
# Identifying Wetlands For Restoration Opportunities: Year 1 Progress Report

PEA-F20-W-2966

This page is intentionally blank.

# Identifying Wetlands For Restoration Opportunities: Year 1 Progress Report

## PEA-F20-W-2966

## Prepared For

Fish and Wildlife Compensation Program

## Prepared By

Arshad Khan, BSc, BIT
Chu Cho Environmental LLP
1940 3rd Avenue | Prince George, BC | V2M 1G7

Jennifer Herkes, M.A.
2 Crow Consulting
Prince George, BC

Sean B. Rapai, MSc, PAg.
Chu Cho Environmental LLP
1940 3rd Avenue | Prince George, BC | V2M 1G7

## Chu Cho Environmental Contact

Arshad Khan
250-617-6046
arshad@chuchoenvironmental.com

1 September 2020

## Recommended Citation

Khan, A., Herkes, J, Rapai, S.B. 2020. Identifying Wetlands For Restoration Opportunities: Year 1 Progress Report: PEA-F20-W-2966.Chu Cho Environmental LLP, Prince George, BC. vii + 45 pp.

# Table of Contents

# List of Figures

# List of Tables

# Executive Summary

This report describes year 1 of a 2-year research and information acquisition project in the Finlay reach of the Williston reservoir. The project was initiated with funding from the Fish and Wildlife Compensation Program.

This project works to identify nearshore wetlands at risk from debris scour and wave action, as well as inland wetlands impacted by industry (forestry, road building, mining) and hydro-related landscape-level disturbances. These cumulative negative effects are threatening the ecological benefits provided by wetlands and the ability of Tsay Keh Dene (TKD) Nation to harvest food and medicine from within wetlands.

The training and education component was conducted over 2 days in June 2019. This was followed by a traditional ecological knowledge (TEK) study, which included interviews with community elders and knowledge holders. This aligns with the FWCP Peace Species of Interest Action Plan, priority action 4a-1. Wetland health assessments were conducted at 15 sites in July 2019.

This project seeks to improve the understanding of the historical distribution of the wetlands within the basin prior to inundation, document the cultural importance of wetlands to TKD Nation, and quantitatively assess the current health of the wetlands. The results of this study will work to identify opportunities for future restoration of nearshore and inland wetlands within the Finlay Reach of the Williston Reservoir.

This project utilized the results of this study, in addition to wetland health assessments, and recommendations from the water license requirements (WLR) trial wetlands monitoring, to identify opportunities for nearshore and inland wetland restoration within the Finlay Reach of the basin. Four sites were found to be good candidates for future restoration potential. Three of these sites will be chosen to develop restoration prescriptions in 2020. This aligns with the riparian and wetlands action plan, priority action 2b-1.

Ultimately, this project will improve TKD Nation’s understanding of the abundance, distribution, and threats posed to wetlands within the Finlay Reach of the reservoir, while also identifying opportunities for wetland conservation and restoration that will enable membership to continue utilizing these wetlands in the future.

# 1 Introduction

Canada has over 1million $km^2$ of wetlands, which provide important ecosystem services and support a wide variety of plant and animal species (Environment and Climate Change Canada 2016). In British Columbia, wetlands provide habitat for a diverse and unique group of plants, over 150 bird species and 50 mammal species, and approximately 20% of wildlife species that are blue- or red-listed in the province. However, wetland systems locally, and within Canada, are facing threats from climate change, land use change and erosion (Darling 2000). The degradation of inland and near shore wetlands within the Finlay Reach of the Williston Reservoir, threatens the ability of TKD membership to harvest food and medicine from these areas. It is understood that significant wetland areas were lost during the flooding of the trench by the W.A.C. Bennet Dam, along with habitat for species that TKD Nation relies upon for food and medicine. In the years following inundation, wave action, fluctuating water levels and log scour have continued to erode sediment and physically damage the remaining nearshore wetlands. In addition to this hydro related erosion, non-hydro-related impacts from industry, such as timber harvesting, road construction, and mining continue to degrade inland wetlands within the basin.

TKD Nation membership has expressed concern regarding both hydro and non-hydro-related threats of the reservoir on wetlands and the species within them. Our project team has conducted a traditional ecological knowledge study. We are in the process of verifying the results, in order to document the extent of the wetlands lost during reservoir inundation, and the impact this wetland loss has had TKD Nations ability to harvest food and medicine from within these areas. The current study is working closely with TKD Nation elders and knowledge holders to identify opportunities for wetland restoration within the Finlay Reach of the Williston Reservoir that aligns with the cultural values, and food and medicinal requirements of TKD Nation.

# 2 Project Goals, Objectives and Action Plans

The goals of this project are to:

- Improve the understanding of the historical distribution of wetlands prior to inundation,
- Document the cultural importance of wetlands to TKD Nation, and
- Quantitatively assess the health of select wetlands within the Finlay reach.

The primary Peace Action Plan that aligns most closely with this project was the Species of Interest Action Plan, and the priority action (4a-1) was to conduct a TEK study.

The secondary Peace Action Plan that aligns most closely with this project was the Riparian and Wetlands Action Plan, and the priority action (2b-1) was to leverage the WLR trial wetland program to create habitat.

To achieve these goals, the specific objectives of the project were to:

- Conduct a traditional ecological knowledge (TEK) study
- Conduct a wetland health assessment workshop in Tsay Keh Dene
- Assess the health of select wetlands within the Finlay reach, using the rapid health assessment tools provided in the wetland workshop
-

# 3 Study Area

The Williston Reservoir is located in the northern interior of British Columbia. It was created in 1968 by the construction of the W.A.C. Bennet Dam on the Peace River. The reservoir is approximately 250 km long and is bounded by the Finlay River to the north, and the Parsnip River to the south. The reservoir is divided into the Finlay, Parsnip, and Peace reaches (ILEC 2019). This project was conducted within the Finlay reach, extending south from Tsay Keh Dene, to the Omineca and Ospika rivers. Figure 1 shows the locations of sites visited for health assessments in the Finlay reach of the Williston Reservoir.

