Columbia Basin Invasive Northern Pike (*Esox lucius*) Suppression and Monitoring, British Columbia (2020 – 2021)

Okanagan Nation Alliance Program: Year 2

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Cover Photos

Left: Twenty-three young-of-year Northern Pike captured at Zuckerberg Pond on August 27 2020. Photo: Eleanor Duifhuis, Okanagan Nation Alliance.

Top Right: Close up of the head of a young-of-year Northern Pike captured in Zuckerberg Pond on July 23 2020. Photo: Eleanor Duifhuis, Okanagan Nation Alliance.

Bottom Right: Eleanor Duifhuis (Okanagan Nation Alliance) with the largest Northern Pike caught between April 28 and October 30 2020 (aged 5 years) caught on May 5 2020 in the Pend d'Oreille River. Photo: Evan Smith, Okanagan Nation Alliance

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Executive Summary

Northern Pike (*Exos lucius*) are a carnivorous fish with a circumpolar distribution. In Canada and the United States, they are native east of the Rocky Mountain Range; excluding Canadian Maritime Provinces and the Atlantic Coastal Plain (east of the Appalachian Mountain Range) in the United States. Northern Pike have been introduced (legally and illegally) to systems outside of their native distribution for the purposes of sport fishing. When introduced, Northern Pike are known to have detrimental effects on native fish populations, including salmonids. In 2004 introduced Northern Pike were observed in the Pend d'Oreille River Box Canyon Reservoir in Pend Oreille County, Washington; this population is suspected to have seeded the lower Columbia River population first observed in 2010 (in Canada) in the Robson Reach near Castlegar, BC via the Pend d'Oreille River. Up to January 2020, an estimated 31,575 Northern Pike have been removed from the Columbia Basin in Canada (734 Northern Pike) and the United States through active suppression, and opportunistically through other programs.

In 2020 active suppression continued in the Columbia and Pend d'Oreille Rivers using a variety of methods including gillnetting, backpack electrofishing, minnow trapping, larval light trapping, Fyke netting, and angling. These methods were implemented in a manner that ensured comparability to similar suppression programs (Box Lake, Boundary, Lake Roosevelt) and past efforts on the Columbia and Pend d'Oreille Rivers. When required, methods were adjusted/added based on site-specific conditions to improve capture opportunities; comparability of data was considered when using adjusted methods.

In total 144 Northern Pike (138 – Columbia River; 6 – Pend d'Oreille River) were captured and euthanized over 40 crew-days in 2020 as part of this targeted program. Most Northern Pike captured were young-of-year (123 Northern Pike) from Zuckerberg Pond. The majority of Northern Pike were captured through gillnetting (131 Northern Pike) while 12 Northern Pike were captured through backpack electrofishing and one via minnow trap. Suppression and monitoring efforts took place between April 28 and October 30 2020. Gillnetting was the most utilized method in the 2020 with 212 sets totaling 1,690.98 hours of soak time (time gillnets were in the water actively fishing), followed by minnow trapping with 14 sites totaling 277.6 hours of soak time, and backpack electrofishing with 11 sites totaling 2.06 hours over 1.35 km. Fyke netting (two sites, 21.3 hours), larval light trapping (8 sites, 48.0 hours of effective soak time) and angling (3 hours) also occurred. The Pend d'Oreille River had the most gillnetting effort; all other methods were only implemented in the Columbia River. Comparable (similar nets and timing of sampling) spring catch-per-unit-effort decreased by 0.11 Northern Pike/8-hours from 2019 to 2020, but was similar to 2018 and was 86% lower than when suppression began in 2014.

Though a high number of Northern Pike were encountered during the 2020 suppression program, the increased effort at Zuckerberg Pond was expected to have produced this result; not an increase in general Northern Pike population.

Columbia River Northern Pike capture locations were consistent with previous years, with the majority of captures occurring in the Robson Reach and by Zuckerberg Island. Adult Northern Pike in the Columbia River have been predominantly encountered along the right downstream bank of the Robson Reach between Celgar Mill and the Robson Bridge, and near Zuckerberg Island and the Kootenay Oxbow downstream of the Robson Reach. Young-of-year Northern Pike have mostly been encountered in Zuckerberg Pond and the Robson Reach, upstream of the Robson Boat Launch along the left bank to Sturgeon Island. Northern Pike capture locations in the Pend d'Oreille River were also consistent with previous years, with the majority of captures occurring at Buckley Campground and near Tillicum Creek. Northern Pike in the Pend d'Oreille River have primarily been captured south of Waneta Launch on the left downstream bank in the Waneta Reservoir, and at Buckley Campground, the mouth of Fraser Creek, and near Tillicum Creek in the Seven Mile Reservoir.

General Northern Pike habitat characteristics (shallow water with low flow and aquatic vegetation) are present in the Columbia and Pend d'Oreille Rivers and typically coincide with Northern Pike capture locations. More Northern Pike have been captured in the Columbia River than the Pend d'Oreille River between 2018 – 2020, though Pend d'Oreille Northern Pike are typically larger and older. Water temperatures in the Pend d'Oreille River appear to be more suitable for Northern Pike growth than the Columbia River Mainstem. However, off-channel habitats are present in the Columbia River which do reach optimal Northern Pike growing temperatures (Zuckerberg Pond). Adult Northern Pike appeared to be utilizing similar habitats to previous years, primarily areas with aquatic vegetation in depths of 2 – 7 m. This habitat appears abundant in the Robson Reach of the Columbia River, where the majority of adult Northern Pike captures have occurred. The capture of 123 young-of-year Northern Pike in 2020 supports previous data and observations that Zuckerberg Pond/Island provides rearing habitat for young-of-year Northern Pike. Kootenay Oxbow, Waldie Island, and the Robson Reach have also been identified as potential young-of-year Northern Pike rearing habitats.

Whitefish (Mountain and Lake) and other salmonids appear to be preferred prey of adult Northern Pike in the Columbia River and are typically the largest prey item observed. Rainbow Trout, Kokanee, Suckers, Sculpin, Northern Pikeminnow, Redside Shiners, Yellow Perch, and Dace have also been identified as Northern Pike prey species in the Columbia River and non-fish prey items included grasshoppers, aquatic sow bugs, wasps, leeches, and other unidentified invertebrates. The dominant prey species of young-of-year Northern Pike in the Columbia River appears to be Yellow Perch and Sculpin, with Rainbow Trout occurring in 3% of young-of-year Northern Pike stomachs between 2019 and 2020. However, this may be a product of availability, as young-of-year Northern Pike were primarily captured in Zuckerberg Pond, which contained 83.3% of the Columbia River non-native bycatch in 2020. Yellow Perch and Smallmouth Bass appear to be the preferred prey in the Pend d'Oreille River, with Yellow Perch having the highest frequency. Rainbow Trout, Whitefish, Northern Pikeminnow, and Suckers have also been identified as Northern Pike prey species in the Pend d'Oreille River.

