Environment and Climate Change Canada

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

Kootenay Connect: 7CW Columbia Wetlands:

Beavers Maintain Wetlands in a Dry Region: Wetland Complexes West of Columbia Lake

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1. Executive Summary

In 2024-2025, CWSP conducted two areas of study in wetlands on the upland bench west of Columbia Lake. In this dry area west of Columbia Lake, we found that most wetlands were dry or had very little water. The only real wetlands found were associated with beaver dams. In total we found 81 beaver dams of which 44 were actively maintained. These complexes made up approximately 38.5 ha of open water, marsh and swamp habitat, which were the only significant wetland and water bodies in the entire region.

This area west of Columbia Lake was identified in previous work as particularly vulnerable to climate change. There are 21 wetland polygons and 24 lake polygons mapped in this area by the BC Freshwater Atlas. We first visited 17 wetland polygons and conducted vegetation and soil surveys in collaboration with The Nature Trust of British Columbia, concluding that only two of these wetlands had a permanent hydroperiod resulting in year-round water, with 12 of these wetlands not being associated with a stream or lake, meaning that they are particularly vulnerable to drying.

We conducted more detailed surveys of beaver dams/lodges in the Upper Marion Creek West Wetlands and found 45 beaver dams, 24 of which were active, and nine beaver lodges, five of which were active. In 2025, we returned to finish these surveys and found a further 12 dams, of which eight were active. In this area there are therefore 57 beaver dams, 33 of which are being actively maintained by beavers. The largest dam was 122 m long and the shortest 1 m long.

These active dams hold approximately 36,941 m^3 of water on the landscape, create 23.20 ha of open water, 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 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.

In 2025 we also surveyed the beaver dams and lodges in the wetland complex approximately 1.5 km north-east of the Upper Marion Creek West Wetlands complex. We called this the Powerline Wetland Complex. We found 24 beaver dams, 11 of which were active, and two beaver lodges, one of which were active. The longest dam was 340 m long, and the shortest 1.2 m long. These dams were holding approximately 12,790 m^3 of water on the landscape, and maintaining 15.30 ha of wetland habitat, including open water, marsh, and swamp. Local knowledge had told us that these wetlands seemed to be drying, which we found to be true. 13 of

the 24 beaver dam created wetlands surveyed showed signs of drying such as visible drawdown, dying wetland vegetation, and increasing dryland vegetation. Our field assessment was that these wetlands are drying, for a variety of reasons, including inactive beaver dams, diversion of water by a human constructed ditch taking water south out of the area, and overall drying of this area.

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.

In 2024, CWSP surveyed 17 wetlands west of Columbia Lake and found that only five had surface water present, and only two were considered to have 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. We also assessed the water in the largest lake on the benchland (Sun Lake). It has been losing water over the last decades and was in fact dry in 2025.

We conducted more detailed surveys of beaver dams and lodges 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. 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.

However, due to time constraints in 2024 we were not able to fully survey all beaver dams in the Upper Marion Creek West Wetlands complex, therefore in 2025 we returned to finish these beaver dam surveys in the Marion Creek area and explore this new wetland complex area; these areas are shown on Figure 1.

In 2024-2025, CWSP conducted two areas of research in wetlands on the upland bench west of Columbia Lake. In this dry area west of Columbia Lake, we found that most wetlands were dry or had very little water. The only real wetlands found were associated with beaver dams. In total we found 81 beaver dams of which 44 were actively maintained. These complexes made up approximately 38.5 ha of open water, marsh and swamp habitat, which were the only significant wetlands in the entire region.

Figure 1: Locations of the Upper Marion Creek West Wetlands complex and the Powerline Wetland complex, on the benchland west of Columbia Lake

3. Beaver Dams Within the Marion Creek West Wetlands

3.1 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 2), 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 2: Using a metre tape to measure length of a beaver dam.

4.2 Beaver Dams and Lodges

In 2024 we surveyed 45 beaver dams and nine beaver lodges, and determined that 24 dams and five lodges were active. In 2025 we surveyed another 12 beaver dams, determining that eight dams were active. Between the two years, we surveyed a total of 57 beaver dams and nine lodges (Figure 3). 33 of these dams and nine of these lodges were active, which 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.