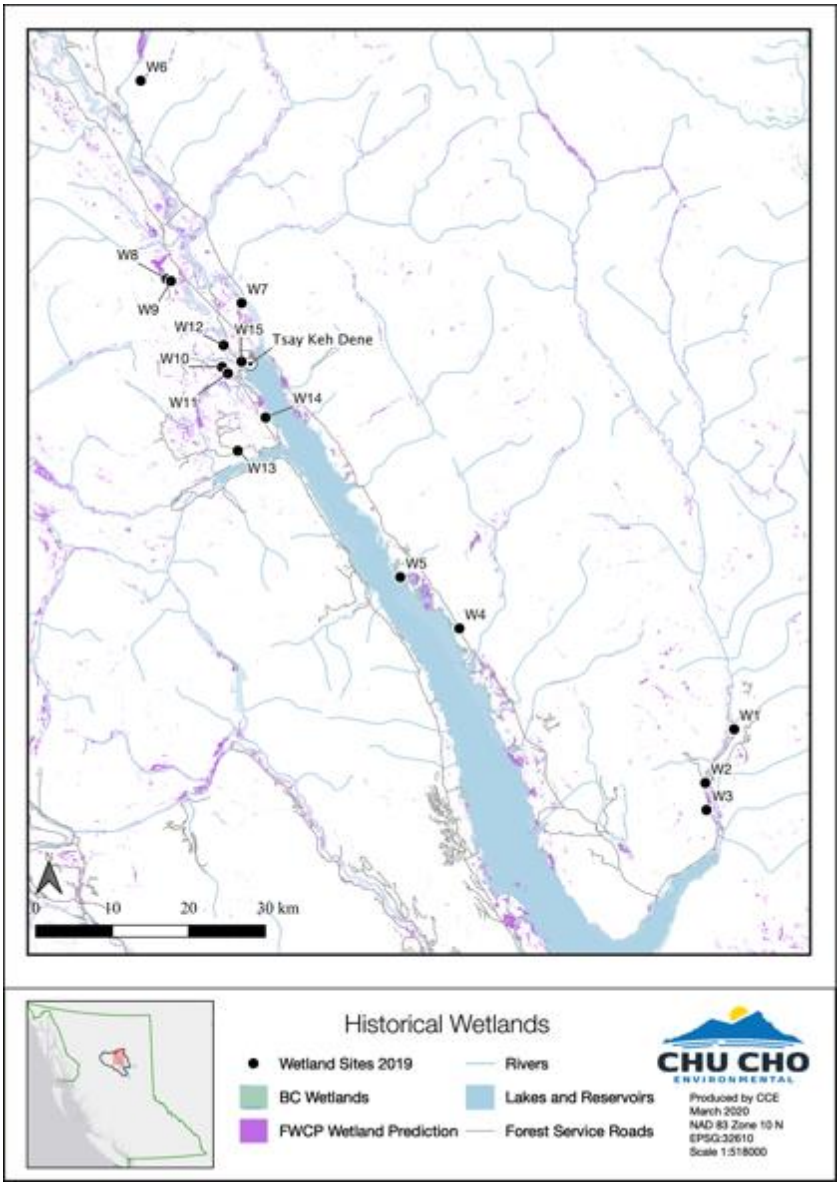



Figure 1. Location of wetland assessments conducted in the Finlay Reach in June 2019

# 4 Methods

The project began with a two-day course led by the British Columbia Wildlife Federation (BCWF). Participants learned about wetland classification, wetland health, as well as the different options for wetland rehabilitation. The training course was followed by traditional knowledge interviews with community elders and knowledge keepers, and finally rapid wetland health assessments were conducted in the Finlay reach, by CCE staff.

## 4.1 Wetland Health Assessment Training

The BCWF conducted a 2-day wetland health assessment training workshop in Tsay Keh Dene, in June 2019. This workshop was attended by community members, elders, and staff from Chu Cho Environmental (CCE), TKD Lands, Resources and Treaty Operations (LRTO), and Chu Cho Industries (CCI). Table 1 summarizes the list of participants who attended the training workshop. Participants learned about wetland classification, soils, vegetation communities and vegetation identification, and how to conduct rapid wetland health assessments using a modified version of the Alberta Lentic Wetland Health Assessment form (Appendix 1) and accompanying foliage cover (Appendix 2) and vegetation distribution guides (Appendix 3).

Table 1. Wetland health assessment training workshop participants

| Name | Organization |
|---|---|
| Arshad Khan | CCE |
| Stephen Friesen | CCE |
| Sean Rapai | CCE |
| Jennifer Herkes | 2 Crow Consulting |
| Jon Kostyshyn | CCI |
| Daniel Pierre | CCI |
| Sina Abad | TKD LRTO |
| Rita Poole | TKD Nation |
| Vera Poole | TKD Nation |
| Jean Issac | TKD Nation |

The purpose of the training was to teach the attendees how to rapidly assess wetland health. These quick surveys were intended to get an overall picture of wetland health at the sites assessed. Ten health parameters were considered, and the assessments were based on ocular measurements. Since the purpose of these surveys was not to classify the wetlands, or determine the causes of degradation, precise measurements were not required at this stage. The parameters measured included vegetation factors, hydrology factors, and human caused alterations. The wetland health assessment training course included visiting 3 wetlands that were identified as degraded by the community participants. These sites were later visited by the CCE crew conducting rapid health assessments, and are identified as sites, W5, W7, and W14 (Figure 1 & Table 4).

Section 4.3 provides details about the field assessments conducted by CCE staff, following the training workshop. The accompanying Alberta Lentic Wetland Health Assessment User Manual (2018) was used as reference. During the field component of the training course, participants filled out rapid health survey questionnaires and were able to compare results with each other. While there were variations amongst the estimations between different participants, overall health scores were found to be consistent for the same site. While soils were not a consideration for the rapid health surveys, during the field component of the workshop, participants were briefly introduced to the methods used to collect a soil sample and the basic interpretation of soil layers.

The BC Forest and Range evaluation program (FREP) also has a wetland health assessment form, called the Wetland Management Routine Effectiveness Evaluation, however, this form was considered too detailed for the purpose of conducting rapid health assessments.

Figure 2 shows participants learning about wetland health in the classroom, and Figure 3 shows workshop participants learning how to conduct rapid wetland health assessments in the field

Figure 2. Classroom component of the wetland health assessment workshop.

Figure 3. Field component of the wetland health assessment training workshop in Tsay Keh Dene, June 2019.

## 4.2 Traditional Ecological Knowledge (TEK) Study

In this component of the project, one on one semi-structured interviews were conducted with community elders and knowledge keepers, and included a mapping component. The interviews were conducted by Jennifer Herkes, an experienced TEK researcher, and Interview questions were developed after reviewing previously recorded information, reviewing the goals and intentions of the project, and collaborating with the TKD Nation LRTO department.

The project began with participation in a two-day course led by the BCWF who taught community members as well as researchers about the different kinds of wetlands, wetland health, as well as the different options for wetland rehabilitation or development.

During site visits, community participants, including elders, shared stories and knowledge about wetland health as well as cultural resources typically sought in these areas. Citizens who participated in the site visits included: Rita Poole, Vera Poole, and Jean Isaac. The field visits included three Tsay Keh Dene citizens and elders who helped to identify the wetlands that should be visited. During our visits, the elders shared stories and knowledge about the importance of wetland health. The opportunity to be on the land,

visiting the wetlands allowed for natural story-telling and descriptions of how the wetlands used to look, what kind of resources had been available, and how things have changed.

After the course, researchers interviewed elders, some of whom had participated in the BCWF training. Questionnaires were created with open-ended questions intended to open discussion (Table 2). The intention was to allow for natural conversation where people can share their experiences, thoughts, and opinions. Open-ended questions allowed for more nuanced answers than questions that allowed for a yes/no answer. The participation in the BCWF training provided some of the respondents with an increased knowledge and understanding of how wetland health is identified scientifically, as well as the different methods of restoring and rehabilitating wetlands. It is understood that participation in the training will affect responses to the questions.