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Table of Contents

List of Figures

List of Tables

List of Equations

1.0 Introduction

Northern Pike (*Exos lucius*) are a carnivorous fish with a circumpolar distribution. In Canada and the United States, they are native to the east of the Rocky Mountain Range; excluding Canadian Maritime Provinces and the Atlantic Coastal Plain (east of the Appalachian Mountain Range) in the United States (Fig 1; McPhail 2007; Hatfield and Pollard 2009). Northern Pike have been introduced (legally and illegally) to systems outside of their native distribution in Canada and the United States for the purposes of sport fishing (Hatfield and Pollard 2009; Runciman and Leaf 2009). Because Northern Pike are a prolific predatory fish species, when introduced to a new system they are known to have detrimental effects on native fish populations, including salmonids (Baxter and Neufeld 2015, Muhlfield et *al.* 2008).

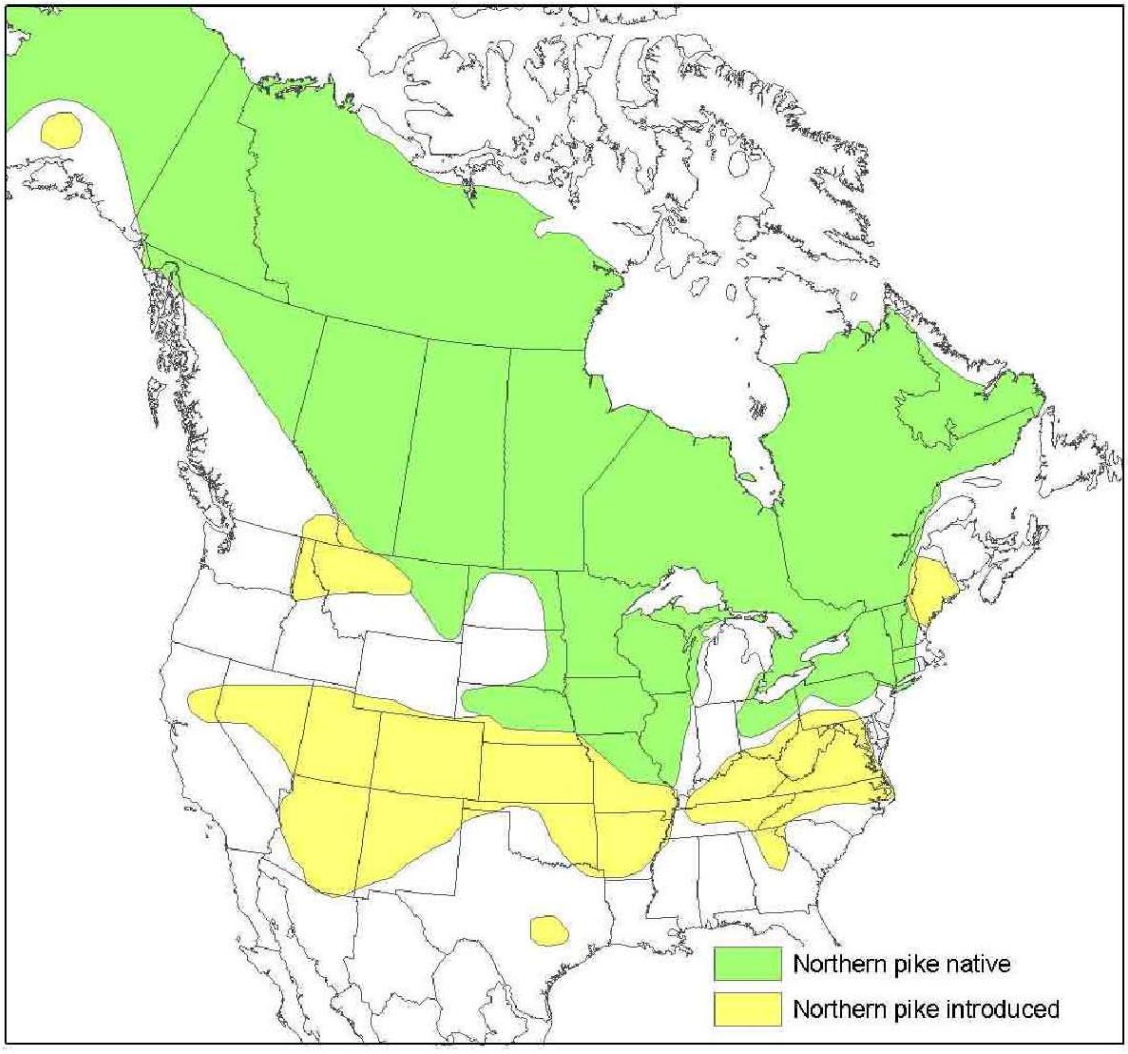

Figure 1. North American distribution of Northern Pike identifying their native and non-native (introduced) range (figure from Harvey 2009).

Introduced (a species living outside its native distributional range due to human activity, either intentional or accidental) Northern Pike were observed in the Koocanusa Reservoir in 1995 by the Montana Department of Fish, Wildlife, and Parks (Parnell 1996; Runciman and Leaf 2009). This population is suspected to have seeded British Columbia's first Northern Pike introduction observation in 2005 at Ha Ha Lake near Warder, BC (Harvey 2009; Runciman and Leaf 2009; Davis 2011). In 2004 introduced Northern Pike were observed in the Pend d'Oreille River Box Canyon Reservoir in Pend Oreille County, Washington (WDFW and KTI 2012; Bartholdt 2018). This population is expected to have seeded the lower Columbia River (LCR) population first observed in 2010 (in Canada) in the Robson Reach near Castlegar, BC via the Pend d'Oreille River (Ford and Thorley 2011). These non-native (introduced) populations are considered invasive (a species that can spread to a degree that causes damage to the environment, human economy or human health) in the Columbia River (Harvey 2009). Within the LCR, Northern Pike pose a risk to resident fish including species listed under the Species at Risk Act (SARA) such as White Sturgeon (*Acipenser transmontanus*), Shorthead Sculpin (*Cottus confusus*) and Umatilla Dace (*Rhinichthys umatilla*).

Northern Pike are monomorphic (males and females look the same, though females tend to be larger at age) and are easily identified by their duckbill-shaped head, elongated body and posteriorly-placed dorsal and anal fins, which allow rapid acceleration; one feature making them a successful predator (Doyon 1988; Hubbs and Lagler 2004; McPhail 2007).