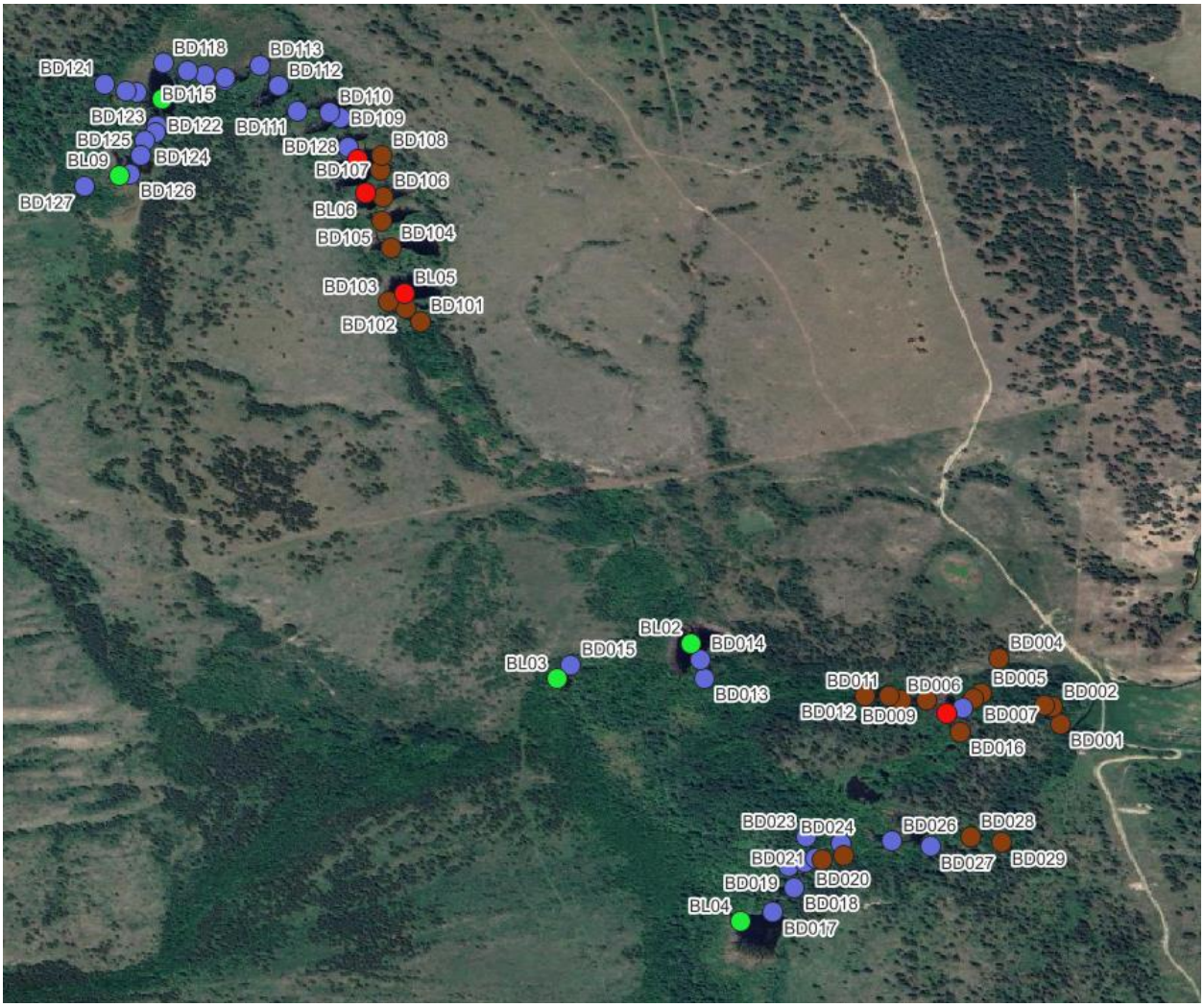

Figure 3: Overview map of the 57 beaver dams surveyed in 2024 and 2025 in the Marion Creek West wetlands area. Blue points are active dams; green points are active lodges; brown points are inactive dams; red points are inactive lodges.