Seven interviews were conducted with elders in Tsay Keh Dene on June 5 and 6, 2019. One interview was conducted in Prince George on July 16, 2019. The number of interviews were based on two factors. One was the availability of knowledge holders, the other was saturation. In qualitative research, saturation is considered to be reached when you no longer receive new answers to the questions. Several knowledge holders were away in the field which restricted the number of participants. It is felt that saturation on the topic was reached; however, there is a substantial gender bias in that 7 out of 8 participants were female. The information gathered from the male participant did not contradict any information provided by the other participants but it is important to note that the information collected may reflect a bias. The following is a list of TKD elder who were interviewed as part of this study: Ray Izony, Jean Chalifoux, Jean Isaac, Vera Poole, Sarah Pierre, Helen Poole, Elsie Pierre, and Mabel Troendel.

Background research included reviewing archival and historic Tsay Keh documents related to wetlands. Also, preliminary research was completed to identify the existence and location of historic mapping of the Finlay Reach, prior to the creation of the reservoir, to help quantify the loss of wetlands due to the inundation of the reservoir. Interview participants were asked to show us locations on the map where they had knowledge of wetlands that are degraded or lost. The areas noted on the paper map were digitized in ArcGIS to allow for spatial analysis. Figure 4 shows areas identified by interview participants as degraded or lost wetlands.

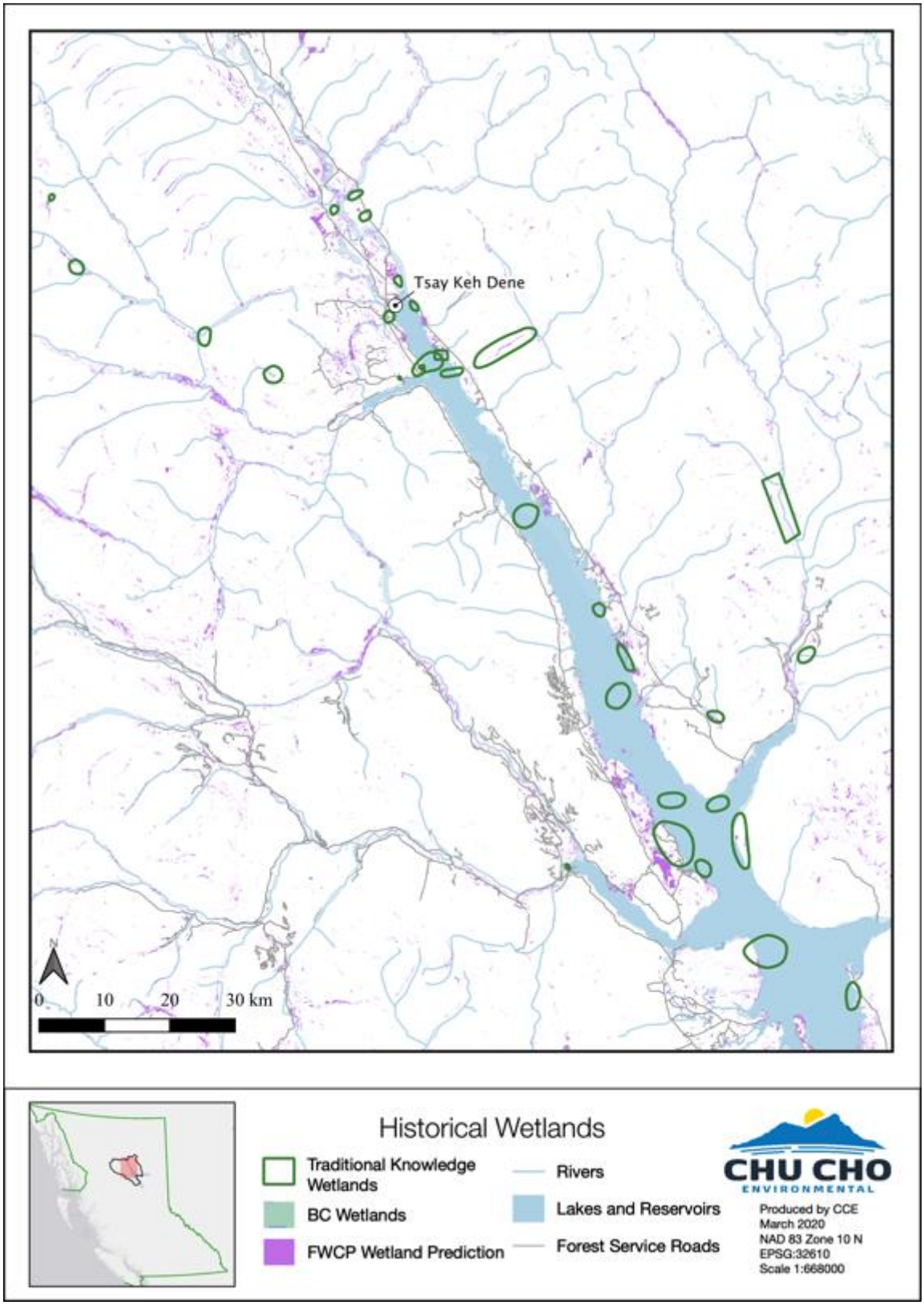



Figure 4. Areas identified as degraded wetlands during traditional knowledge interviews

The interviews were recorded, if permission was given, and transcribed verbatim. If an interview was not recorded, then clear notes were taken instead. The interview transcripts and notes were analysed using thematic analysis. This involved a thorough read-through of all of the interviews, looking for key words or thoughts that seemed to occur repeatedly in the documents. Key words/thoughts were reviewed and categorized into themes. Themes were usually subjective to the researcher and were guided by the intention of the research project. The transcripts were then coded for the themes. This allowed for a quantitative assessment of themes to some extent (i.e 7 out of 10 people mentioned the same thing), but also a clear understanding of the connection of the themes. This type of analysis, while guided by the research question, is strongly informed by the information provided by the knowledge holders. Table 2 includes a list of questions asked during the TEK interviews.

Table 2. List of TEK interview questions

1. Can you tell me why you think wetlands are important? What makes wetlands special?
2. Are there signs that tell us when a wetland is healthy? Or unhealthy?
3. Are there specific animals you expect to see in wetlands?
4. Are there any specific plants that you would go to a wetland to collect?
5. Can you tell me how wetlands have been impacted within the territory?
   - Causes (reservoir, logging, roads, mining, etc.)
   - Locations (map)
   - To what extent? How many?
6. Can you think of any other places where there used to be wetlands, and now they are gone?
   - Locations (map)
   - Reasons?
7. Have these changes to wetlands affected how Tsay Keh Dene hunt or harvest?
8. Are there any places you would suggest to restore wetlands?
   - Locations (map)
   - Reasons? Why those places?

## 4.3 Wetland Health Assessments

In July 2019 CCE staff visited 15 sites, based on information provided during the TEK study, along with satellite imagery and the FWCP wetland prediction layer. Table 4 summarizes the locations of wetlands within the Finlay reach, visited for rapid health assessments, and Figure 1 provides an overview of the site locations in relation to Tsay Keh Dene.

Rapid health assessments were completed at these sites, along with brief site descriptions and photographs. A drone was used to gather aerial photographs as well as assist with ocular estimations of vegetative cover. An effort was made to visit specific areas identified during the TEK study, while also ensuring that sites were sampled on both the east and west side of the reservoir, as well as around the community of Tsay Keh Dene. Keeping in mind the eventual goal of wetland restoration, sites that were closer to Tsay Keh Dene, and easy to access by road were prioritized, since any future restoration work would require easy site access as well.

