation in this area. The high tree percentage reported suggests this may be a wooded fen such as those identified as Wf06 Scrub Birch, which we have found in multiple wetland sites on the benchlands on the west side of the Columbia Valley, and which display a wide range of characteristics that do not appear to be distinguished by the current BC wetland classification system.

This wetland had an ephemeral hydroperiod and was noticeably impacted by periods of drought and reduced water in the system, much like other wetlands in this region. The BC Freshwater Atlas numbers it as 705006373.

Figure 8: Wetland 8, showing Scrub Birch fen conditions.

3.3.9 Wetland 9

This wetland is a complex of wetlands created along Marion Creek by both active and inactive beaver dams. In this initial survey, we surveyed three plots within Wetland 9, two of which were classified as swamp and one as marsh. Both swamps were palustrine with seasonal hydroperiods, while the marsh was riverine and semi-permanent, with a surface water depth of 0.02m. We later returned to Wetland 9 and surveyed the beaver dams present in detail; this work can be found in Section 4 of this report.

Figure 9: Photograph showing series of beaver dams and associated wetlands along Marion Creek.

3.3.10 Wetland 10

We surveyed three plots in this potential wetland area, all of which we identified as being non-wetland upon visual survey, despite this wetland being mapped in the BC Freshwater Atlas numbered as 705005780. This indicates that drying has occurred in this area, as this wetland is no longer classifiable as a wetland based on soil and vegetation. This is likely due to the impacts of climate change and possibly the history of ranching in the area diverting water away from this wetland.

3.3.11 Wetland 11

In this wetland we surveyed only one plot, which we identified as an alkaline meadow. A salt crust was visible across this entire wetland area. We classified this wetland as palustrine with a seasonal hydroperiod, and likely to be impacted by its proximity to roads and powerlines, and increased drought conditions due to climate change. In the BC Freshwater Atlas this wetland is numbered as 705006473.

Figure 11: Photograph of wetland, showing obvious salt crust.

3.3.12 Wetland 12

This wetland is the Sqlewúlécw/Sun Creek restoration project, led by ʔakisq̓nuk First Nation with support by Rewilding Water & Earth, BC Wildlife Federation, The Nature Trust of BC and the Ministry of Water, Land and Resource Stewardship, and is identified in the BC Freshwater Atlas as wetland 705005963.

Figure 12: Drone photo of wetland.

We surveyed six plots at this site, two of which were swamp, two of which were marsh, and two of which were classified as non-wetland. Hydroperiod varied from seasonal to ephemeral, and open water was present in the marsh areas in ponded areas that were dug as part of the restoration project. The depth of water in these areas ranged from 0.05 m to 0.60 m deep. We noted invasive species such as Canada Thistle *Cirsium arvense* growing on the soil mounds that had been excavated from these areas, and suspect that drying due to climate change and water demands for ranching is adversely impacting this wetland, as a portion of Sun Creek is diverted upstream of this wetland to an artificial dam holding water for cattle.

Figure 13: Photograph of restoration area of wetland, classified as marsh, showing open water areas, Bulrush, earth mounds, and presence of invasive species such as Canada Thistle.

Figure 14: Swamp area of wetland, showing sedges and Scrub Birch. Open water was not present, but the ground was wet underfoot and this area was dominated by wetland plants.

3.3.13 Wetland 13

We surveyed one plot in this wetland and classified it as a palustrine fen, with a temporary hydroperiod. Impacts to the wetland included a road cutting through the wetland complex, powerlines, and increased drought conditions due to climate change. In the BC Freshwater Atlas this wetland is numbered as 705005953.

3.3.14 Wetland 14

Despite being highlighted as a potential wetland area by the EcoLogic mapping, upon surveying this site in person we classified this as non-wetland. This area may once have been a wetland but perhaps due to overall drying in the region it is no longer a wetland area.

3.3.15 Wetland 15

In this wetland we surveyed one plot which was classified as a swamp. This wetland is palustrine with an ephemeral hydroperiod, and we noted a history of agriculture in the area, likely affecting water flow and vegetation, as well as the large-scale affects of drying due to climate change. This wetland is not mapped in the BC Freshwater Atlas.

3.3.16 Wetland 16

We surveyed two plots in this wetland, one of which was classified as swamp and the other as fen. This was a palustrine wetland with an ephemeral hydroperiod. This site had a history of agriculture and is likely also impacted by the overall drying landscape due to climate change. In the BC Freshwater Atlas, this wetland is mapped as number 705005963.

