Advancing Wetland Stewardship & Restoration in the Kootenays

Final Report Prepared For:
Fish and Wildlife Compensation Program
Project No: COL-F23-W-3717: [Year 5 of 10+]

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Prepared with financial support of the Fish and Wildlife Compensation Program on behalf of its program partners BC Hydro, the Province of B.C., Fisheries and Oceans Canada, First Nations, and the public.

From the reporting period: April 1, 2022 to March 31, 2024
Submitted: March 28, 2024

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1.0 Executive Summary

Beginning April 1, 2022, the B.C. Wildlife Federation's Wetlands Education Program (WEP) successfully hosted a series of workshops to build community capacity and completed wetland restoration and enhancement projects in the Kootenays. In collaboration with multiple partners, BCWF was able to restore wetlands for wildlife and control invasive species, filter water, promote biodiversity, and protect Species at Risk. A quick summary of the results includes:

- Trained 31 wetland practitioners, including representatives from six First Nation bands, during the 7-day intensive Wetlands Institute workshop in topics such as wetland restoration, wetland classification and delineation, proposal writing, and wetland health assessments and monitoring. This workshop was partially hosted in Slocan, Rossland and Trail.
- Trained 20 participants at the Rossland Wetland Restoration workshop and supported the enhancement of Jubilee wetland by planting native plants and thinning the native cattails.
- Trained six wetland practitioners, including three Shuswap Band technicians, at Canal Flats Wetland Restoration workshop and planting event and supported the enhancement of 0.24 ha of wetland habitat at Hyppo Logging Basin wetland by building and reinforcing 200 m of alternative cattle exclusion fencing and planting and watering 500 plants and installing browse protectors.
- Trained 16 community members, ?aq'am staff, and Land Guardians at the Wetland Health Assessment workshop for ?aq'am Band (Ktunaxa Nation) in classification and assessment of wetlands, and identified potential restoration sites on reserve lands.
- Trained 12 participants at the Crawford Bay Wetlandkeepers workshop and supported wetland restoration designs within the newly established Crawford Creek Regional Park.
- Trained 23 participants at the Slocan Wetlandkeepers in wetland classification, delineation, and stewardship.
- Restore 67500 m^2 of wetland and shallow lake habitat and 1700 linear m of stream at Yaqan Nukiy (Creston)
- Collected data to create a restoration design plan for wetland habitat at Ravine Creek Farm (Winlaw) for approval by landowner.
- Set up wildlife and hydrology monitoring at 11 previously restored sites within the Columbia basin for wetland effectiveness monitoring.
- Processed wildlife monitoring data for 35 monitoring units (camera trap and song meter) at the Yaqan Nukiy project for wildlife monitoring.

The 2022 project aligns best with the FWCP's Wetland and Riparian Areas Action Plan priority action COLWRA.ECO.HB.20.01 Stewardship opportunities to improve habitat-P1. We collaborated with Indigenous groups, stewardship groups, and others to identify potential stewardship opportunities to improve habitat and address threats to critical wetland and riparian areas; and the FWCP's Wetland and Riparian Areas Action Plan priority action COLWRA.ECO.HB.13.01 Restore and create wetland/riparian habitat-P1.

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2 .0 Introduction

In comparison to many other ecosystems, the benefits from wetlands are exceptionally large relative to their size (MacKenzie & Shaw, 1999). Based on one commonly referenced study, the market and non-market values of wetland goods and services (e.g., climate regulation, nutrient cycling, and food production) are valued at $19,580 hectare/year (Costanza et al., 1997), which extrapolates to approximately $100 billion/year in BC (MOE, 2010). More recent studies have indicated a value of about $1.8 million/km^2 per year and a median value of $91,000/km^2, especially for coastal areas (Sun & Carson, 2020). When total economic values are considered, wetlands often provide greater economic returns than when the land is converted for other uses (Millennium Ecosystem Assessment, 2005). However, wetlands have been historically degraded and destroyed in low-elevation areas of the Kootenay region from large scale developments such as hydro-electric production, agriculture, diking, and transportation networks, as well as from residential growth (Utzig & Schmidt, 2011). Furthermore, remaining wetlands are at risk of degradation from human activities such as mud-bogging, and the introduction and spread of invasive plants and wildlife (e.g., Reed Canary grass, American bullfrog).

Restoration and enhancement were completed at 2 sites across the Columbia Basin. A total of 6.75 hectares of wetlands, and 1.7 km of historic river channel were restored on Yaqan Nukiy (Lower Kootenay Band) lands in the Creston area. A total of 0.24 ha of wetland were enhanced with the installation of natural material fencing for cattle exclusion and a cattle access ramp and 500 plants were planted, watered, and protected with browse guards at Hyppo Logging Basin wetland in Canal Flats. Data was collected at Ravine Creek Farm in Winlaw to create a restoration proposal for the landowner. Wildlife and hydrology monitoring occurred at 11 previously restored sites to assess wetland restoration effectiveness. Due to decreased funding secured from FWCP, our teams were limited in conducting enhancement and maintenance work at other restored wetlands in the Columbia region, as well as other monitoring surveys.

The 2022 initiative is most alligned with FWCP's Wetland and Riparian Areas Action Plan, specifically prioritizing action COLWRA.ECO.HB.20.01, which focuses on stewardship endeavors to enhance habitat, Priority 1. This report provides further details to the above projects, their impact, and future steps to be taken.

3.0 Goals and Objectives

Goal 1: Through workshops, increase community capacity to map, classify, restore, and steward wetlands in the Columbia Basin.

Objective 1.1: Train 20+ participants during the delivery of two 2.5-day Wetlandkeepers workshops in Slocan and Crawford Bay, respectively.

Objective 1.2: Train 10+ Land Guardians and community members during the delivery of the 4-day Wetland Health Assessment workshop workshop in Cranbrook with ?aq'am First Nation.

Objective 1.3: Train 20+ participants during the delivery of two 2.5-day Wetland Restoration workshops in Canal Flats and Rossland, respectively.

Objective 1.4: Train 20+ participants during the delivery of 7-day Wetland Institute workshop in the Kootenay-Boundary region (Grand Forks, Slocan Valley, Rossland and Trail).

Goal 2: Restore wetland habitat in the Columbia Basin.

Objective 2.1: Restore up to 10 ha of wetland habitat & reconnection of floodplain and wetland habitat to the Kootenay River on Yaqan Nukiy Projects (Creston).

Objective 2.2: Enhance 0.24 ha of wetland habitat at Hyppo Logging Basin in Canal Flats by installing a natural material fence to exclude cattle, build a cattle access ramp and plant shrubby species within fence line.