Figure 4: Photograph of a dam showing new mud and sticks recently added to it, indicating that this dam is being actively maintained by beavers.

There were two distinct areas of beaver dams within the Marion Creek West Wetlands, as can be seen in Figure 5. The more southerly region contained 29 dams, 13 of which are active, and 16 of which are inactive (Figure 19). The inactive dams are further downstream than the active dams. There were three active lodges in this region, two of which were close to only one or two dams, perhaps indicating that the beavers in these lodges are not maintaining that many dams, or are travelling down the various stream channels to further away 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 5: Map of the 29 beaver dams in the southern part of the Marion Creek West wetlands. Green indicates blue dams, green active lodges, brown inactive dams, and red inactive lodges.

Figure 6: Drone photograph showing the predominantly wooded southerly area of the Marion Creek West Wetlands.

The more northerly area contained 28 dams, 20 of which are active and nine of which are inactive (Figure 7). 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 8).

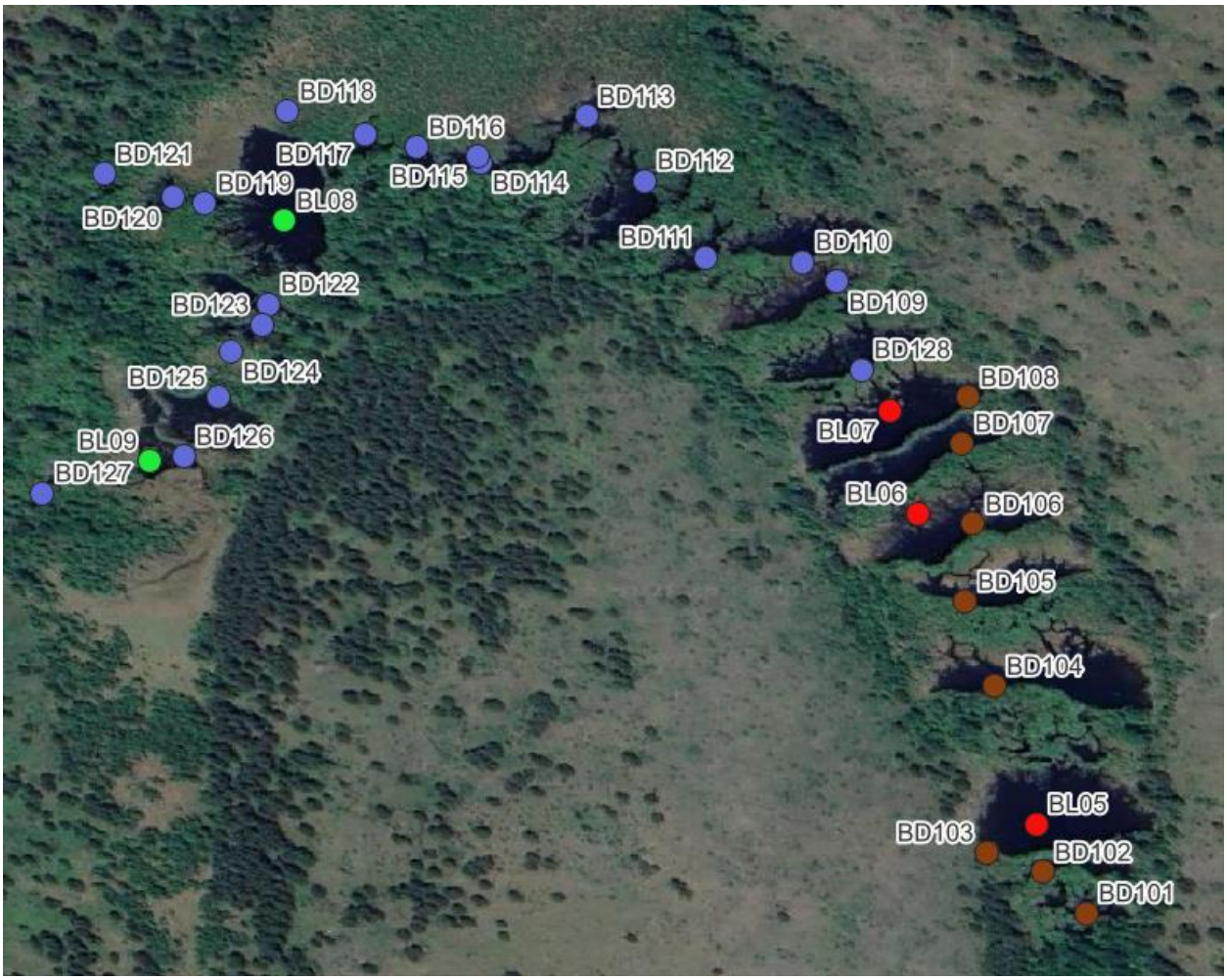

Figure 7: Map of the 28 beaver dams in the northern region of the Marion Creek West wetlands. Green are active dams, while blue shows active lodges. Yellow dots indicate inactive dams and brown dots inactive lodges.

Figure 8: 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* sp. 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 (Figure 9).

Figure 9: 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 10). An estimated 23.20 ha of wetland habitat is being maintained by these beaver dams, including open water, shrub swamp, tree swamp, open water, marsh, and fen habitats. We estimated these dams are retaining 36,941 m^3 of water in open water areas 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 10: Aerial photo showing contrast between wetlands maintained by beaver dams along Marion Creek and surrounding landscape.

4. Beaver Dams Within the Powerline Wetlands Complex

In 2025 we surveyed 24 beaver dams and two beaver lodges, and determined that 11 dams were active (Figure 11). The longest dam was 340 m long, and the shortest 1.2 m long; both of these dams were being actively maintained. Active dams meant we observed fresh mud and stick repairs to dams, indicating that beavers were actively maintaining dams. As it was summer, it was not possible to determine lodge activity as beavers were not yet caching food.