1.1 Previous Suppression and Monitoring Efforts

Since the introduction of Northern Pike to south-eastern British Columbia, north-eastern Montana, northern Idaho, and north-eastern Washington, a number of suppression programs have been implemented in effort to reduce and/or eliminate them. Most of these programs utilized gillnetting and electrofishing as suppression techniques. The suppression of Northern Pike has been a transboundary effort with multiple organizations involved. Today, Northern Pike are known to inhabit the Kettle River in addition to the Pend d'Oreille River and Columbia River; photo evidence indicates they may have reached Christina Lake, via the Kettle River. As of January 2020, a documented 31,575 Northern Pike have been removed from the Columbia River Basin in Canada and the United States through active suppression and angler incentive programs; and opportunistically through other projects in the area (AMEC 2017; Baxter and Lawrence 2018; BC Hydro unpublished data; CCT 2020; McLellan et *al*. 2019; ONA 2016; ONA 2020; WDFW and KTI 2020[1]; WDFW and KTI 2020[2]; Wood 2019).

1.1.1 United States Suppression Efforts (Pend d'Oreille and Columbia Rivers)

In 2012 the Kalispel Tribe of Indians (KTI) and the Washington Department of Fish and Wildlife (WDFW) began an active suppression program in the Box Canyon Reservoir, which has resulted in the removal of 17,891 Northern Pike as of January 2020 (427 in 2019; WDFW and KTI 2020[1]). An additional program was implemented in the Boundary Reservoir in 2016 which has resulted in the removal 590 Northern Pike as of January 2020 (44 in 2019; WDFW and KTI 2020[2]).

A dedicated Lake Roosevelt Northern Pike Suppression Program was initiated in 2015 to address Northern Pike population growth in the reservoir; involving the Confederated Tribes of the Colville Indian Reservation, Spokane Tribe of Indians, WDFW, and the US Department of Energy – Bonneville Power Administration. This program has removed 12,502 Northern Pike as of January 2020; with 3,637 Northern Pike being removed in 2019 alone (McLellan et *al*. 2019; CCT 2020).

1.1.2 Canadian Suppression and Efforts (Pend d'Oreille and Columbia Rivers)

In 2014 a gillnetting program, funded by Teck Resources Limited, the Columbia Basin Trust (CBT), and the Ministry of Forests Lands and Natural Resource Operations and Rural Development (FLNRORD), was initiated in the LCR resulting in the removal of 323 Northern Pike from the LCR between 2014 and 2017 (Baxter and Lawrence 2018). An angler reward program was initiated by FLRNORD in 2013/14 and 2015/16 resulted in the removal of an additional 29 Northern Pike from the LCR and four Northern Pike from the Pend d'Oreille River (Doutaz 2019).

In 2015 and 2016 additional detection programs were implemented to target young-of-year (YOY/juvenile) Northern Pike through projects by the Castlegar and District Wildlife Association and Golder Associates (2015), and Okanagan Nation Alliance (ONA; 2016). The 2015 project was a pilot program aiming to capture larval Northern Pike utilizing light traps, minnow traps, plankton tows, dip nets, and backpack electrofishing. However, the presence of larval Northern Pike were not detected during this study (Golder 2015). In 2016 the ONA conducted a juvenile Northern Pike sampling program in the Robson Reach of the LCR resulting in the capture of one YOY Northern Pike; indicating Northern Pike were now spawning in the LCR rather than immigrating from the Pend d'Oreille River (ONA 2016). This theory was supported by Doutaz (2019) who used microchemistry analysis to determine 49 of 50 Northern Pike sampled from the Columbia River had hatched there.

In 2018 suppression efforts continued, resulting in the removal of 27 Northern Pike from the LCR and 15 from the Pend d'Oreille River (Canadian Reach; Wood 2019). An ONA lead Angler Incentive Program was implemented in 2018, which resulted in the documented removal of four Northern Pike; three from the Columbia River and one from the Pend d'Oreille River (ONA 2020). The ONA also conducted a brief adult suppression program in 2018 (3,031 seconds electrofishing and 47.83 hours gillnetting) in the LCR and Pend d'Oreille Rivers, though no Northern Pike were captured.

In Year 1 (2019) if the ONA Northern Pike Suppression Program, 45 Northern Pike were captured, ten in the Pend d'Oreille River and thirty-five in the LCR (ONA 2020). In total 635 Northern Pike have been removed through Canadian Suppression and Angler Incentive Programs in the Pend d'Oreille River (79 Northern Pike) and LCR (556 Northern Pike) since 2014. In addition to suppression efforts, 99 Northern Pike have been opportunistically captured and removed from the Columbia River since 2010 through BC Hydro's Lower Columbia River Fish Population Indexing Surveys (CLBMON 45); including two Northern Pike in 2020 (BC Hydro unpublished data).

1.2 Project Goals and Objectives

The primary goal of this program is to continue efforts to suppress adult and YOY Northern Pike in the Columbia and Pend d'Oreille Rivers (within Canada), while working to identify previously undiscovered Northern Pike hot-spots and monitoring range expansion. Specific goals and objectives are detailed below:

Goal 1: *Reduce Northern Pike Population in the Columbia and Pend d'Oreille Rivers*

Objective 1.1:	Utilize existing Northern Pike suppression methodologies from similar programs to ensure comparability (Catch Per Unit Effort compared between years and programs)
Objective 1.2:	Investigate and implement additional/new Northern Pike control actions that could further support suppression efforts
Objective 1.3:	Identify and treat high quality spawning/rearing habitat
Objective 1.4:	Minimize mortality of native species and Species at Risk (SARA)

Goal 2: *Impede Northern Pike range expansion into susceptible locations*

Objective 2.1:	Utilize eDNA to monitor for Northern Pike presence outside of the current known range
Objective 2.2:	Develop a rapid response plan to quickly suppress Northern Pike in newly detected areas

Goal 3: *Promote stewardship and public involvement in Northern Pike suppression*

Objective 3.1:	Engage local stewardship groups through conferencing, outreach and education
Objective 3.2:	Develop a bounty/lottery program to involve/reward anglers for participating in Northern Pike suppression

2.0 Suppression/Monitoring Area

Active suppression and eDNA sampling occurred in two primary locations; the LCR and the Pend d'Oreille River (Fig 2). Active monitoring at Christina Lake was not conducted in 2020 due to the COVID-19 Pandemic and associated travel and crew restrictions during the Northern Pike Spawning window (April – June 2020), however, eDNA samples were collected.