Objective 2.3: Conduct pre-restoration monitoring and collect data to create a restoration proposal for the landowner at Ravine Creek Farm in Winlaw.

Goal 3: Improve the success of wetland restoration projects.

Objective 3.1: Contribute to the enhancement of previously restored sites to promote and increase biodiversity, in accordance with findings from the Comprehensive Restoration Evaluation Project (2018).

The above goals and objectives correspond to the following Habitat-based Actions from the Columbia Region Wetland and Riparian Areas Action Plan (2021 version):

<u>Ecosystem Action Table: Recommended actions that apply to all six focal areas</u>:

20 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.

<u>Action priorities for the Slocan Valley</u>

14 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.

<u>Action priorities for the Creston Valley</u>

13 Restore and create wetland and riparian habitat to address impacted, degraded or lost habitat.

14 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.

17 Improve habitat connectivity between wetland and river ecosystems. High priority areas include wetland and riparian areas directly affected by dam impacts, biodiversity hot spots and conservation properties.

36 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.

4.0 Study Area

Below are GPS locations of related workshops and events, with descriptions of field locations when appropriate.

- Workshops
    - Wetlands Institute- Kootenays portion:
        - Slocan Valley- Hunter Siding Project: 50.118503, -117.525971
            - Tour with Slocan Lake Stewardship Society on restoration techniques of a recently restored marsh and floodplain habitat and removed bull thistle from 0.5 ha of wetland.
        - Rossland-Jubilee wetland: 49.081859, -117.797294
            - Supported the enhancement of ~0.4 ha of Jubilee wetland, a restored marsh and open water wetland, by removing invasive plants, planting native plants, and repairing a fence to keep children and community members out of sensitive parts of the wetland.
        - Rossland- Centennial wetland: 49.077262, -117.818753
            - Tour with Rossland Society for Environmental Action on restoration techniques and collection of native seed to inoculate soils at Jubilee wetland.
        - Trail- Cambridge/Violin wetlands: 49.060983, -117.729942
            - Two restored reservoir lake basins into wetland complexes; Tour with Rewilding Water & Earth on restoration techniques and wildlife and hydrology monitoring.
    - Crawford Bay Wetlandkeepers
        - Crawford Creek Regional Park Wetlands: 49.666503, -116.827453
            - RDCK A recently secured land for a new park in Crawford Bay, including 162 acres of wetland complex, one of the largest intact wetlands around Kootenay Lake. Participants learned about the value of wetlands and learned classification, wetland health assessment techniques, and GPS delineation.
    - Slocan Wetlandkeepers
        - Upper Little Slocan Lake: 49.682349, -117.652913
            - Swamp and marsh habitat used to train participants in plant ID, delineation, and wetland classification.
        - Crooked Horn Farm: 49.598508, -117.570948
            - Tour of restored marsh wetland with Gregoire Lamoureux from the Slocan River Streamkeepers.
        - Ravine Creek Farm: 49.651250, -117.518194

        - Drained wetland converted to hay field used to train participants in health assessment and restoration potential.
    - Rossland Wetland Restoration workshop
        - Oasis Wetland: 49.13361111, -117.74055556
            - Shallow open water and marsh habitat used to train participants in plant ID, delineation, and wetland classification.
        - Red Resort Compensation Pond: 49.103001, -117.815318
            - Amphibian breeding pond constructed as compensation for the Red Mountain Resort developments; used to train participants in aquatic macroinvertebrate survey techniques.
        - King George VI Provincial Park: 49.012267, -117.833393
            - Marsh and wet meadow restored in 2019; used to train participants in restoration and wildlife and plant monitoring techniques.
        - Jubilee wetland: 49.081859, -117.797294
            - Supported the enhancement of Jubilee wetland by planting native plants and thinning out cattail to prevent infilling of open water pond.
    - Canal Flats Wetland Restoration workshop & planting event
        - Hyppo Logging Basin: 50.157971, -115.887124
            - Supported wetland enhancement by building and reinforcing 200 m of natural material fence and building a cattle access ramp, and planting, watering, and installing browse guards on 500 plants.
        - Sun Creek wetland: 50.184975, -115.885716
            - Tour of newly restored marsh and swamp habitat, including beaver reintroduction discussion.
        - Island pond: 50.030272, -115.750063
            - Shallow open water wetland and marsh; used to train participants in health assessment and classification.
    - ʔaq'am Wetland Health Assessment workshop
        - Mineral Lake Wetland: 49.350637, -115.855679
            - Swamp wetland used to train participants in wetland classification and plant ID.
        - Bummer's Flats: 49.671085, -115.681559
            - Shallow water and marsh wetland used to train participants in classification, plant ID and wetland health assessment.
        - Cranbrook wetland: 49.448368, -115.793241
            - Impacted swamp wetland used to train participants in rapid health assessment.
        - Adrian Lake: 49.662383, -115.764962
            - Large wetland complex used to train participants how to conduct a health assessment on a large site.

- Wetland Restoration
    - Yaqan Nukiy Lands, Creston: 49.071536, -116.545556

        - Located on the floodplain of the Kootenay River, this area was modified in the 1970's with artificial impoundments, ditches, dikes, pipes, pumps, and other water control structures (some of which were failing and/or expensive to maintain). Some of the site is used for pasture and farming, and much of it is dominated by invasive Reed Canary Grass. Within close proximity to the Creston Wildlife Management Area.
- Wetland Enhancement
    - Hyppo Logging Basin: 50.158118, -115.887149
        - Enhanced 0.24 ha of wetland habitat at Hyppo Logging Basin by installing 200 m of natural material fence and building a cattle access ramp and planting 500 plants with browse protectors with support from Shuswap First Nation technicians.
- Effectiveness Monitoring
    - Eleven previously restored sites were equipped with wildlife cameras and hydrology poles to monitor wildlife use and water levels during the spring and summer of 2022. See appendix A Figure 8 for locations of monitoring project sites.

5.0 Methods

Wetlands Institute

The Wetlands Institute provided hands-on training to wetland practitioners through field visits to restoration sites and training and lectures provided by a number of expert guest speakers. Field experts and high-quality speakers are selected to provide leading and relevant information on wetland topics such as wetland restoration design and techniques and wildlife monitoring (See Appendix B for the schedule).