Wetlands were scored on vegetation factors, and soil/hydrology factors.

The vegetation factors included:

- vegetation cover of the polygon
- invasive species presence (percent cover, density and distribution patterns)
- presence of undesirable herbaceous species
- the establishment and regeneration of preferred trees and shrubs
- the presence and utilization (browsing by wildlife and use by humans) of live trees and shrubs
- human alteration of the vegetation community

The soil and hydrology factors included:

- human alteration of the site (percent of polygon altered by human use and the severity of the alteration)
- human-caused bare ground
- the severity of human caused hydrological changes

The scores were totalled and the total expressed as a percentage, which provided the health rating for the wetland. One additional question, regarding the stability of any existing overflow structure, such as a culvert, was added to the field form by the BCWF (Appendix 1). This question was only considered if such a structure was observed in the wetland being assessed (sites W1 and W9). These scores give a general overview of the wetland's current health. Non-functional wetlands could take priority when it comes time to draft restoration prescriptions, however wetlands in the functional at-risk category will also be considered. The scoring, along with input from TKD Nation members will be taken into consideration when choosing sites for developing future restoration prescriptions. Table 3 summarizes the three rating categories for wetland health.

Table 3. Wetland health rating categories

| Health Rating (%) | Definition |
|---|---|
| 80-100% | proper functioning condition (healthy) |
| 60-79% | functional at risk (healthy but with problems) |

| | |
|---|---|
| < 60% | non-functional (unhealthy) |

Table 4. Wetland Health Assessment Sites in the Finlay Reach of Williston Reservoir

| Site ID | Latitude (N) | Longitude (W) |
|---|---|---|
| W1 | 56.46584° | – 123.92028° |
| W2 | 56.40236° | – 123.97978° |
| W3 | 56.37060° | – 123.97663° |
| W4 | 56.57859° | – 124.50780° |
| W5 | 56.63726° | – 124.63607° |
| W6 | 57.21172° | – 125.22338° |
| W7 | 56.95430° | – 124.99093° |
| W8 | 56.97969° | – 125.15358° |
| W9 | 56.97753° | – 125.14437° |
| W10 | 56.87838° | – 125.02878° |
| W11 | 56.87112° | – 125.01598° |
| W12 | 56.90407° | – 125.02704° |
| W13 | 56.78064° | – 124.99008° |
| W14 | 56.82069° | – 124.93250° |
| W15 | 56.88545° | – 124.98753° |

Final site selection will be made using the results of the rapid health assessments, as well as input from TKD Nation community members. Any future industrial work being planned around these sites will also feed into the decision-making process. Input from community members with regards to the scale of restoration work, and intended outcomes of any restoration, will be important in the final choice of sites and the prescription development.

# 5 Results

## 5.1 TEK Study

The results of the TEK study are in the process of being validated. We will be presenting the results to the community, and having conversations with the original interview respondents to see if they agree with the results of the TEK study. We are working closely with the participants, and TKD Nation LRTO, to ensure how best to share this information in the year 2 report.

## 5.2 Wetland Health Assessments

A total of 15 sites were assessed. Site W6 was later found to be outside Tsay Keh Dene territory, and site W12 was found to be within a provincial park boundary. These sites, while summarized in this report, were therefore not considered to have good restoration potential.

Wildlife and wildlife signs observed included insects, waterfowl, mammals, and amphibians. Invasive species were observed at some of the wetlands, and could have potential management concerns for any future restoration work.

Disturbance-increaser undesirable species can be native or exotic species, which indicate a change from natural riparian plant communities. They are usually shallow rooted and do not perform most functions of riparian plant species (Alberta Lentic Wetland Health Assessment User Manual, 2018). Undesirable species observed during the wetland health assessments were Foxtail barley (*Hordeum jubatum*) and strawberries (*Fragaria* sp.).

The results of the rapid wetland health assessments are summarized in Table 5.

Table 5. Summary of the rapid wetland health assessment results

| Site | Overall Rating % | Description | Vegetation Rating % | Soil/Hydrology Rating % | Date Surveyed |
|---|---|---|---|---|---|
| W1 | 71 | Functional at risk (healthy but with problems) | 61 | 81 | July 4 |
| W2 | 70 | Functional at risk (healthy but with problems) | 48 | 93 | July 4 |
| W3 | 83 | Proper functioning condition (healthy) | 67 | 100 | July 4 |
| W4 | 76 | Functional at risk (healthy but with problems) | 55 | 100 | July 5 |
| W5 | 51 | Non-functional (unhealthy) | 48 | 53 | July 5 |
| W6 | 92 | Proper functioning condition (healthy) | 85 | 100 | July 5 |
| W7 | 78 | functional at risk (healthy but with problems) | 58 | 100 | July 6 |
| W8 | 97 | Proper functioning condition (healthy) | 94 | 100 | July 6 |
| W9 | 64 | functional at risk (healthy but with problems) | 82 | 47 | July 6 |

| | | | | | |
|---|---|---|---|---|---|
| W10 | 87 | Proper functioning condition (healthy) | 94 | 80 | July 6 |
| W11 | 95 | Proper functioning condition (healthy) | 91 | 100 | July 6 |
| W12 | 90 | Proper functioning condition (healthy) | 82 | 100 | July 7 |
| W13 | 84 | Proper functioning condition (healthy) | 70 | 100 | July 7 |
| W14 | 48 | Non-functional (unhealthy) | 55 | 40 | July 7 |
| W15 | 81 | Proper functioning condition (healthy) | 64 | 100 | July 7 |

* Rating categories: **80-100%** = proper functioning (healthy), **60-79%** = functional at risk (healthy but with problems), **<60%** = non-functional (unhealthy).

### 5.2.1 Site W1

**Location:** Ospika FSR

**Overall Rating:** 71%

**Site comments:** The site was observed to have black spruce (*Picea mariana*) interspersed with wet inundated areas and a small channel of running water. Common sundew (*Drosera rotundifolia*), a carnivorous wetland plant was abundant. (Figure 6). Other plant species observed were Labrador tea (*Rhododendron groenlandicum*), horsetails (*Equisetum* sp.), and willow (*Salix* sp.). Very little emergent vegetation was present. A blocked culvert, likely due to improper road maintenance and ditch cleaning was also present at the road (Figure 7). A wading bird believed to belong to the family Scolopacidae (sandpipers) was observed at this site. Very little emergent vegetation was observed at this site. In areas without standing water present, the ground was observed to be very wet indicating the presence of water in the soils.

Figure 5. Aerial view of assessment site W1

Figure 6. Common sundew *Drosera rotundifolia* abundant at site W1

Figure 7. Blocked culvert at site W1

### 5.2.2 Site W2

**Location:** Ospika FSR - Discovery Camp

**Overall Rating:** 70%

**Site comments:** This site is located a short walk from Discovery Camp, an outdoor camp for TKD youth. A beaver dam was present as well as a beaver lodge. Numerous tadpoles of an unidentified species were observed in the water (Figure 9). Moose (*Alces alces*) tracks were present along with signs of browsing. Numerous damselflies were observed, and the development of damselfly larva is dependent on wetland habitat. A yellow-rumped warbler (*Setophaga coronata*) was also observed Sedges were the dominant emergent vegetation present. Willow (*Salix* sp.) along the wetland borders showed signs of browsing.