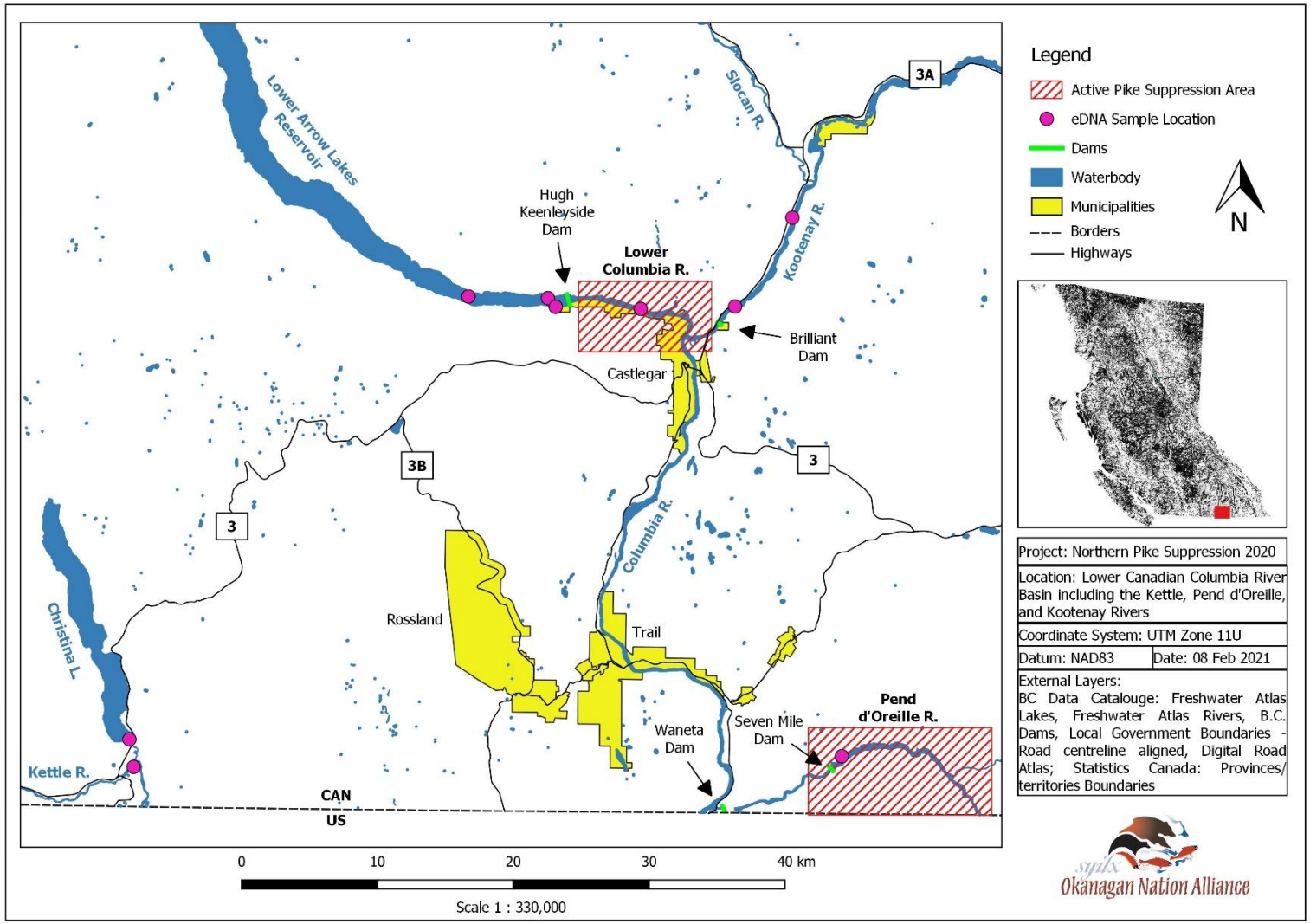

Figure 2: Active Northern Pike suppression/eDNA monitoring locations within the Columbia and Pend d'Oreille Rivers, and eDNA monitoring locations in the Kootenay and Kettle Rivers, and Christina Lake.

The Columbia River is approximately 1,600 km long originating in Columbia Lake near Canal Flats, BC and draining into the Pacific Ocean near Portland Oregon, Washington State (WA). The Columbia River is one of the world's largest sources of hydroelectric power and is impacted by many other anthropogenic activities such as industrial activity, logging, mining, and urbanization. Nearly 800 km of the Columbia River is located in Canada and Northern Pike (in the Canadian Columbia River) are currently known to occupy the ~ 56 km reach between Hugh L. Keenleyside (HLK) Dam, Castlegar BC and the Canada/United States Border. The 2020 suppression effort in the Columbia River were focused between HLK Dam and Zuckerberg Island, Castlegar BC because of the well documented Northern Pike presence and high value habitat (Baxter and Neufeld 2015; Baxter 2016; Baxter and Doutaz 2017; Baxter and Lawrence 2018; Wood 2019; ONA 2020). This area includes the lower reach of the Kootenay River between the Columbia/Kootenay River confluence upstream approximately 2.6 km to Brilliant Dam. For the purposes of this report the "Columbia River" or "LCR" will refer to the reach between HLK dam and Zuckerberg Pond, and the Kootenay River as previously described.

The Pend d'Oreille River is a tributary of the Columbia River and is approximately 209 km long originating in Lake Pend Oreille near Sandpoint Idaho. The majority of the river is located in the United States before entering Canada downstream of Boundary Dam; located north of Metaline Falls, WA. Approximately 25 km of the Pend d'Oreille River flows through southern BC before draining into the Columbia River just north of the Canada/United States Border. Within the Canadian Reach there are two reservoirs; Waneta Reservoir and Seven Mile Reservoir. The Waneta Reservoir was formed with the Construction of Waneta Dam and extends from the forebay of Waneta Dam to the tailrace of Seven Mile Dam (9.5 km). The Seven Mile Reservoir originates behind Seven Mile Dam to the Boundary Dam tailrace (14 km). In 2020, active suppression only occurred in the Seven Mile Reservoir, due to dynamic flow conditions of the Waneta Reservoir and limited access to the Waneta Launch caused by an increase in recreation due to the COVID-19 Pandemic.

Christina Lake is located between Grand Forks and Castlegar, BC, and drains into the Kettle River; a tributary to the Columbia River. The lake is roughly 18 km long and has a surface area of 25.5 km^2 providing high recreational value. Locally it's known as the warmest timber-lined lake in BC. Christina Lake was identified as a high priority monitoring location and a candidate for exploratory sampling because of the high potential for Northern Pike introduction through the Kettle River, which has confirmed Northern Pike presence. Active monitoring did not occur in Christina Lake in 2020 due to the COVID-19 Pandemic, though eDNA sampling was conducted.

The Kettle and Kootenay Rivers were chosen for eDNA sampling locations to monitor Northern Pike Range expansion.

Suppression began on April 28 2020, prior to the anticipated Northern Pike spawning window, which allowed the crew to monitor for signs of Northern Pike spawning. Sampling conducted prior to the spawning window gave indication of the effectiveness of suppression efforts during this time. Suppression occurred in the spring (April 28 – June 30 2020), with minor effort in the summer (July 1 2020 – August 19 2020), and some effort in the fall (August 20 – October 30 2020). Additionally, Northern Pike were opportunistically captured and removed during the CLBMON 45 Indexing Program (October 5 – November 7 2020; BC Hydro unpublished data).