Training included methodologies on soils texturization, vegetation zonation, wetland delineation, plant/wildlife inventories, project planning, and landowner contact and dialogue techniques, primarily based on the Wetlandkeepers Handbook (Southam & Curran, 1996), as well as grant acquisition guidance and budget management. Furthermore, participants learned how to identify wetland ecological communities using the Land Management Handbook 52 Wetlands of British Columbia: A Guide to Identification (Mackenzie & Moran, 2004), in conjunction with draft wetland classification forms, which were developed in conjunction with the Ministry of Forests, Lands, and Natural Resource Operations and Rural Development (FLNRORD). Participants were also introduced to additional methodologies, such as the BCWF's Wetland Ecosystem Services Protocol (WESP) and Alberta Cow's and Fish Lentic Health Assessment protocol. Wetland restoration specialist Robin Annschild was a featured educator and taught participants how to design wetland restoration prescriptions. Hands-on methods were largely based on those found in Wetland Restoration and Construction–A Technical Guide (Biebighauser, 2011).

Wetlandkeepers

Two 2.5-day Wetlandkeepers workshops were hosted in Crawford Bay and Slocan, respectively, to train participants in wetland classification, plant ID, and wetland stewardship. In the field, participants were shown how to identify vegetation and texture soil types to identify wetland ecological communities.

Methodologies are primarily based on the Wetlandkeepers Handbook (Southam & Curran, 1996) and Mackenzie & Moran (2004) Land Management Handbook 52; Wetlands of British Columbia: a guide to identification. These workshops agendas were designed with input from project partners.

Wetland Restoration Workshops

Two 2.5-day Wetland Restoration workshops were hosted in Rossland and Canal Flats, respectively, to train participants on wetland classification, delineation, restoration design and enhancement techniques. In the field, participants were shown how to identify vegetation and texture soil types to identify wetland ecological communities using Mackenzie & Moran (2004) Land Management Handbook 52; Wetlands of British Columbia: a guide to identification. Participants at the Canal Flats workshop supported enhancement work at the Hyppo Logging Basin wetland and participants at the Rossland workshop supported enhancement work at the Jubilee wetland. These workshops agendas were designed with input from project partners.

Wetland Health Assessment workshop

In 2021, ?aq'am Lands & Resources Project Coordinator attended WEP's virtual Cranbrook Wetlandkeepers workshop and approached BCWF about partnering in 2022. A 4-day Wetland Health Assessment workshop was hosted in Cranbrook for ?aq'am staff, community members, Guardian-in-Training youth, and KNC Land Guardians. Traditional Ecological Knowledge (TEK) was integrated into learnings with support from the community's Elders and knowledge sharing by participants. Participants were trained to identify vegetation and texture soil types to identify wetland ecological communities using Mackenzie & Moran (2004) Land Management Handbook 52; Wetlands of British Columbia: a guide to identification, and Alberta Cow's and Fish Lentic Health Assessment protocol by visiting several different types of wetlands in various stages of health on and off reserve lands. The workshop agenda was designed with input by ?aq'am First Nation.

Wetland Restoration

Tom Biebighauser has developed wetland design prescriptions in BC with input from landowners and regional biologists. Over the past 42 years, Tom has designed over 5000 wetland restoration projects and successfully restored over 2000 wetlands in North American and New Zealand. Projects were designed to function as a natural wetland, provide ecological benefits, be relatively inexpensive, and require little to no maintenance (i.e., without the use of water control structures). Excavated soils remained on site and were used to create ridges, islands, and hummocks to increase habitat complexity. Native seed was used to reduce soil erosion. Logs and coarse woody debris were also placed in and around wetlands as habitat features. Specific site details can be found below.

Yaqan Nukiy Restoration Project: Designed by Tom Biebighauser with input from the Lower Kootenay Band, this project was designed to reconnect the natural floodplain to the Kootenay River. Using heavy machinery, dams were dismantled and wetlands were primarily restored using the groundwater technique described in Wetland Restoration and Construction–A Technical Guide (Biebighauser, 2011) where shallow basins were contoured in areas high in Reed Canary Grass. The restored area will provide white sturgeon and burbot access to floodplains during freshet, and provide habitat for a several other species of mammals, waterfowl, and amphibians.

Wetland Enhancement

Wetland enhancement work at Hyppo Landing was conducted by Arrowstone Forest Contracting Ltd., with support from the BCWF Wetlands Workforce Kootenay Pod, Canal Flat Wetland Restoration workshop participants and Shuswap First Nation Technicians. This enhancement work was prescribed by the 2021 Wetlands Workforce Kootenay Pod with guidance from regional biologists and the current grazing tenure holder.

A natural material fence was installed around the wetland pool using on site material (e.g., down aspen trees) and secured with T posts and wire. A cattle access ramp was installed to allow cattle access to the pond as a water source. Riparian plants were planted within the fenced area to contribute to restricting access to cattle but not impeding native ungulates and other wildlife.

Wetland Monitoring

Wildlife cameras were deployed in late Spring at 11 previously restored wetland sites throughout the Kootenays to capture wildlife species richness and behaviour. Hydrology poles were installed in the wetland and the camera was set to take a scheduled photo per day to monitor the hydrology of the wetlands to determine if ephemeral built wetlands were experiencing proper periods of dryness and permanent wetlands were holding water throughout the season.

6.0 Results

Wetlands Institute

The Fish and Wildlife Compensation Program considers wetland conservation and restoration as a priority for the Columbia Basin and has developed several interim initiatives (FWCP, 2014). Other action plans in the Columbia Basin identify wetlands as a priority habitat for conservation/restoration (Green et al., 2006). As with previous years, the B.C. Wildlife Federation's Wetland Education Program (WEP) supported these initiatives by building the capacity of residents to protect, enhance, and restore wetlands through the following programming: delivery of two Wetland Restoration workshops in Canal Flats and Rossland, delivery of two Wetlandkeepers workshops in Slocan and Crawford Bay, delivery of a Wetland Health Assessment workshop with ?aq'am First Nation, and delivery of a 7-day Wetlands Institute workshop in Grand Forks, Slocan Valley, Rossland and Trail. These workshops trained a total of 108 wetland practitioners, community members, Land Guardians and First Nation technicians in topics such as wetland classification, plant identification, and wetland health assessments. Participants also learned about the values of wetlands, and benefits and challenges to wetland restoration.

Thirty-one wetland practitioners attended the Wetlands Institute (WI), including representatives from Penticton Indian Band, Okanagan Indian Band, Okanagan Nation Alliance, ?aq'am First Nation, Splats'in First Nation, and Coleville Confederated Tribes. Participants came from various backgrounds such as Environmental Consultants, Regional Managers, ENGOs, First Nation Technicians, and University students. Of the 24 participants that completed an evaluation, 96% of them rated the quality of the WI as among the best or above average compared to other workshops or extension courses. Additionally, 100% of respondents indicated that the WI helped with their wetland project, and 100% of respondents stated they would recommend the WI to others. Some quotes from participants:

When asked if the WI helped with their project: “Yes, learning the process of wetland restoration from engagement to design to implementation was very beneficial. I learned who to talk to and how to go about it and feel more confident about the direction of our project.”