3.3.17 Wetland 17

We surveyed a single plot in this wetland and classified it as an alkaline meadow. This wetland is not mapped in the BC Freshwater Atlas.

Figure 15: Photograph showing presence of Foxtail Barley as well as ruderal species.

4. Beaver Dams Within the Marion Creek West Wetlands

4.1 Methods

We conducted visual surveys of beaver dams, beaver lodges, and water sources (i.e. creek outflows, springs) in the Marion Creek West Wetlands. We identified this area from the wetland surveys detailed in Section 3 above and from drone imagery as containing a large number of beaver dams and thus being of interest in assessing how beaver dams are influencing water flow and wetlands in this region. This area is also of interest as there is a creek and wetland restoration project planned just downstream of this area (Figure 1). We visited the area between the 23rd and 26th of September 2024 and walked the Marion Creek West Wetlands area, noting the location and physical attributes of beaver dams, lodges, and water sources as we encountered them. Physical attributes measured included length and width of beaver dams (Figure 16), water depth behind each dam, and whether dams and lodges were active or inactive. Some attributes were collected post-fieldwork from aerial imagery, such as dam length of long dams (more than 60m in length), and approximate flooded area behind each dam. We also noted evidence of disturbance, such as trampling by cows.

Figure 16: Using a metre tape to measure length of a beaver dam.

4.2 Beaver Dams and Lodges

We surveyed 47 beaver dams and nine beaver lodges, and determined that 24 dams and five lodges were active (Figure 17). This means we observed fresh mud and stick repairs to dams and cached vegetation by lodges (Figure 18), indicating that beavers were actively maintaining dams and storing food for the winter in these locations.