3.0 Methods

All methods used for this program were implemented in accordance with Department of Fisheries and Oceans SARA Permit 20-PPAC-0009 (Columbia River) and MFLNRORD Scientific Collection Permit MRCB20-603200 (Columbia and Pend d'Oreille Rivers).

3.1 Sampling Methods

A variety of methods were utilized during the suppression program including gillnetting, backpack electrofishing, Fyke netting, minnow trapping, larval light trapping, and angling. These methods were implemented in a manner that ensured comparability to similar suppression programs (Box Lake Reservoir, Boundary Reservoir, Lake Roosevelt) and past efforts on the Columbia and Pend d'Oreille Rivers. When required, methods were adjusted/added based on site-specific conditions to improve capture opportunities; comparability of data was considered when using adjusted methods.

3.1.1 Gillnetting

Two different gillnet types were used to target the different life stages of Northern Pike. Spring Pike Index Nets (SPIN), were deployed from April through October 2020 to target adult Northern Pike (Table 1). Individual nets were constructed of five different mesh size panels (2", 2.5", 3", 3.5", 4"), with a total length of 45.72 m and depth of 1.83 m. Juvenile nets (1" monofilament nets, 45.72 m x 1.83 m) were deployed in August through October 2020 to target YOY Northern Pike. Gillnets were deployed from a jet boat at all sites except those in Zuckerberg Pond, due to shallow water and access issues; here gillnets were deployed via canoe (Fig 3).

Table 1. Individual panel specifications that comprise a typical Spring Pike Index Net used for suppression/monitoring in the Columbia River and Pend d'Oreille River including panel length (m), panel depth (m) mesh size (inch; stretched), monofilament material number (indicates type of monofilament from manufacture), monofilament diameter (mm) and test strength (lbs).

Panel Number	Panel Length (m)	Panel Depth (m)	Mesh Size (inch)	Monofilament Material Number	Diameter (mm)	Net test Strength (lbs)
1	9.144	1.83	2.0	#104/#4	0.33	11
2	9.144	1.83	2.5	#104/#4	0.33	11
3	9.144	1.83	3.0	#139/#6	0.40	17
4	9.144	1.83	3.5	#139/#6	0.40	17
5	9.144	1.83	4.0	#139/#6	0.40	17

Figure 3. Example of gillnet deployment via canoe in Zuckerberg Pond, Castlegar BC. Photo: Evan Smith, Okanagan Nation Alliance.

Gillnets were set in areas of known or suspected Northern Pike habitat (shallow, slow moving, abundant aquatic vegetation). Whenever possible, gillnets were set perpendicular to shore with the shallow end in ~1 m of water. SPIN nets were deployed with the smallest mesh size close to shore and the largest mesh size in deeper water. The length of net and percentage of intact netting were recorded for every set (percentage of intact netting was subtracted with each hole or break the net sustained). Gillnets were left to soak for up to four hours in the LCR and up to 24 hours in the Pend d'Oreille River in accordance with applicable permitting. Soak times in the LCR were reduced to 2 hours when White Sturgeon capture rate was high.

3.1.2 Electrofishing (backpack)

Backpack electrofishing occurred in Zuckerberg Pond and the LCR, targeting YOY Northern Pike, and was completed with a Smith-Root Model LR-24. Electrofishing settings were initially 30 Hz, 12% duty cycle at 25 W average-output power and then adjusted to increase efficiency. Variables such as water conductivity, substrate, temperature, fish size, and species all effect the efficacy of the electrofishing unit (Beaumont et *al*. 2002). Settings were adjusted in accordance with page 27 of the LR-24 Electrofisher User's Manual (Smith-Root 2018).

Appropriate settings for site conditions in Zuckerberg Pond during the sampling timeframe were determined to be 70 Hz with a 12% duty cycle producing 305 V. Due to the low abundance of native species and high abundance of non-native species in Zuckerberg Pond (ONA 2020) the risk of electrofishing to native species in this location was perceived as low, therefore electrofishing settings were higher than typically recommended for soft bodied fish (: *Oncorhynchus mykiss*, etc.) to increase Northern Pike capture success. If native species were observed during backpack electrofishing, the power was turned off and resumed when the fish was thought to have left the sampling area (15 m from the electro-fisher). Other non-native species were opportunistically captured and euthanized when encountered. Effort was measured in seconds, while site length (m), estimated effective width (m), and average depth (m) were also recorded.

3.1.3 Fyke Netting

Fyke netting was briefly used in Zuckerberg Pond to target YOY Northern Pike. The net was set perpendicular from shore near the outflow of Zuckerberg Pond to the Columbia River. Data recorded on each set included: location (GPS), date and time deployed and checked, and water-surface temperature. Nets were checked once per day and were not set for longer than 24 hours at a time. Data collected during checks included: number of fish captured by species and mean length of fish captured. All native species were released near their capture location following processing while non-native species were euthanized.

3.1.4 Minnow (Gee) Trapping

Gee Wire Minnow Traps were utilized in Zuckerberg Pond and the LCR to target YOY Northern Pike. Minnow Traps were 44 cm in length by 7.5 cm in diameter with a 1.5 cm mesh size, and a 3.0 cm hole on each end to allow access to the inside of the trap. Attractants such as bait (cat food) or a glow stick (or a combination of the two) were placed in the middle of the trap and left to soak overnight; soak times did not exceed 24 hours.

3.1.5 Larval Light Traps

Light Traps were used to sample for larval Northern Pike using similar methods to Golder (2015). Quatrefoil light traps (Fig 4), consisting of three perforated plastic tubes connected to platforms on each side, were set in habitats with low water velocity and were submerged or overhanging vegetation was present. A glow stick (with an advertised six-hour lifespan) was inserted into the traps as close to dusk as possible and then collected the next morning. Though actual soak times were greater than 6 hours, due to the lifespan of the glow-stick attractant, the “effective soak time” is considered to be 6 hours per trap.

Figure 4. An example of a Quatrefoil light trap used to sample for young-of-year Northern Pike in the Columbia River in 2020.

3.1.6 Angling

Angling for Northern Pike occurred opportunistically with various lures while gillnets were soaking. Effort was recorded as time angling and the type of lure was recorded if a Northern Pike was captured. Other recorded angling data included the angler and bycatch. All anglers possessed a valid BC fishing license and followed applicable BC Fishing Regulations.

3.1.7 Habitat Data Collection

At each sample location the percentage of specific habitat parameters were estimated to a total of 100%. These habitat parameters included interstices, woody debris, aquatic vegetation, terrestrial vegetation, shallow water, and deep water (Table 2). In sites where two of the listed habitat parameters were present at the same time and location (shallow water with aquatic vegetation) preference was given to the dominant cover type (i.e. aquatic vegetation would be given 100% of the shallow area with aquatic vegetation).