When asked about the quality of the coordinators: “Among the best. As a First Nations person, I was dealt with respect. That means a lot to me. They are very pleasant and informative. If they don’t know something, they will find out or answer your questions to the best of their abilities.”

Additionally, 0.5 ha of wetland at the Hunter-Siding project in the Slocan Valley was enhanced through the removed bull thistle. At the Jubilee wetland in Rossland, ~0.4 ha of wetland was enhanced by removing invasive plants, planting native plants, and repairing a fence to keep children and community members out of sensitive parts of the wetland.

Wetlandkeepers

A total of 35 participants attended the two Wetlandkeepers workshops hosted in Crawford Bay and Slocan. Of the 32 participants that completed evaluations, 84% indicated that the quality of the workshop was among the best or above average compared to other similar environmental training workshops (16% did not respond to this question). When asked if this course, which concentrates on hands-on inventory field skills, will help them obtain their wetland project goals, 28/31 respondents answered yes.

Wetland Restoration Workshops

Twenty-three participants attended the two Wetland Restoration workshops hosted in Canal Flats and Rossland. Of the 16 that completed evaluations, 100% of participants indicated they would recommend this workshop to others, and 94% indicated that this workshop was among the best or above average compared to other workshops (16% didn’t respond to this question). 84% of respondents indicated that this workshop would help their current or future wetland project (19% did not respond to this question).

Wetland Health Assessment workshop

Sixteen participants attended this training and 11 completed an evaluation. Of the respondents, 55% indicated the quality of the workshop was among the best or above average, and 45% indicated it was average. One participant commented “I think if we had more time and less heat, going into more detail would have been helpful”. 100% of participants indicated they would recommend this workshop to others, and 91% of respondents rated the coordinators and coordination of the workshop as among the best or above average.

Wetland Restoration

In fiscal year 2022-23, the Lower Kootenay Band had constraints on resources and needed to delay heavy equipment works for this project to 2023/24 fiscal. During phase 4 of the Yaqan Nukiy Restoration Project, two 24-inch culverts were replaced with 48-inch culverts to allow more floodwaters to enter the restored area. A total of 1.7 km of historical river channel and 6.75 ha of wetland and shallow lakes were restored in the North Unit of the project site using heavy equipment. Soils were decompacted using the rough and loose technique and spread with native seed mix, and planting will occur in the Fall to promote the best survivorship. The wetland basins were shaped with varied topography containing pits and mounds to improve plant and animal diversity.

A final report of works completed in 2023 was prepared by Tom Biebighauser and can be shared by request.

Wetland Enhancement

During the Canal Flats workshop and during subsequent visits by the Wetlands Workforce Kootenay Pod and Shuswap Technicians, 0.24 ha of wetland habitat at Hyppo Logging Basin were enhanced by building and reinforcing 200 m of alternative cattle exclusion fencing, building a cattle access ramp, and planting and watering 500 plants and installing browse protectors. Planned future enhancement activities at this site include soil amendments for the spoil piles and revegetation efforts.

Wetland Monitoring

Of the 12 sites monitored, some of the wildlife cameras were damaged by animals at one site, therefore we only have data from 11 sites. Hydrology and wildlife data is still being analyzed and interpreted. 26 unique species were identified across the sites, found in table 1. See appendix A, figure 8 for locations of projects that received monitoring stations.

Individual Species Identified at Kootenay Monitoring Stations
American coot (Fulica americana)
American crow (Corvus brachyrhynchos)
American Wigeon (Mareca americana)
Belted Kingfisher (Megaceryle alcyon)
Blue-winged Teal (Anas discors)
Bufflehead (Bucephala albeola)
Canada Goose (Branta canadensis)
Cedar Waxwing (Bombycilla cedrorum)
Cinnamon Teal (Spatula cyanoptera)
Common Raven (Corvus corax)
Coyote (Canis latrans)
Eastern Kingbird (Tyrannus tyrannus)
Elk (Cervus elaphus)
European starling (Sturnus vulgaris)
Great Blue Heron (Ardea herodias)
Hooded merganser (Lophodytes cucullatus)
Mallard (Anas platyrhynchos)
Mule Deer (Odocoileus hemionus)
Northern Shoveler (Spatula clypeata)
Pileated woodpecker (Dryocopus pileatus)
Red-tailed hawk (Buteo jamaicensis)
Red-winged blackbird (Anas platyrhynchos)
Sandhill Crane (Grus canadensis)
Western Meadowlark (Sturnella neglecta)

White-Tailed Deer (Odocoileus virginianus)
Wood Duck (Aix sponsa)

Table 1: Identified species captured by wildlife cameras at 11 sites across the Kootenays, including 2 incidental wildlife sightings during site visits.

7.0 Discussion

BCWF's Wetlands Education Program continued its support in the Columbia Basin in 2022, and was in line with multiple FWCP priorities, as outlined in the Columbia Basin Riparian and Wetland Action Plan (2021 version), including:

Ecosystem Action Table: Recommended actions that apply to all six focal areas

20 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.

- This project was in partnership with the Yaqan Nukiy First Nation (Lower Kootenay Band), David Lewis Ecological Servicesaq'am Fist Nation, Eastshore Freshwater Habitat Society, Rossland Society for Environmental Action, Rossland Summit School, the Slocan Waterfront Society, the City of Grand Forks, and Slocan Lake Stewardship Society.

Action priorities for the Slocan Valley

14 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.

- Enhancement at the Hunter-Siding project during the Wetlands Institute included actions to control of invasive bull thistle

Action priorities for the Creston Valley

13 Restore and create wetland and riparian habitat to address impacted, degraded or lost habitat.

- Wetland, shallow lake and historic river and riparian habitat were restored at Yaqan Nukiy in Creston, BC.

14 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.

- Restoration at Yaqan Nukiy is expected to help control invasive Reed Canary Grass.

17 Improve habitat connectivity between wetland and river ecosystems. High priority areas include wetland and riparian areas directly affected by dam impacts, biodiversity hot spots and conservation properties.

- Restoration work on Yaqan Nukiy lands reconnected wetland habitat to the Kootenay and Goat Rivers.

36 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.

- Restoration work on Yaqan Nukiy lands was designed so that the wetlands would support spawning grounds for burbot and sturgeon.