Figure 8. Aerial view of site W2 near Discovery Camp

Figure 9. Tadpoles at site W2

### 5.2.3 Site W3

**Location:** Ospika FSR (west side)

**Overall Rating:** 83%

**Site Comments:** This site is a small wetland on the west side of the Ospika FSR. Dead spruce (*Picea* sp.) were observed. Sedges were the dominant emergent vegetation present. Other vegetation observed included willow (*Salix* sp.) A beaver lodge was present but appeared to be old and not in use.

Figure 10. Aerial view of site W3

Figure 11. Site W3 beside Ospika FSR

### 5.2.4 Site W4

**Location:** Davis FSR 49 km

**Overall Rating:** 76%

**Site Comments:** This site along the Davis FSR appears to have been inundated due to a beaver dam. Dead trees were observed standing in the inundated area. Browsed willow (*Salix* sp.) and moose droppings were observed. Dragonflies were present. Creeping buttercup (*Ranunculus repens*), an invasive species was also noted at this site. Other plant species observed were raspberry (*Rubus* sp.) and red currant (*Ribes* sp.), both of which are edible.

Figure 12. Aerial view of site W4 beside the Davis FSR, with Williston Reservoir in the background

### 5.2.5 Site W5

**Location:** Middle Creek

**Overall Rating:** 51%

**Site Comments:** This site shows major degradation, where the creek has headcut, causing the wetland to dry out. A headcut is an erosional feature caused by a sudden drop in the streambed. Headcuts can move upstream, as in the case of this site, and cause a channel incision, which is the overall lowering of channel bed, which in turn leads to the stream falling below its floodplain, and the subsequent drying of associated wetlands.

Invasive creeping buttercup (*Ranunculus repens*), and disturbance indicator foxtail barley (*Hordeum jubatum*) were observed at this site.Wood frogs (*Lithobates sylvaticus*) were seen during the assessment, as well as grizzly bear (*Ursus arctos horribilis*) tracks. There was no standing water or emergent vegetation present, due to the channel incision.

Figure 13. Aerial view of the degraded wetland at Middle Creek showing channel incision

Figure 14. Deep channel created by the headcut at Middle Creek leading to drying of the wetland

### 5.2.6 Site W6

**Location:** Akie Mainline

**Overall Rating:** 92%

**Site Comments:** This wetland was observed to have a mix of lentic (still) and lotic (flowing) systems. Sedges and horsetails (*Equisetum* sp.) were the dominant emergent vegetation present. Willow (*Salix* sp.) was present but no browsing indicators were observed. Creeping buttercup (*Ranunculus repens*), an invasive species was present. One unidentified fish was observed by the crew. This wetland was later found to be outside TKD Nation territory, and will not be considered as having restoration potential for the purpose of this project.

Figure 15. Aerial view of the wetland north of the Akie mainline

### 5.2.7 Site W7

**Location:** Finlay FSR 20km

**Overall Rating:** 78%

**Site Comments:** This site was entirely dry and covered by grasses, except for a few small microsites with bare soil and limited vegetation cover. The boundary of the site was well established with willow (*Salix* sp.), alder (*Alnus rubra*), spruce (*Picea* sp.), and aspen (*Populus tremuloides*). Numerous wood frogs (*Lithobates sylvaticus*) were observed, as well as unidentified ungulate droppings and bear scat. Songbirds were heard but not identified.

According to local knowledge this area used to be wet in the past but has been dry for a number of years.

Figure 16. Aerial view of site W7 near the bridge at Deserters Canyon

Figure 17. Grasses are the dominant vegetation at site W7

Figure 18. Wood frog (*Lithobates sylvaticus*) at site W7

### 5.2.8 Site W8

**Location:** 10,000 Rd (North side)

**Overall Rating:** 97%

**Site comments:** This site was accessed by an old trail through a plantation on the north side of site W9 on the 10,000 Rd, which is accessed via the Russell FSR at 10km. Wood frogs (*Lithobates sylvaticus*) and numerous unidentified butterflies were observed. The site was wet throughout; even in areas appearing dry the soil was inundated. Black spruce (*Picea mariana*), alder (*Alnus rubra*), and willow (*Salix* sp.) were present at this site. No invasive species were observed.

Figure 19. Aerial view of site W8

Figure 20. Inundated area in site W8

### 5.2.9 Site W9

**Location:** 10,000 Rd (South side)

**Overall Rating:** 64%

**Site Comments:** This site appears to have been inundated at one time but was dry at the time of the health assessment. Two culverts were observed at the road, one was mostly buried and the other was perched. Very little water or emergent vegetation was present, and was confined to the area near the culverts. Sedges were the dominant emergent vegetation observed. Some of the dead standing trees showed evidence of past fire. Across the road was a damp area with an abundance of black spruce (*Picea mariana*), which prefers wet sites. It was theorized that improper culvert placement could be responsible for the lack of water and emergent vegetation at this site.

Figure 21. Aerial view of side W9 (foreground) and W9 (background)

Figure 22. Culverts at site W9. Left culvert is perched high, right culvert is buried

### 5.2.10 Site W10

**Location:** Pelly FSR

**Overall Rating:** 87%

**Site Comments:** This site appeared dry and mossy but was actually wet, and in areas fairly deep, with a moss layer covering the water. Emergent vegetation (sedges) was plentiful, along with black spruce (*Picea mariana*) and alder (*Alnus rubra*). Dominant shrub cover was observed.