Table 2. Habitat parameters and their respective definitions used to document habitat conditions at Northern Pike suppression sites.

Parameter	Definition
Interstices	Boulders, boulder clusters, or bedrock features large enough to provide cover for Northern Pike
Woody Debris	Submerged or floating logs, woody-debris features, or docks capable of providing cover for Northern Pike
Aquatic Vegetation	Submerged living vegetation
Terrestrial Vegetation	Vegetation in the riparian area providing overhanging cover, or living submerged riparian vegetation
Shallow Water	Areas with a depth of < 8 m and without cover
Deep Water	Areas with a depth of > 8 m and where other habitat features cannot be identified

Specific water quality measurements were collected at each site to supplement physical habitat descriptions (Table 3). Weather conditions, sample start time/date, and sample end time/date were recorded at all sites for all methodologies. Long-term water temperature data in the Seven Mile Reservoir and Zuckerberg Pond were collected with HOBO Pendant Temperature/Light 64K Data Loggers, while water temperature and river level data for the Columbia River were obtained from the Water Survey of Canada (WSC) at Birchbank (Station: 08NE049; WSC 2020).

Table 3. Parameters recorded at suppression sites; including the instrument used to measure the respective parameters and their associated accuracy.

Parameter	Instrument	Accuracy
Water Depth (m) Surface Water Temperature (°C)	Humminbird Helix 7x Chirp GPS G2	+/- 0.1 m +/- 0.1°C
UTM Location	Garmin 64st	+/- 3 m
Water Chemistry • Dissolved Oxygen (mg/L) • pH • Conductivity (µs/cm)	YSI Pro2030 (Dissolved Oxygen, Conductivity) Hanna HI98103 pH tester (pH)	 +/- 0.2
Water Clarity (m)	Secchi Disc	+/- 0.25 m

The YSI probe was calibrated at the beginning of the field season while the Hanna pH tester was calibrated bi-weekly.

3.2 Northern Pike Processing and Data Collection

All captured Northern Pike were euthanized before being scanned for a Passive Integrated Transmitter (PIT) tag, measured (fork length in mm), weighed (+/- 1 g), and photographed. Northern Pike were dissected to inspect gonads, stomach contents, and remove a cleithrum for aging. In some cases, parasites or stomach contents were collected and preserved with 95% ethyl alcohol in a vial, which was labelled with a Northern Pike ID specific to that individual. Samples were transported to the ONA kɬ cp̓əlk̓ stim̓ Fish Health and Diagnostics Laboratory in Penticton BC.

Northern Pike were aged using the cleithrum with methods described by Faust et *al*. (2013). Cleithra were briefly (15 - 30 seconds) submerged in boiling water to loosen attached tissue, which was subsequently removed by hand. The process was repeated until cleithra were clean. Once completely dry (1 - 2 days), cleithra were placed in a black dish and submerged in water to improve visibility of annuli. Annuli were counted with the naked eye, or with a microscope depending on the inherent visibility of annuli. This method was chosen over otolith aging due to its reliability (specifically for Northern Pike) and its comparatively simple sample preparation (Faust et *al.* 2013). Adult Northern Pike are classified as 1 + years old, while YOY Northern Pike are less than 1 year-old.

All bycatch were scanned for a PIT tag and measured. Native bycatch was identified, measured, and scanned before being released back into the river. All invasive fish species were euthanized and disposed of at the point of capture. In the Columbia and Pend d'Oreille Rivers, Walleye were considered a non-native sportfish and were not euthanized.

3.3 Data Management and Mapping

All field data was recorded on a project-specific datasheet, with supplemental data recorded in field notebooks. Over the course of a field day, pictures of datasheets were taken as a digital backup. At the end of the day all datasheets were scanned and transferred to the ONA shared network. Field data were entered into an excel database and QA/QC'd (Quality Assurance – Quality Control), while GPS data were stored in Garmin Basecamp (Version 4.7.0).

All mapping was completed on Q-GIS (Version 3.4.14-Madeira) with layers obtained from 2020 field data and open-source external layers from the BC Data Catalog and Statistics Canada. All satellite imagery is open source from the ESRI World Imagery service and the year of the imagery is identified in each map. Individual layers and their source are identified in each map and are included in the references section under *7.2 Map Layer Sources*.

3.4 Data Analysis

Microsoft Excel (2010) was used for all summary statistics and graphs, and geographical analysis were completed using Q-GIS.

3.4.1 Catch per unit Effort

Gillnet catch-per-unit-effort (CPUE) was calculated as catch per 8-hour period (Eq 1). $CPUE_{8hr}$ was compared to previous years when timing and method of suppression was similar; typically, April 1 – June 30 (Baxter and Neufeld 2015; Baxter 2016; Baxter and Doutaz 2017; Baxter and Lawrence 2018; Wood 2019; ONA 2020).

Equation 1. Gillnet catch-per-unit-effort equation used to compare between years.

$$CPUE_{8hr} = \frac{Northern\ Pike}{total\ gillnet\ hours} \times 8\ hours$$

Electrofishing (backpack and boat) CPUE is expressed as Northern Pike per hour using the calculation: Northern Pike captured / time sampled in hours. Electrofishing CPUE was compared between years and between waterbodies (Columbia and Pend d'Oreille Rivers).

Fyke net CPUE is expressed as Northern Pike per hour using the calculation: Northern Pike captured / total soak time and was compared to ONA (2016).

Minnow trap CPUE is expressed as Northern Pike per hour using the calculation: Northern Pike captured / total soak time. Minnow Trap CPUE was compared to Golder (2015).

Larval light trap CPUE is expressed as Northern Pike per hour using the calculation: Northern Pike captured / effective soak time. Where effective soak time is the length of time where the trap is submerged with the glow stick operational, and not the total soak time. Larval light trap CPUE was compared to Golder (2015).

Angling CPUE is expressed as Northern Pike per hour using the calculation: Northern Pike captured / angling hours. Angling CPUE was compared between years and between waterbodies. Lure type was not accounted for during CPUE calculations.

3.4.2 Northern Pike Population Dynamics

A variety of Northern Pike population dynamics were explored including relative population trends, spawning window variations, growth rate, identification of juvenile habitat, length-age relationships, length-weight relationships (size), condition factor, parasitic relationships, and diet.