8.0 Recommendations

BCWF's Wetland Education program strongly believes that training and providing support to communities, local stewardship groups, First Nations members, government workers, and professionals can increase the capacity for improved conservation and protection actions throughout British Columbia. Like previous years, BCWF's 2022 works had a strong emphasis on wetland restoration and enhancement, which resulted in several hectares of improved habitat for wildlife, promotion of native biodiversity, improved water quality, carbon sequestration, water retention, and flood mitigation. Due to the negative effects of climate change, conservation, stewardship, and restoration of wetlands is especially important. It is expected that many of these restoration efforts will lead to future restoration opportunities, as they have in the past. It is the Wetland Education Program's recommendation that the FWCP and other organizations continue to invest in similar capacity building programs in the Columbia Basin to build upon the momentum that the Wetlands Program instigated through the delivery of projects through 2012-2022.

9.0 Acknowledgements

We would like to acknowledge the following financial and in-kind supporters:

- Government of BC - Community Gaming Grant
- Wildlife Habitat Canada
- Environment and Climate Change Canada
- Columbia Basin Trust
- Yaqan Nukiy Lower Kootenay Band
- Healthy Watersheds Initiative (Real Estate Foundation of BC, Watersheds BC, and the Government of BC)
- TD Friends of the Environment
- Habitat Conservation Trust Foundation

We would also like to thank the following project partners for their support:

Yaqan Nukiy First Nation (Lower Kootenay Band), Columbia Basin Fish & Wildlife, ?aq'am First Nation, Eastshore Freshwater Habitat Society, Rossland Society for Environmental Action, Rossland Summit School, the Slocan Waterfront Society, the City of Grand Forks, and Slocan Lake Stewardship Society.

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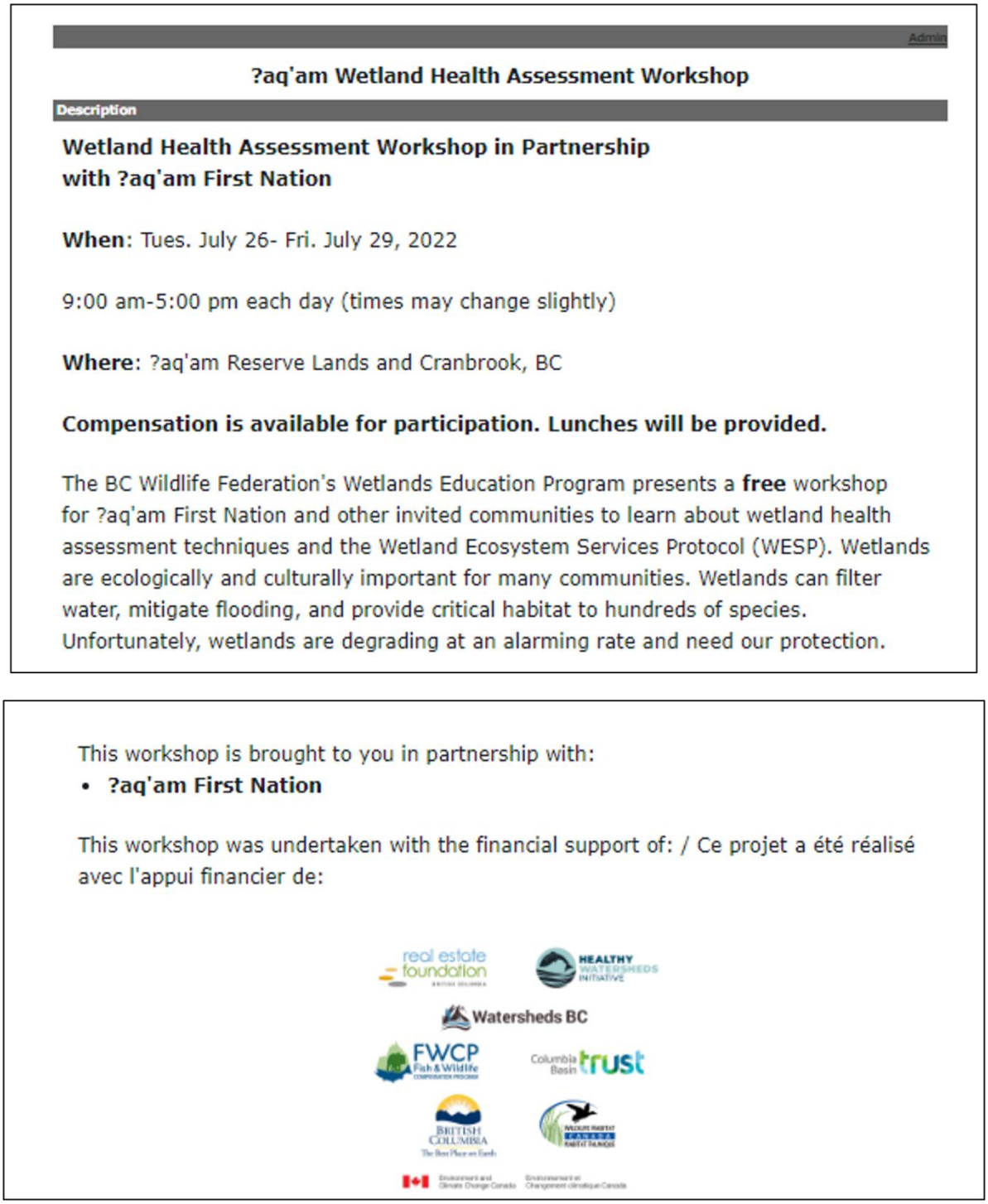
11.0 Confirmation of FWCP Recognition

FWCP's logo was displayed before all the workshops on advertisements and registration pages, and during the workshops on participant packages, welcoming slides, and in presentations. FWCP's contribution is also recognized online on the BCWF website, on blog posts, and in Flickr photo album descriptions. The 2022 Wetlands Update, BCWF AGM booklet, and BC Outdoors Magazine all recognize FWCP's contribution in print format. In addition, BCWF continues to distribute the Landowner Contact pamphlets, created in 2015 with funding from FWCP.

Please see the following for examples of where FWCP was recognized:

Figure 1: Sample Facebook post highlighting our sponsors.

Figure 2: Feature on WEP's Bog Blog about the 2022 Wetlands Institute. FWCP recognized as a financial supporter. Blog can be found here: https://bcwfbogblog.com/2022/10/31/bcwf-celebrates-20-years-of-the-wetlands-institute/ .



Admin

?aq'am Wetland Health Assessment Workshop

Description

Wetland Health Assessment Workshop in Partnership with ?aq'am First Nation

When: Tues. July 26- Fri. July 29, 2022

9:00 am-5:00 pm each day (times may change slightly)

Where: ?aq'am Reserve Lands and Cranbrook, BC

Compensation is available for participation. Lunches will be provided.