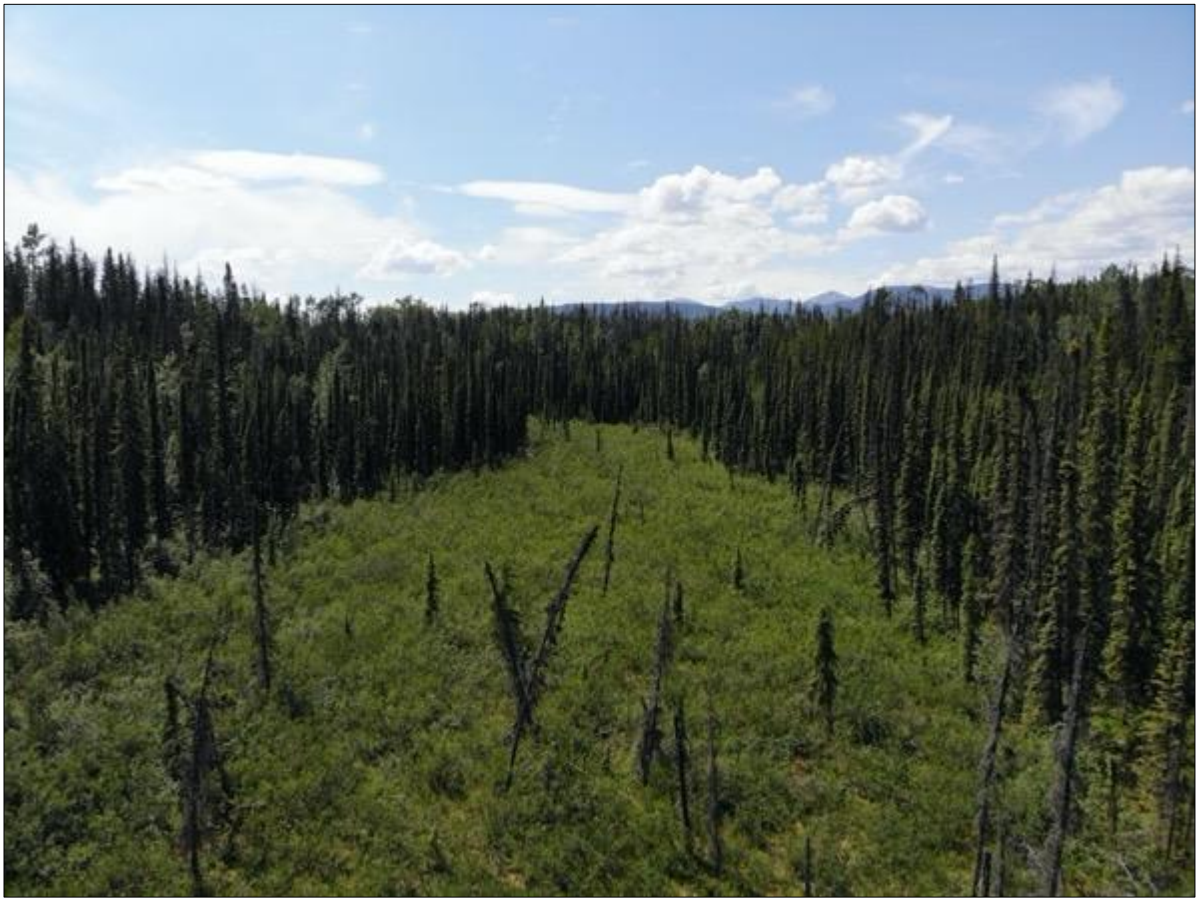


Figure 23. Site W10 appears dry, however the site is wet

### 5.2.11 Site W11

**Location:** Pelly FSR

**Overall Rating:** 95%

**Site Comments:** This site on the west side of the Pelly FSR has a low amount of water and dead trees scattered throughout. Emergent vegetation is mainly grass and rushes. The presence of dried brown grasses suggests the site once had more water but has dried out. Soapberry (*Shepherdia canadensis*) was observed at this site.

Figure 24. Aerial view of site W11 on the Pelly FSR

### 5.2.12 Site W12

**Location:** Pelly FSR

**Overall Rating:** 90%

**Site Comments:** This site was wet at the time of assessment, and fringed with black spruce (*Picea mariana*). Small stunted spruce was also observed growing on raised microsites. Vegetation observed was willow (*Salix* sp.), soapberry (*Shepherdia canadensis*) and trappers tea (*Rhododendron groenlandicum*). Moose (*Alces alces*) tracks were observed and wood frogs (*Lithobates sylvaticus*) were present at this site during the assessment.

Figure 25. View of site W12

Figure 26. Emergent vegetation at site W12

### 5.2.13 Site W13

**Location:** Isola FSR

**Overall Rating:** 84%

**Site Comments:** This site is on the south side of the Isola FSR. Sedges were the dominant emergent vegetation. Black spruce (*Picea* mariana) and alder (*Alnus rubra*) were present. Trappers tea (*Rhododendron groenlandicum*) and soapberry (*Shepherdia canadensis*) were observed. Unidentified waterfowl were present during the assessment, and dragonflies were also observed.

Figure 27. Aerial view of site W13 beside the Isola FSR

### 5.2.14 Site W14

**Location:** Rat Lake - near old Ingenika village

**Overall Rating:** 48%

**Site Comments:** This site was once used as a horse pasture and reed canary grass (*Phalaris arundinacea*) was grown for forage. The site is no longer used as a pasture and the reed canary grass has dominated the area. It is considered an alien exotic species in British Columbia, i.e. a species which has moved outside its natural range often due to anthropogenic activity (Klinkenberg 2019). At this site it has dominated over other species to establish itself. Other invasive species observed were creeping buttercup (*Ranunculus repens*) and oxeye daisy (*Leucanthemum vulgare*).

Local knowledge has also indicated that in the past a ditch was dug from Rat Lake to bring water to Ingenika village. Wild mint (*Mentha arvensis*) was noted at the site during the assessment, and is collected by TKD citizens from this area. Older and newer beaver dams were present. Bear scat was observed along with moose (*Alces alces*) droppings and a cow moose was observed. Wood frogs (*Lithobates sylvaticus*) and western toads (*Anaxyrus boreas*) were observed during the assessment, as well as unidentified dragonflies and butterflies.

Figure 28. Aerial view of site W14 showing Rat Lake in the background

Figure 29. Oxeye daisy (*Leucanthemum vulgare*), creeping buttercup (*Ranunculus repens*) and reed canary grass (*Phalaris arundinacea*) at site W14

Figure 30. Old pasture dominated by reed canary grass (*Phalaris arundinacea*) at site W14

### 5.2.15 W15

**Location:** Hydro Creek

**Overall Rating:** 81%

**Site Comments:** At site W15 a large wetland was observed along with a beaver dam and lodge. The creek flowing out of the wetland eventually flows into the Williston reservoir. Sedges were the dominant emergent vegetation observed. Black spruce (*Picea mariana*), alder (*Alnus rubra*), and willow (*Salix* sp.) were present on the wetland edge. Willow browse was not observed. Unidentified fish, waterfowl and dragonflies were observed during the assessment.

Figure 31. Aerial view of site W15

Figure 32. Beaver dam at site W15

# 6 Discussion and Recommendations

Based on the rapid wetland health assessments conducted by Chu Cho Environmental in July 2019, 2 sites are considered to be non-functional (poor health), 5 sites are considered functionally at risk (healthy but with problems), and 8 sites are considered functionally healthy. These sites are summarized in Table 5. Our intention in 2020 is to develop restoration prescriptions for 3 of the 15 sites for which health assessments were conducted. The 2 non-functional sites W5, and W14 are considered good candidates for restoration potential based on their poor health rating, easy access for restoration work, and interest from the community for restoration work. Of the sites considered to be healthy but with some problems, site W7 and W9 are considered good candidates for restoration potential, based on easy access for restoration work and input from TKD citizens. The selection of one of these sites is ongoing, and will involve community engagement before a final decision is made.

These restoration prescriptions will be developed in conjunction with wetland restoration specialists. The intent is to identify sites that are able to be restored in a cost-effective manner, improving the ecological functioning of the wetlands, enhancing wildlife and plant habitat, and providing resources to TKD citizenship. Funding for year 2 has been conditionally granted (PEA-F21-W-3179).