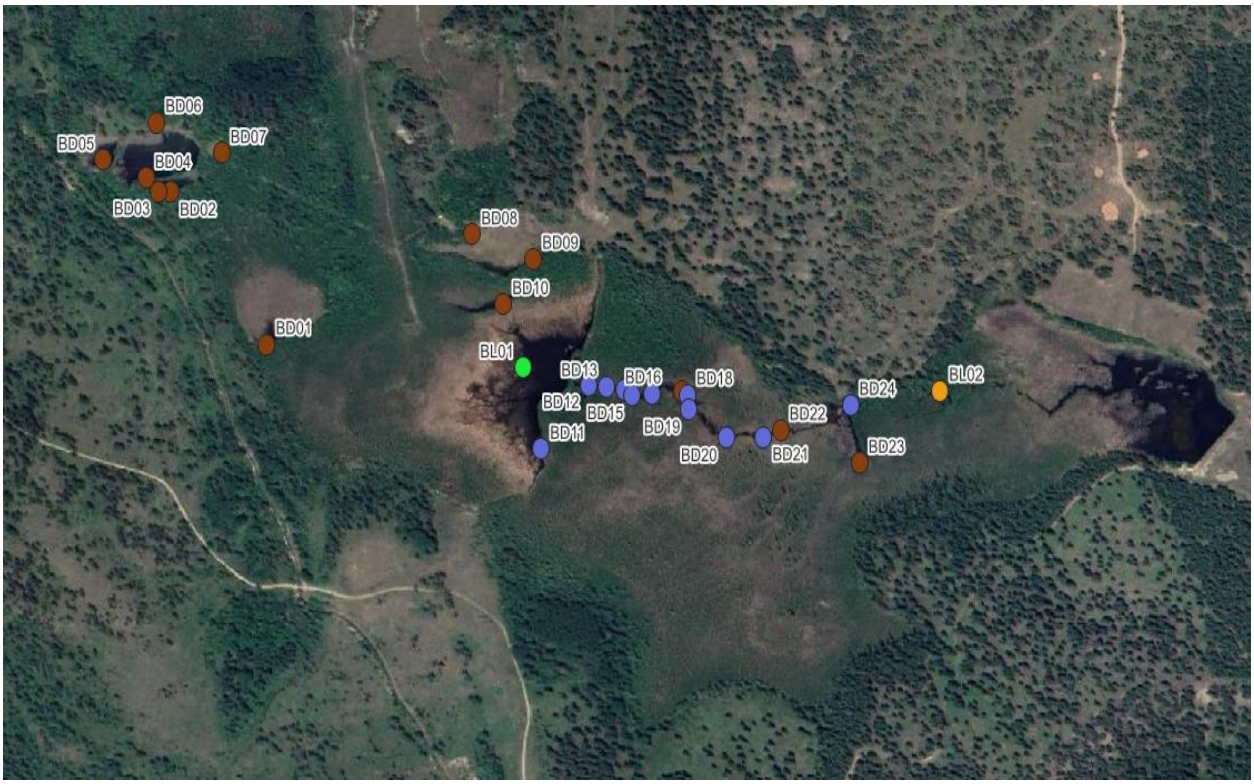

Figure 11: Map showing the 24 beaver dams and two lodges surveyed in the Powerline Wetlands complex. Blue points are active beaver dams, brown points inactive, green point is an active beaver lodge, yellow a beaver lodge of unknown activity.

Wetland areas in this complex ranged from open water with fringes of Sedges and Cattail, to being dense Cattail marshes, to being dominated by Scrub Birch (Figure 12). An estimated ha of open water area was being maintained by beaver dams in this system, holding an estimated 12,790 m^3 of water on the landscape.