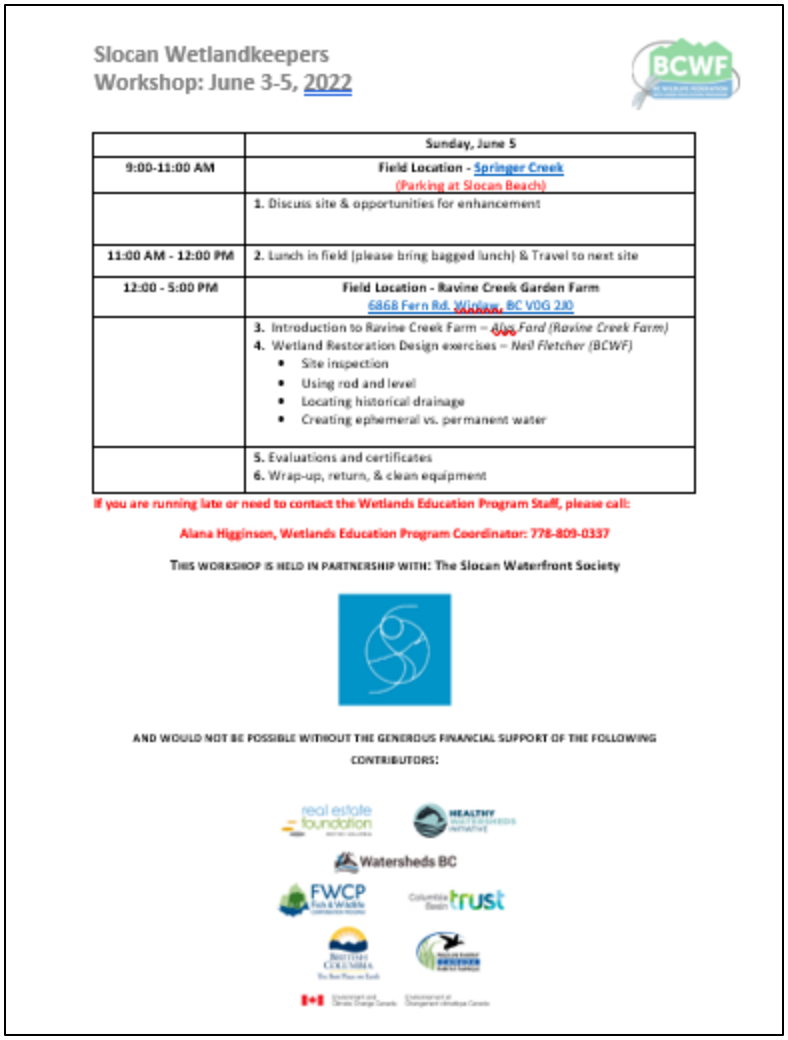
The BC Wildlife Federation's Wetlands Education Program presents a **free** workshop for ?aq'am First Nation and other invited communities to learn about wetland health assessment techniques and the Wetland Ecosystem Services Protocol (WESP). Wetlands are ecologically and culturally important for many communities. Wetlands can filter water, mitigate flooding, and provide critical habitat to hundreds of species. Unfortunately, wetlands are degrading at an alarming rate and need our protection.

This workshop is brought to you in partnership with:

- **?aq'am First Nation**

This workshop was undertaken with the financial support of: / Ce projet a été réalisé avec l'appui financier de:

Figure 3: Registration page for the Wetland Health workshop with ?aq'am First Nation where sponsors are recognized.



Slocan Wetlandkeepers
Workshop: June 3-5, 2022

	Sunday, June 5
9:00-11:00 AM	**Field Location - Springer Creek** (Parking at Slocan Beach)
	1. Discuss site & opportunities for enhancement
11:00 AM - 12:00 PM	2. Lunch in field (please bring bagged lunch) & Travel to next site
12:00 - 5:00 PM	**Field Location - Ravine Creek Garden Farm** 6868 Fern Rd. Winlaw, BC V0G 2J0
	3. Introduction to Ravine Creek Farm – *Alys Ford (Ravine Creek Farm)* 4. Wetland Restoration Design exercises – *Neil Fletcher (BCWF)* • Site inspection • Using rod and level • Locating historical drainage • Creating ephemeral vs. permanent water
	5. Evaluations and certificates 6. Wrap-up, return, & clean equipment

If you are running late or need to contact the Wetlands Education Program Staff, please call:

Alana Higginson, Wetlands Education Program Coordinator: 778-809-0337

THIS WORKSHOP IS HELD IN PARTNERSHIP WITH: The Slocan Waterfront Society

AND WOULD NOT BE POSSIBLE WITHOUT THE GENEROUS FINANCIAL SUPPORT OF THE FOLLOWING CONTRIBUTORS:

Figure 4: Example agenda sent to participants for the Slocan Wetlandkeepers workshop where funders are recognized.

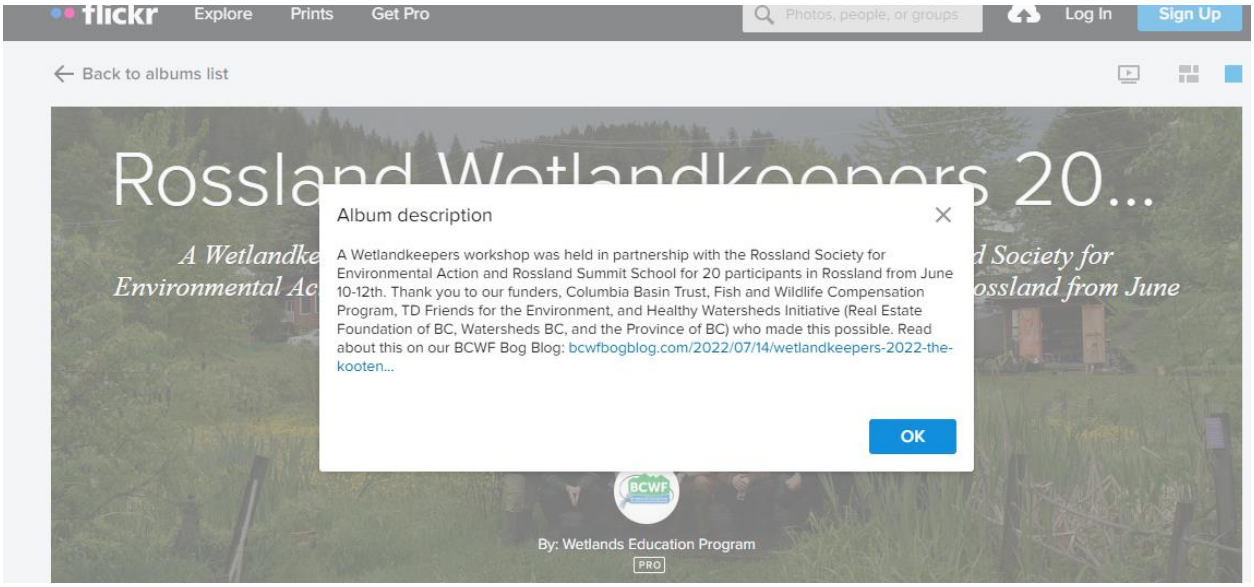


Figure 5: Description on one of our Flickr albums where FWCP is recognized as a funder. Album can be viewed here: https://www.flickr.com/photos/bcwfwep/albums/72177720300547373