The WLR trial wetlands project, which is conducting long-term monitoring to study the effectiveness of wetland enhancements on plant and animal habitat, is now in its 8th year, and while final results from the project are not yet available, indications are that there has been very good occurrence data to date, with multiple plant and animal species identified over many years, in the study areas. In the case of plant species, there is indication that while species composition of plant communities has remained stable, the use of habitat has altered as new habitat is made available. In 2018 most of the expected bird species were observed at the trial wetlands and continued use of enhanced habitat is expected by migrating birds. Also, in 2018 all indicator species of fish were present during surveys and species composition appears to be stable over the study period. Overall indications are that plant and animal communities are using the enhanced wetland habitats (d' Entremont et. al. 2019). The monitoring methods developed for the WLR trial wetlands project could be reproduced for assessing the efficacy of any future wetland restoration work in the Finlay reach.

Clearly, TKD Nation membership is invested in ensuring that wetlands within their territory remain healthy and provide necessary ecosystem services for the future needs of their members. There was positive reaction from TKD citizens, during community engagement, to the opportunities for restoration, especially in terms of the benefits to wildlife. However, there was emphasis on restoration by supporting natural processes rather than intensive restoration activities. Furthermore, there was reference to working towards decreasing the developments that are impacting wetlands. Most of the TEK interview respondents felt that restoration of wetlands would be positive opportunities as the restoration could work to bring back the wildlife that has been noted to be depleting in the territory.

# 7 Acknowledgements

This project was managed and delivered with financial support from the Fish and Wildlife Compensation Program. www.fwcp.ca. The wetland health assessment workshop was conducted by Neil Fletcher and Alana Higginson from the BC Wildlife Federation. www.bcwf.bc.ca. This project was supported by Tsay Keh Dene Lands Resources and Treaty Operations (LRTO). We would like to thank Luke Gleeson, Sina Abad, Nicole Wheele from LRTO. Additionally, we would like to thank the following elder participants who contributed to the traditional knowledge interviews, and took part in the wetland health assessment course: Sarah Pierre, Elsie Pierre, Jean Isaac, Mabel Troendel, Ray Izony, Rita Poole, Vera Poole, and Jean Chalifoux.

# 8 References

Alberta Lentic Wetland Health Assessment User Manual. 2018. http://cowsandfish.org/riparian/documents/ALBLenticSurveyManual_001.pdf

Darling, L. M. editor. 2000. Proceedings of a Conference on the Biology and Management of Species and Habitats at Risk, Kamloops, B.C., 15 - 19 Feb.,1999. Volume Two. B.C. Ministry of Environment, Lands and Parks, Victoria, B.C. and University College of the Cariboo, Kamloops, B.C. 520pp.

Davis, A. 2008. *Sekani Ethnobotany: Traditional Role of Plants Amongst the Sekani People*. Tsay Tay Forestry Ltd: Victoria, BC.

d' Entremont, M.V., N. Hentze, I. Beveridge and L. Ferreria. 2019. GMSMON-15: Williston Reservoir Wetland Habitat Monitoring. Year 8 Annual Report – _2018. LGL Report EA3901. Unpublished report by LGL Limited environmental research associates, Sidney, B.C for BC Hydro Generations, Water License Requirements, Burnaby, B.C. 55 pp + Appendices.

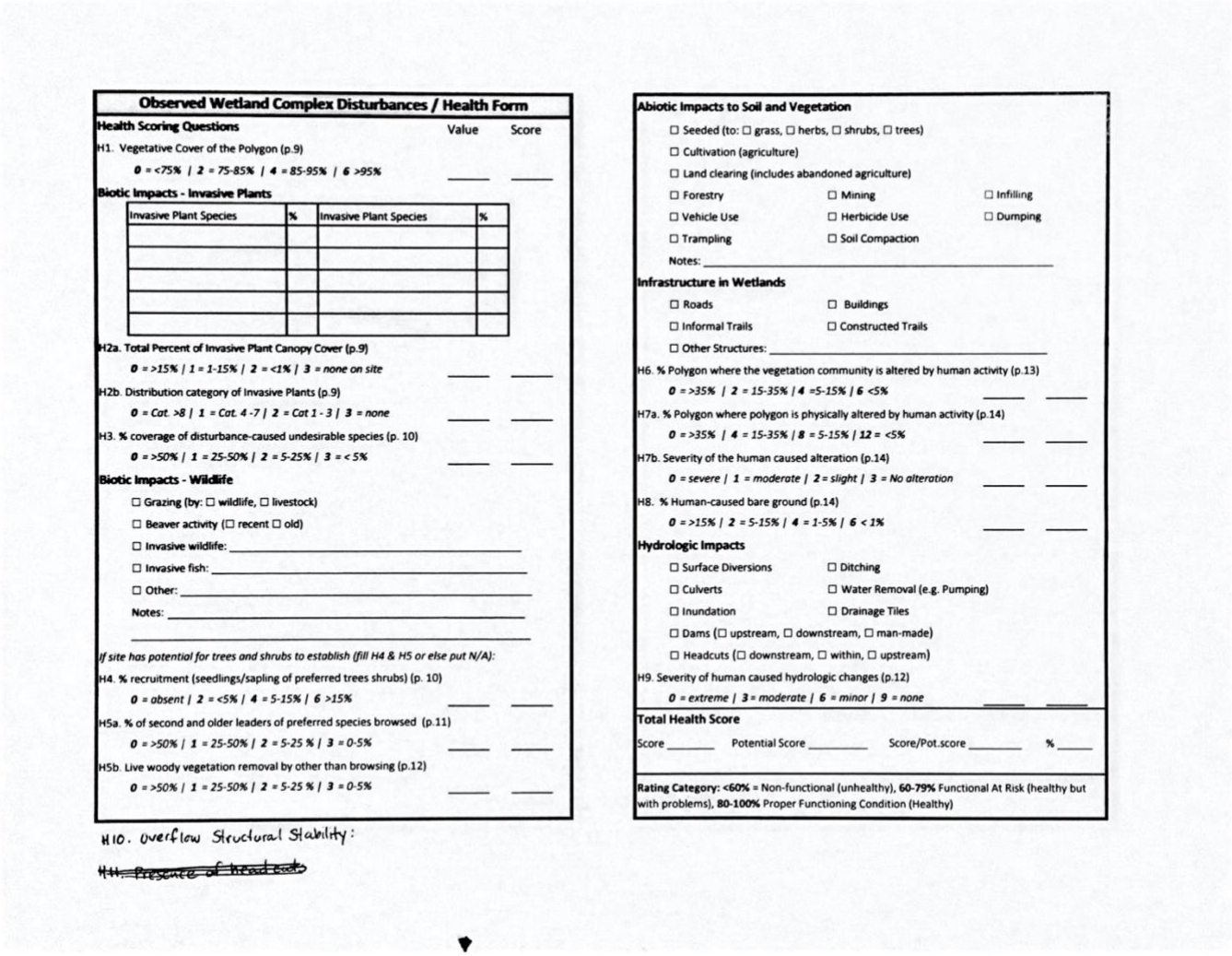
Environment and Climate Change Canada (2016) Canadian Environmental Sustainability Indicators: Extent of Canada's Wetlands. Consulted on *November 1, 2019*. Available at: https://www.canada.ca/content/dam/eccc/migration/main/indicateurs-indicators/69e2d25b-52a2-451e-ad87-257fb13711b9/4.0.b-20wetlands_en.pdf