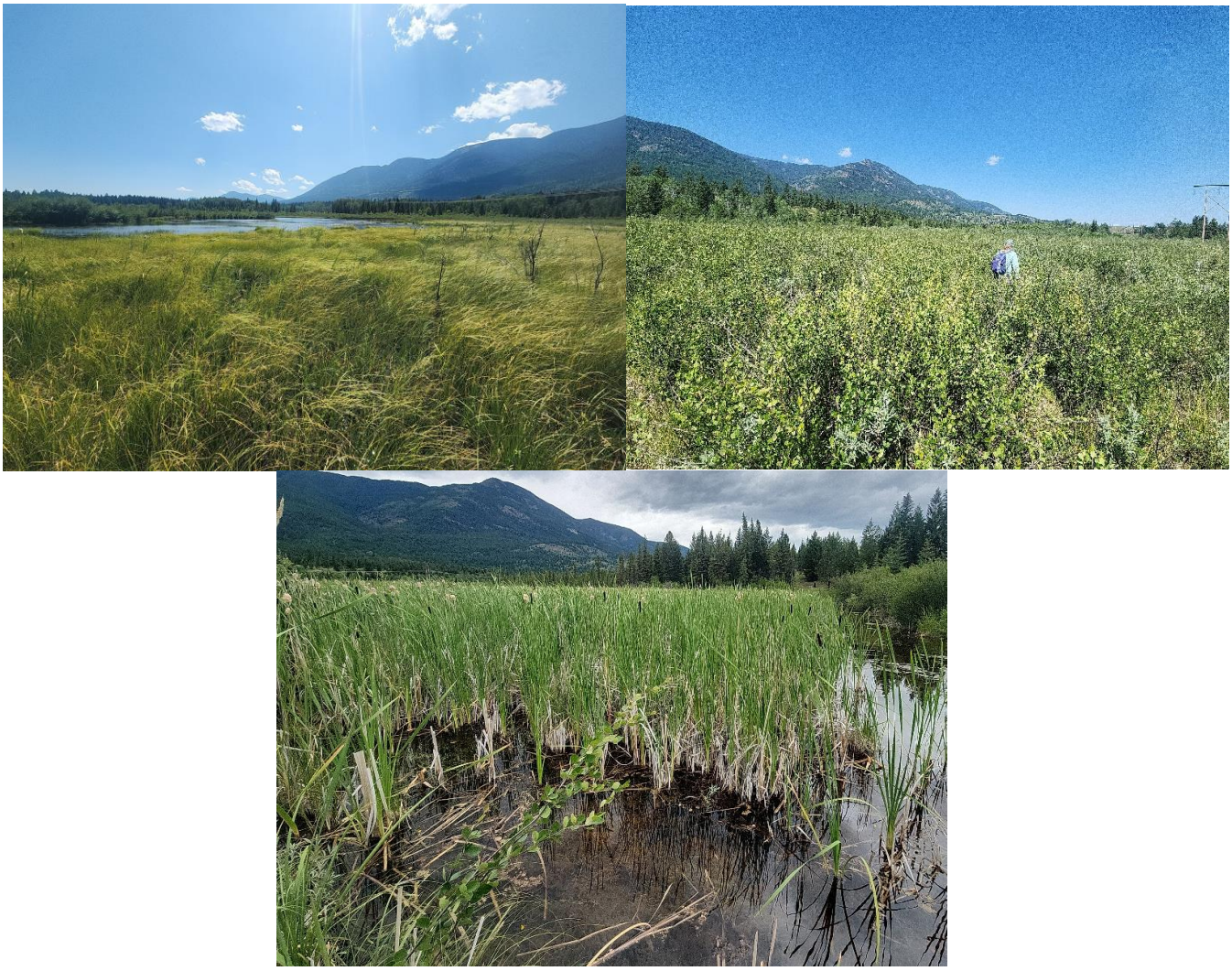

Figure 12: Images showing three habitat types found within this wetland complex: sedges and open water, scrub birch, and open water and cattails.

Unlike the Marion Creek wetland complex, many of the wetland areas where old dams would have previously held water were drying or already dry. Indications of drying that we observed included included areas of upland plants, areas of dying wetland vegetation, visible drawdown, and isolated areas of water (Figure 13). Some of these dams had visible breaches, indicating that water was no longer being held here because the dam was not capable of holding the water, but some of these areas had intact dams and no water, indicating that there was just no water available for these dams to be holding. Some wetland areas also had small and clearly diminishing pools of water directly upstream of beaver dams, but then the rest of the wetland area was dry.

Figure 13: Observed indications of drying: no longer wet wetland area upstream of old beaver dam (dam marked by shrubs on right-hand side of photo); wetted area only present directly upstream of dam, while the rest of wetland is dry.

There were more indications of drying, as indicated by the inactive dams in Figure 11, on the upstream side of this wetland complex. Further downstream, more water was present in the wetland complex, presumably arising from springs within the wetland complex or at the base of the slope to the north of the wetland. This wetter area had more active beaver dams (Figure 14), more open water, and more diversity of wetland associated vegetation.

Figure 14: All 11 active beaver dams within the Powerline Wetlands complex were downstream of BD11, the longest dam in the area holding the most water.