12.0 Appendices

Appendix A - Maps and images of project locations

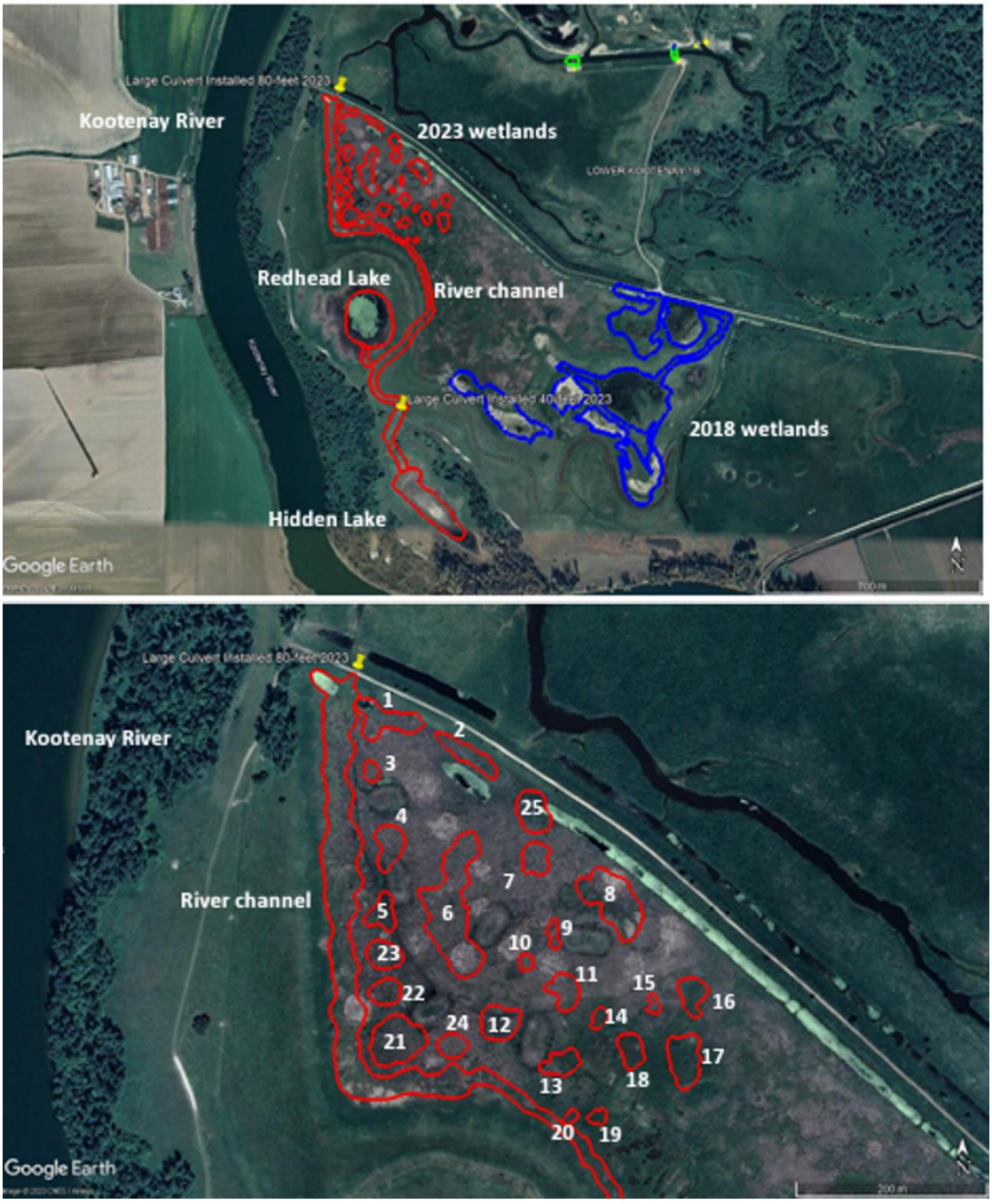


Figure 6:Wetlands, lakes and river channel constructed in 2023 at the Yaqan Nukiy Restoration Project