ILEC 2019. International Lake Environment Committee, World Lake Database, 2019. Williston Lake NAM-29. Accessed November 29 2019 (http://wldb.ilec.or.jp/Details/Lake/NAM-29)

Klinkenberg, Brian. (Editor) 2019. E-Flora BC: Electronic Atlas of the Plants of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver. [Accessed: 29/12/2019 11:49:55 PM ] http://linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Phalaris%20arundinacea

# 9 Appendices

## 9.1 Appendix 1 Wetland Health Assessment Form



**Observed Wetland Complex Disturbances / Health Form**

**Health Scoring Questions** Value Score

H1. Vegetative Cover of the Polygon (p.9)

*0 = <75% | 2 = 75-85% | 4 = 85-95% | 6 >95%* _____ _____

**Biotic Impacts - Invasive Plants**

| Invasive Plant Species | % | Invasive Plant Species | % |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

H2a. Total Percent of Invasive Plant Canopy Cover (p.9)

*0 = >15% | 1 = 1-15% | 2 = <1% | 3 = none on site* _____ _____

H2b. Distribution category of Invasive Plants (p.9)

*0 = Cat. >8 | 1 = Cat. 4 -7 | 2 = Cat 1 - 3 | 3 = none* _____ _____

H3. % coverage of disturbance-caused undesirable species (p. 10)

*0 = >50% | 1 = 25-50% | 2 = 5-25% | 3 = < 5%* _____ _____

**Biotic Impacts - Wildlife**

☐ Grazing (by: ☐ wildlife, ☐ livestock)

☐ Beaver activity (☐ recent ☐ old)

☐ Invasive wildlife: _____

☐ Invasive fish: _____

☐ Other: _____

Notes: _____

_____

*If site has potential for trees and shrubs to establish (fill H4 & H5 or else put N/A):*

H4. % recruitment (seedlings/sapling of preferred trees shrubs) (p. 10)

*0 = absent | 2 = <5% | 4 = 5-15% | 6 >15%* _____ _____

H5a. % of second and older leaders of preferred species browsed (p.11)

*0 = >50% | 1 = 25-50% | 2 = 5-25 % | 3 = 0-5%* _____ _____

H5b. Live woody vegetation removal by other than browsing (p.12)

*0 = >50% | 1 = 25-50% | 2 = 5-25 % | 3 = 0-5%* _____ _____

H10. Overflow Structural Stability:

~~H11. Presence of Headcuts~~

**Abiotic Impacts to Soil and Vegetation**

☐ Seeded (to: ☐ grass, ☐ herbs, ☐ shrubs, ☐ trees)

☐ Cultivation (agriculture)

☐ Land clearing (includes abandoned agriculture)

☐ Forestry ☐ Mining ☐ Infilling

☐ Vehicle Use ☐ Herbicide Use ☐ Dumping

☐ Trampling ☐ Soil Compaction

Notes: _____

**Infrastructure in Wetlands**

☐ Roads ☐ Buildings

☐ Informal Trails ☐ Constructed Trails

☐ Other Structures: _____

H6. % Polygon where the vegetation community is altered by human activity (p.13)

*0 = >35% | 2 = 15-35% | 4 =5-15% | 6 <5%* _____ _____

H7a. % Polygon where polygon is physically altered by human activity (p.14)

*0 = >35% | 4 = 15-35% | 8 = 5-15% | 12 = <5%* _____ _____

H7b. Severity of the human caused alteration (p.14)

*0 = severe | 1 = moderate | 2 = slight | 3 = No alteration* _____ _____

H8. % Human-caused bare ground (p.14)

*0 = >15% | 2 = 5-15% | 4 = 1-5% | 6 < 1%* _____ _____

**Hydrologic Impacts**

☐ Surface Diversions ☐ Ditching

☐ Culverts ☐ Water Removal (e.g. Pumping)

☐ Inundation ☐ Drainage Tiles

☐ Dams (☐ upstream, ☐ downstream, ☐ man-made)

☐ Headcuts (☐ downstream, ☐ within, ☐ upstream)

H9. Severity of human caused hydrologic changes (p.12)

*0 = extreme | 3 = moderate | 6 = minor | 9 = none* _____ _____

**Total Health Score**

Score _____ Potential Score _____ Score/Pot.score _____ % _____

**Rating Category: <60%** = Non-functional (unhealthy), **60-79%** Functional At Risk (healthy but with problems), **80-100%** Proper Functioning Condition (Healthy)

## 9.2 Appendix 2 Foliage Cover Estimation Guide

Wetland Inventory Training

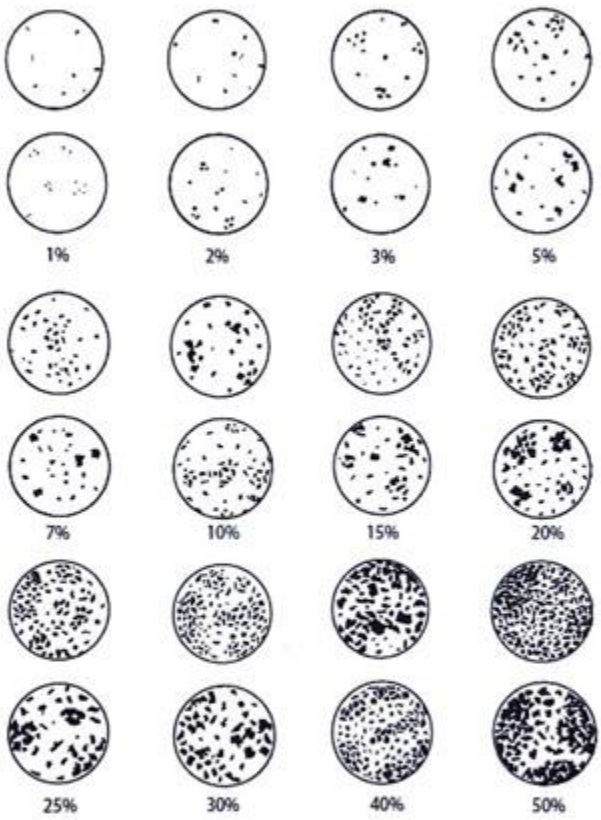



FIGURE 3.2 Comparison charts for visual estimation of foliage cover.

## 9.3 Appendix 3 Vegetation Distribution Estimation Guide

Wetland Inventory Training

| CLASS | DESCRIPTION OF ABUNDANCE | DISTRIBUTION PATTERN |
|---|---|---|
| 0 | No invasive plants on the polygon | |
| 1 | Rare occurrence | |
| 2 | A few sporadically occurring individual plants | |
| 3 | A single patch | |
| 4 | A single patch plus a few sporadically occurring plants | |
| 5 | Several sporadically occurring plants | |
| 6 | A single patch plus several sporadically occurring plants | |
| 7 | A few patches | |
| 8 | A few patches plus several sporadically occurring plants | |
| 9 | Several well spaced patches | |
| 10 | Continuous uniform occurrence of well spaced plants | |
| 11 | Continuous occurrence of plants with a few gaps in the distribution | |
| 12 | Continuous dense occurrence of plants | |
| 13 | Continuous occurrence of plants associated with a wetter or drier zone within the polygon. | |