The most upstream area of this seemed to be receiving water flowing out of the hillside (Figure 16), presumably from springs arising within this hill; this water flow is indicated with light blue arrows (Figure 15). Also present at the top of the slope was a human constructed ditch, which descended and carried water towards the south (indicated with a dark blue arrow). This ditch continued for more than 1.5 km, which was the distance we walked along it. Along the ditch we noted signs of beavers felling trees and attempting to construct dams (Figure 17).

Figure 15: BD05 was the most upstream beaver dam found, with the land around this dam and wetland rising in all directions. The light blue arrows indicate water inflows to these wetlands; the dark blue arrow indicates the flow of water within the human constructed ditch that began on this hillside.

Figure 16: Water inflow to the wetland above BD5, rising from gently sloping hillside.

Figure 17: Downstream area of ditch, with signs of beaver-felled trees and beaver-constructed dams that have been removed. Water is flowing towards the photographer, in a southerly direction. The Powerline Wetlands complex is to the north.

In the field it appeared that due to this ditch diverting water southwards, less water is entering the Powerline Wetlands complex, which is contributing to the drying of these wetlands, particularly in the more upstream area of this wetland, above BD 11 (Figure 11). Loss of beaver dams also appeared to be contributing to this drying, with breached beaver dams no longer retaining water. We also believe that the overall drying of this area is contributing to loss of water in this system; previous work by CWSP and others has highlighted the moisture debt of this area as well as the presence of many drying wetlands.

5. References

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