Northern Pike population estimates have previously been calculated using the Lincoln-Petersen mark-recapture method (Baxter and Neufeld 2015; Baxter 2016; Baxter and Doutaz 2017). However, the accuracy of these estimates are questionable as two of the five assumptions for the Lincoln-Petersen mark-recapture method were not met: (1) The population is physically (immigration or emigration) and demographically (recruitment or mortality) closed (so that N is constant over the time of sampling), and (2) marks or tags are not lost or missed (Wood 2019). Therefore, due to the complications of addressing these assumptions (primarily the assumption of a closed population in such a large and dynamic system over a long period of time), and the requirement to release tagged Northern Pike (known to be prolific spawners), mark-recapture population estimates did not occur between 2018 – 2020 (Wood 2019). Instead, a comparison of spring (April 1 – June 30) $CPUE_{8hr}$ is used to compare and estimate relative abundance trends between years.

Analysis of the Northern Pike spawning windows in the Columbia and Pend d'Oreille Rivers were conducted utilizing current and historic Northern Pike capture and available water temperature/elevation data. Temporal observations of spawning Northern Pike were graphed with the corresponding water temperatures/levels at the time to identify possible correlations.

Data on Northern Pike growth rates were collected opportunistically through the capture of previously tagged individuals from other studies (e.g. Doutaz 2019; Baxter and Neufeld 2015), and comparisons of YOY Northern Pike captured at the same location over several weeks. The growth rate for tagged adults is expressed by cm/year and kg/year (Eq 2).

Equation 2. Growth rate equation used to determine length or weight growth of individual re-captured Northern Pike.

$$AG = \frac{GP\ at\ second\ capture - GP\ at\ initial\ capture}{Years\ at\ large}$$

$Where$:

$AG = Annual\ Growth\ (length\ in\ cm\ or\ weight\ in\ kg)\ by\ year$

$GP = Growth\ parameter\ (length\ in\ cm\ or\ weight\ in\ kg)\ of\ Northern\ Pike$

$Years\ at\ large = \ number\ of\ days\ between\ two\ capture\ events\ \div\ 365\ days$

Adult growth rates were compared to previous studies in the LCR (Baxter and Neufeld 2015; Doutaz 2019). The estimated growth rate of YOY Northern Pike was determined by graphing average weekly lengths (cm) and weights (kg) of individuals captured in Zuckerberg Pond. Excel was used to calculate a linear regression and determine an equation expressed in cm/week and kg/week (which was then converted to g/week).

Northern Pike rearing habitat was primarily identified by the density of YOY Northern Pike captured or observed in a location. Habitat parameters were compared between sites with high YOY presence, and sites with no (or low) YOY presence.

Length/age, length/weight and condition factor (Eq 3) were graphed to compare between systems. The condition factor equation used a species-specific population-fitted exponent developed by Doyon et *al*. (1988); the qualifier 10^5 transforms the value to bring it closer to 0.

Equation 3. Condition factor equation used to quantify the condition of Northern Pike in various system.

$$K_n = \frac{(10^5\ \times W)}{L^3}$$

$Where$:

$K_n = Condition\ factor\ of\ Northern\ Pike\ n$

$W = Weight\ of\ Northern\ Pike\ (g)$

$L = Length\ of\ Northern\ Pike\ (mm)$

Parasitic relationships were explored through the collection of parasites present in Northern Pike. All samples were preserved in a vial with 95% Ethyl Alcohol and labelled with the associated Northern Pike Sample ID before being sent to the kɬ cp̓əlk̓ stim̓ Fish Health and Diagnostics Laboratory for identification.

Data on Northern Pike diet in the Columbia and Pend d'Oreille Rivers were obtained through observations of euthanized Northern Pike stomach contents. Stomach contents of Northern Pike were inspected and prey were identified to species (or family) to the best of the crew's ability. When prey items were intact, notations on length (mm) and weight (g) were recorded. Prey composition was compared between the Columbia and Pend d'Oreille Rivers to identify any possible differences in diet.

3.5 eDNA Sampling and Processing

In 2019 an eDNA primer was developed and QA/QC'd by the ONA kɬ cp̓əlk̓ stim̓ Fish Health and Diagnostics Laboratory for use of Northern Pike detection in the Columbia River (ONA 2020). In June 2020 eDNA samples were taken at Christina Lake, the Kettle River, Arrow Lakes Reservoir, and the Kootenay River, and positive control samples were collected in the LCR and Pend d'Oreille River. Three replicate samples, consisting of > 1 L each, in whirl packs, were obtained for each site (> 3 L per site). Whirl packs were labeled with the site name, date, and replicate number, while the location of each site/replicate was recorded on a GPS (+/- 3 m). A separate cooler was used to transport samples for each eDNA site. Coolers were wiped down with a 10% bleach solution and dried before being used for another site. Individuals involved in eDNA collection ensured they had not come into contact with Northern Pike for at least a week and wore fresh nitrile gloves between each replicate sample, and each site, to reduce cross contamination and instances of false positives. To avoid clogging the filter, collectors either stood on shore while collecting the sample, or collected the sample upstream of where they entered the creek/waterbody.

All samples were filtered on the same day as collection using the portable filtration station developed by the kɬ cp̓əlk̓ stim̓ Fish Health and Diagnostics Laboratory (Fig 5). This system used an air pump to create a vacuum which pulled the sample water through a 45 µM filter membrane. At least 1 L of each replicate sample was filtered through a membrane (one membrane for each replicate), with a fourth sample of distilled water to act as a negative control. Once filtered, each membrane was roughly cut and placed in separate 1.5 mL vials containing 1 ml of 1xDNA/RNA solution and stored in the fridge until they were shipped to the kɬ cp̓əlk̓ stim̓ Fish Health and Diagnostics Laboratory; where they were then stored at -80°C until processing. Utensils used to cut the membranes (lab scissors and tweezers) were sterilized between samples in a 10% bleach solution for a least two minutes, then rinsed and dried. Individuals handling the eDNA sample through this process used fresh nitrile gloves between handling replicate samples.