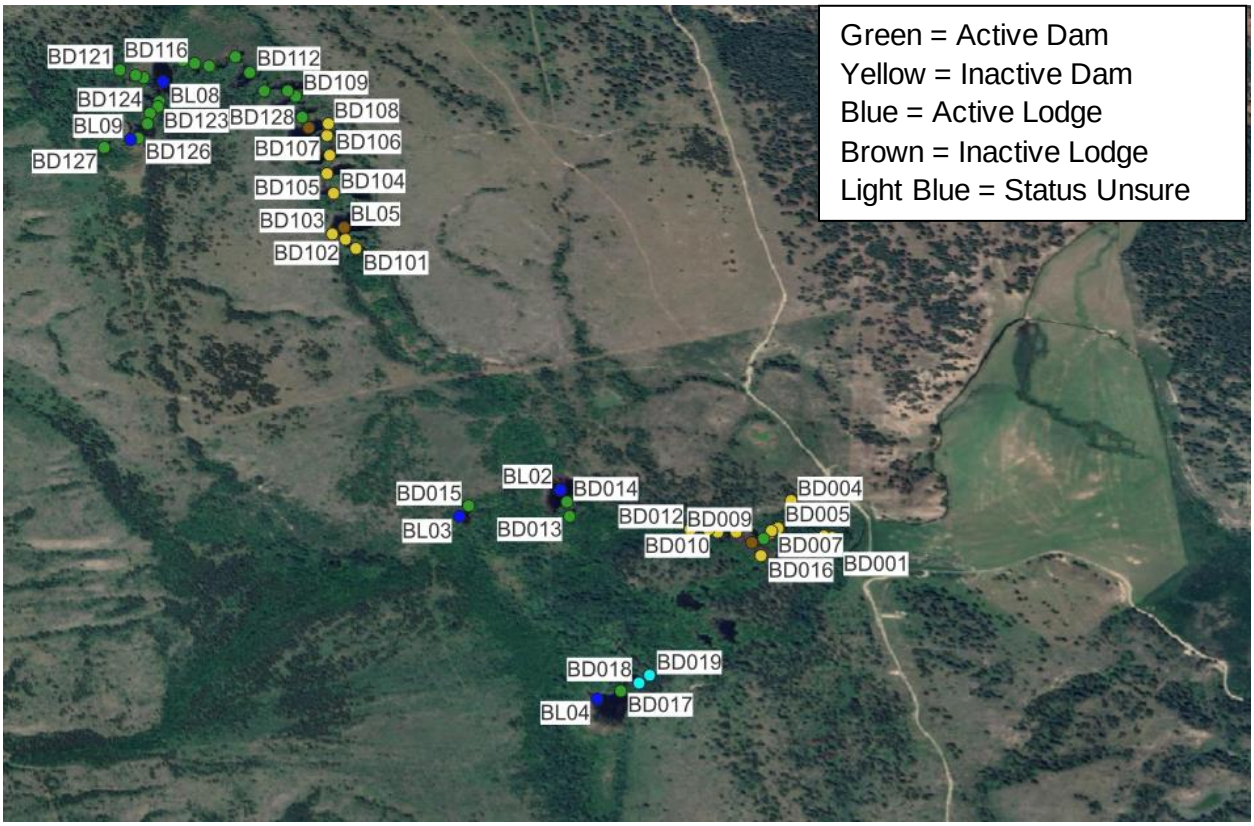

Figure 17: Overview map of the 46 beaver dams surveyed in September 2024 in the Marion Creek West wetlands area.

Figure 18: Drone footage showing a beaver lodge with branches cached beside it, indicating that beavers are living in the lodge and preparing for winter. Photo shows Dam 118 and Lodge 08.

There were two distinct areas of beaver dams within the Marion Creek West Wetlands, as can be seen in Figure 17. The more southerly region contained 19 dams, five of which are active, 11 of which are inactive, and two of which we do not know the status of (Figure 19). There were three active lodges in this region, indicating that the beavers in each lodge were maintaining only one or two dams. This region was predominantly wooded, with many small inactive dams built across Marion Creek which were not holding water or maintaining any wetland area. We found both the longest and the shortest dam in this area, at 122m and 1m in length, respectively. The wetlands associated with active beaver dams were dominated by open water, with a marsh fringe. Plants observed include *Nuphar variagata* and various *Potamogeton* species in the open water, and sedges such as Water Sedge and Beaked sedge in the marsh areas. The wetland associated with Dam 15 was entirely open water, with deciduous forest close to the edge of the wetland area, and no marsh fringe.

Figure 19: Map of the 19 beaver dams in the southern part of the Marion Creek West wetlands. Green indicates active dams, Blue active lodges, yellow inactive dams, and brown inactive lodges. Light blue indicates two dams whose status we have not confirmed. The red box is the area where beaver dams remain to be assessed.

Figure 20: Drone photograph showing the predominantly wooded southerly area of the Marion Creek West Wetlands.

Some dams in this area remain unsurveyed, due to time constraints, and we plan to return to this area next year to complete this work. These unsurveyed dams are indicated in Figure 19 with a red box.

The more northerly area contained 28 dams, 19 of which are active and nine of which are inactive (Figure 21). We observed only two active lodges in this area, indicating that each beaver lodge is sustaining multiple dams, and that each lodge may therefore have a higher population of beavers living inside than in the more southerly region. Dams in this area were between 29m and 115m in length, and created a stepped series of wetland along the creek valley (Figure 22).

Figure 21: Map of the 28 beaver dams in the northern region of the Marion Creek West wetlands. Green are active dams, while blue shows active lodges. Yellow dots indicate inactive dams and brown dots inactive lodges.

Figure 22: Drone photograph of series of beaver dams in the more northern area of the Marion creek West Wetlands.

The wetlands maintained by many of the active dams were dominated by open water and marsh vegetation. In the open water areas, plants observed included *Nuphar variagata* and various *Potamogeton* species in the open water. In the marsh areas, plants observed included Water Sedge, Beaked Sedge, Cattail, and Coltsfoot. The wetlands between dams 110 and 118 had fen characteristics, including the presence of Scrub Birch and Labrador Tea. All dams in this area were surveyed.

Figure 23: Drone photo showing wetland area between Dams 110 and 118; note mix of open water, fen, and marsh.

The wetlands within the Marion Creek West Wetlands are highly impacted by beavers; we observed a clear association between the presence of active beaver dams and open water and marsh dominated wetlands (Figure 24). An estimated 4.23 ha of open water area was being maintained by beaver dams in this system, holding an estimated 33,447 m^3 of water on the landscape. This is important both for the wetlands themselves and also for the larger system. This is a dry region, with a projected moisture deficit of 45 cm/year (MacDonald Hydrology Consultant Ltd., 2024), and so the presence of water is a valuable resource. Without these beaver dams, there would be far less wetland habitat in this system, and less water available for wildlife and humans.

Figure 24: Aerial photo showing contrast between wetlands maintained by beaver dams along Marion Creek and surrounding landscape.

6. References

Holden, J., Bayley, S., and Leven, C. (2024) Hydrology and Beavers: Wetlands on the Western Upland Bench of the Columbia Valley. Prepared for Columbia Wetlands Stewardships Partners. (March 2024).

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