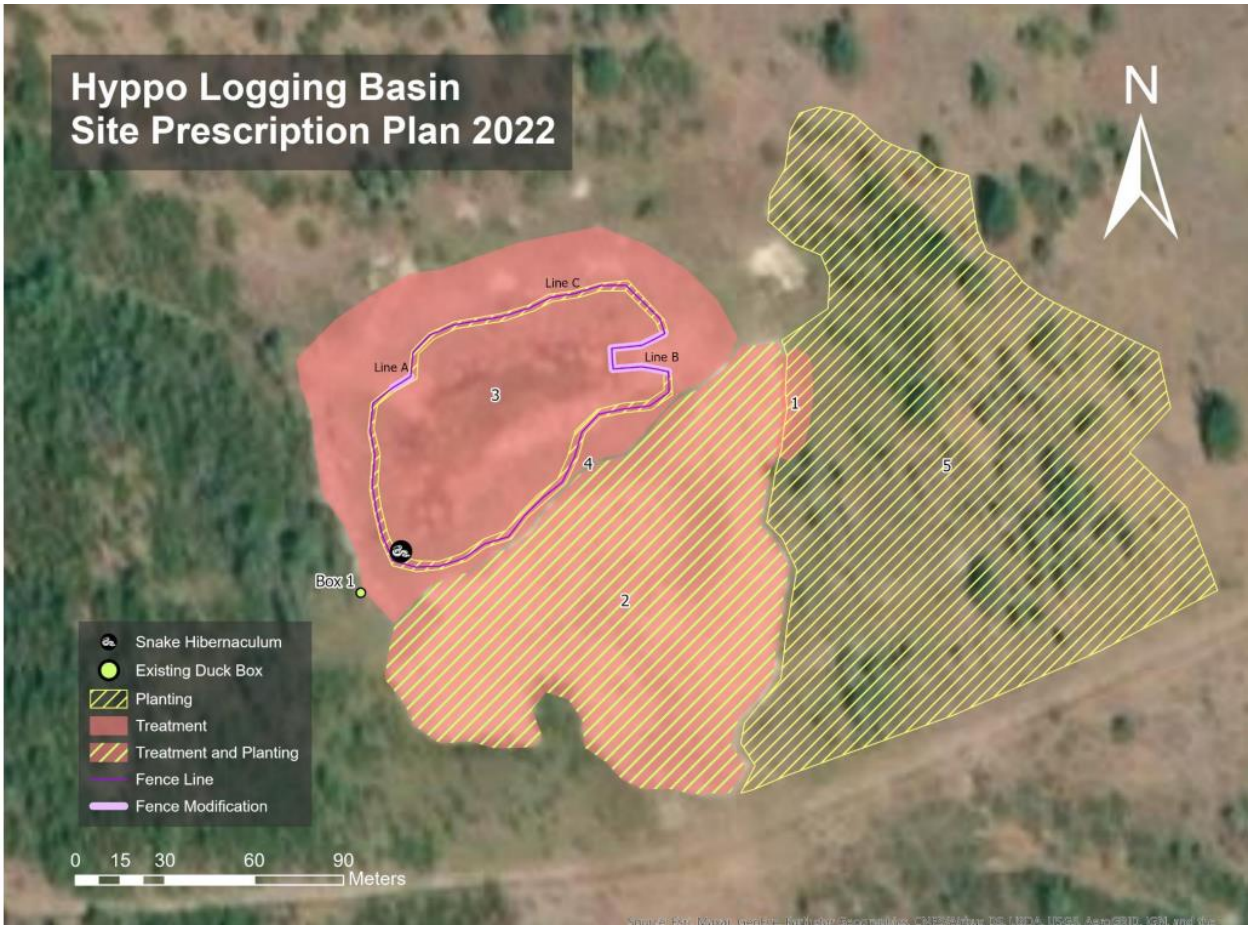


Figure 7:Location of natural material fence and cattle access ramp installed at Hyppo Logging Basin and treatment area plans for future maintenance work.

Figure 8: Location of restored wetlands equipped with hydrology and wildlife monitoring stations in the Spring and Summer of 2022

Appendix B – 2022 Wetlands Institute Schedule

2022 WETLANDS INSTITUTESCHEDULE - GRAND FORKS, SLOCAN VALLEY, ROSSLAND & TRAIL- STAFF COPY								
	Sept 18	Sept 19	Sept 20	Sept 21	Sept 22	Sept 23	Sept 24	Sept 25
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Location	Grand Forks	Grand Forks	Grand Forks	Grand Forks	Slocan Valley (New Denver & Hills)	Slocan Valley (Winlaw)	Trail	Rossland
8:00am					travel to Slocan Valley (~2.5-3 hrs) leave by ~7:30 am	travel to site (40 min from New Denver to Winlaw)		
8:30am							travel to Trail (~2 hrs) - meet at Tunnel pub in Trail to carpool (need AWD & can only park 6 & 8 vehicles at site)	
9:00am		Arrive at Pines Bible Camp: Attendance/registration, receive handouts	Morning lecture: Theory of Restoration - Neil Fletcher (BCWF)	North Ruckle Design tour with Associated Environmental (David Forde, Nicola Van Der Mark & Carrie Nadeau)				Centennial wetland site visit: Plant ID & Wetland classification, native seed collection - Eva Cameron (Eva Cameron Landscape Designs)
9:30am		Welcome to the Wetlands Institute (incl. 15 min coffee break)						
10:00am			Travel					
10:30am		Participant presentations: Group 1	Cultural Engagement TBD		Summit Lake Project site: Invasives Spp. 101 - Laurie Frankcom (CKISS); Project site tour - Wendy King (Slocan Lake Stewardship Society (SLSS)) & Ryan Durand (EcoLogic)			
11:00am								
11:30am				Lunch		Restoration design - Ravine Creek Farm (Winlaw) - Robin Annschild (Rewilding Water & Earth)		Lunch
12:00pm		Lunch at Bible Camp (lunch provided)	Lunch	Travel	Lunch at Hills Fire Hall - pack own lunch (12:15-1:00 pm) - carpool to next site		Cambridge/Violin site tour and wildlife and hydrology monitoring: Rewilding Wild & Earth staff	Jubilee Park site visit: Wetland enhancement activities (e.g., wetland delination with logs, boardwalk enhancement, invasives species removal, planting shrubs & seeding) - Eva Cameron (Landscape Designs); Using Jubilee wetland as a teaching tool - Laura Jackman (Rossland Summit School)
12:30pm	Suggest arriving in Grand Forks today to start first thing tomorrow morning	Travel						
1:00pm		Classification & delineation - Neil Fletcher (BCWF)	Intro to Wetland Ecosystem Services Protocol (WESP): Kyla Rushton & Rebekah Ingram (BCWF)	Wetland Rapid Health Assessment - Kyla Rushton (BCWF)	Hunter Siding Project: Site tour, monitoring and maintenance activities - Wendy King (SLSS) & Ryan Durand (EcoLogic)			
1:30pm								
2:00pm								
2:30pm		Travel						
3:00pm		Participant presentations: Group 2						
3:30pm								
4:00pm							travel	Evaluations & wrap up - Thanks for joining!!
4:30pm		dinner	dinner	dinner	check in to accommodations	dinner	Check in to accommodations	
5:00pm								
5:30pm					dinner			
6:00pm		Optional Evening lecture - How to write a successful grant - Neil Fletcher (BCWF)	Optional Evening webinars: 1) A History of Wetland Drainage: How They Pulled the Plug! 2) How to Build Wetlands That Will Last Forever - Tom Biebighauser (Wetland Restoration and Training LLC)	Optional Evening webinar: Camera traps: Setting up for Success- Rae Kokes (WildCAM)	(ZOOM): Yaqan Nukiy Hunting Grounds Ecosystem Restoration Project - Tom Biebighauser (Wetland Restoration and Training LLC)	Optional Evening webinar (ZOOM): Removing Dams and Restoring Entire Valleys containing Wetlands and Streams - Tom Biebighauser (Wetland Restoration and Training LLC)	Dinner (Optional Group Dinner at Flying Steamshovel Pub)	
6:30pm								
7:00pm								
7:30pm								
8:00pm								
8:30pm								

Figure 9: 2022 Wetlands Institute Schedule for participants