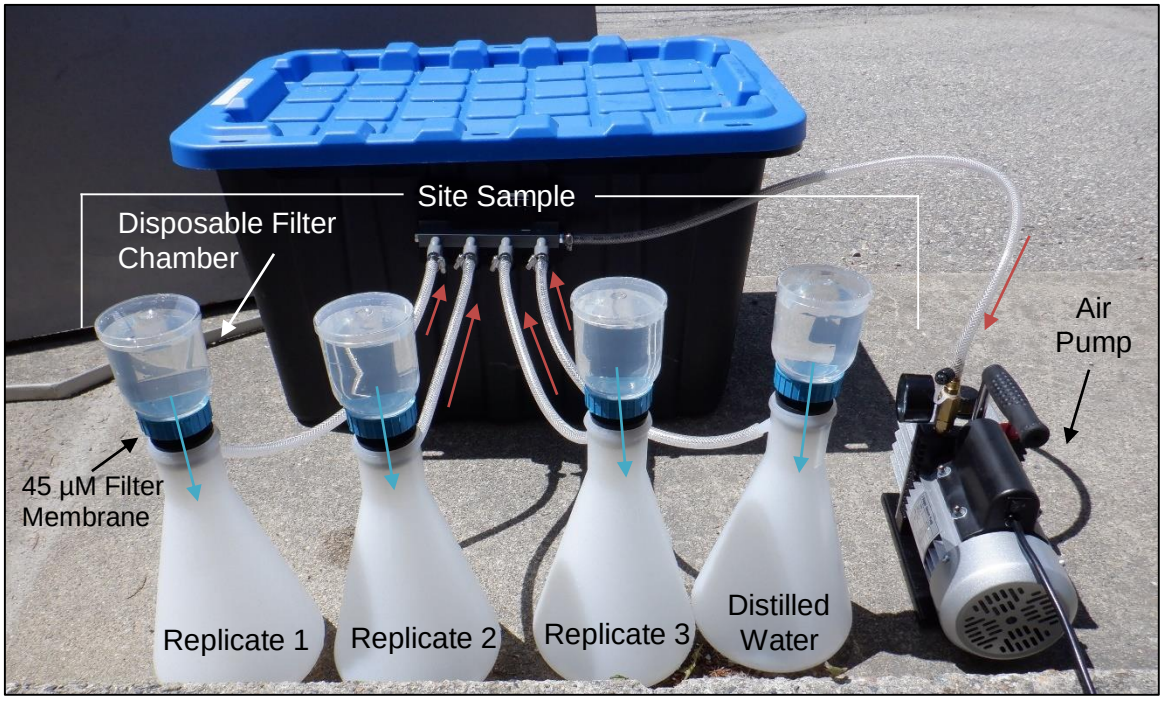

Figure 5. Field processing system used to filter eDNA samples to send for lab analysis depicting the major components of the system, relationship between a sample site, replicate sample, and negative control, and airflow (red arrows)/water flow (blue arrow).

Lab samples were processed using the Zymo research Quick-DNA/RNA MagBead Kit according to the manufactures recommended protocol. Each purified nucleic acid sample was split into two, stored at -80°C, and subsequently used as template in the quantitative polymerase chain reaction (qPCR). These samples were tested for viability using eplant qPCR assay according to Veldhoen et *al.* (2016) then tested for Northern Pike DNA using the primer developed by Cairm et *al.* (2019) and QA/QC'ed by the ONA (ONA 2020).

4.0 Results

In total 144 Northern Pike (138 – LCR and 6 – Pend d'Oreille River) were captured and euthanized over 40 crew-days in 2020. The majority of Northern Pike were captured through gillnetting (131 Northern Pike), while fewer were captured via backpack electrofishing (12 Northern Pike) and minnow trapping (1 Northern Pike). In 2020 Northern Pike were not captured using larval light traps, Fyke nets, or angling. Most of the Northern Pike captured in 2020 were YOY from Zuckerberg Pond (123 YOY Northern Pike vs 15 adult Northern Pike in the LCR and 6 adult Northern Pike in the Pend d'Oreille River). Two additional Northern Pike were captured in the LCR during the CLBMON 45 Indexing Program over four sampling events between HLK Dam and the WSC Birchbank Station south of Genelle, BC (October 5 – November 7 2020; BC Hydro unpublished data).

Water quality parameters (conductivity, dissolved oxygen, pH, and Secchi depth) were measured, but the data is difficult to compare as the different waterbodies were not always sampled in the same month.

4.1 Effort and Catch per Unit Effort

Suppression efforts took place between April 28 and October 30 2020. Gillnetting was the most utilized method in the 2020 suppression program with 212 sets totaling 1,691.0 hours of soak time (time gillnets were in the water actively fishing), followed by minnow trapping with 14 sites totaling 277.6 hours of soak time, and backpack electrofishing with 11 sites totaling 2.06 hours over 1.35 km. An additional 17.49 hours of boat electrofishing occurred between HLK Dam and the WSC Birchbank Station, inclusive of the lower Kootenay River, during the CLBMON 45 Indexing Program (BC Hydro unpublished data). Fyke netting (two sites, 21.3 hours), larval light trapping (8 sites, 48.0 hours of effective soak time) and angling (3 hours) also occurred in 2020. The Pend d'Oreille River had the most gillnetting effort; all other methods were only implemented in the LCR. A summary of all sample sites by method is available in Appendix A.

Backpack electrofishing had the highest CPUE, followed by gillnetting and minnow trapping. Larval light trapping, Fyke netting, and angling had a CPUE of zero. CPUE for Northern Pike during the CLBMON 45 Indexing Program was 0.0003 Northern Pike/hour; when considering effort between HLK dam and the WSC Birchbank Station (BC Hydro unpublished data; Table 4). Gillnetting had the highest effort and caught the most Northern Pike. Maps of site location are provided in Appendix B.

Table 4. Summary of total effort and catch-per-unit-effort (CPUE) for the methods used between April 28 – October 30 2020 (October 5 – November 7 2020 for CLBMON 45 data). Gillnetting $CPUE_{8hr}$ is catch per 8-hour period, while backpack electrofishing, minnow trapping, Fyke netting, and angling CPUE is catch per hour. Larval light trapping CPUE is expressed as catch per effective soak time. CLBMON 45 Indexing Program data are expressed as catch per hour (BC Hydro unpublished data).

Sample Method	Northern Pike Captured	Total Effort (hr)	CPUE
Gillnetting	131	1,690.98	0.62_{8hr}
Backpack Electrofishing	12	2.06	5.82_{1hr}
Minnow Trapping	1	277.58	0.004
Larval Light Trapping	0	156.35	0.00
Fyke Netting	0	21.52	0.00
Angling	0	3.00	0.00
CLBMON 45	2	17.49	0.0003

The Pend d'Oreille River had the highest gillnet effort due to the possibility of overnight sets, where the soak times in the LCR were generally limited to four hours (Table 5). However, the LCR had the highest CPUE. A description of gillnet effort by season, location, and net type is provided in Appendix C.

Table 5. Summary of gillnetting total effort and catch-per-unit-effort (CPUE) by location between April 28 and October 30 2020. $CPUE_{8hr}$ is catch per 8-hour period.

Location	Northern Pike Captured	Soak Time (hrs)	$CPUE_{8hr}$
Pend d'Oreille River	6	1,317.08	0.04
Columbia River	125	373.90	2.67
Total	**131**	**1,690.98**	**0.62**

Backpack electrofishing only occurred in the LCR, with focus on Zuckerberg Pond and some exploratory sampling upstream of Zuckerberg Pond in the LCR Mainstem. (Table 6). Due to restrictions brought on by the COVID-19 Pandemic in the spring of 2020, and consideration of the CLBMON 45 Indexing Program in the fall, the decision was made to omit boat electrofishing in the 2020 suppression program. Backpack electrofishing had the highest CPUE in 2020 due to the density of YOY Northern Pike in Zuckerberg Pond. Two adult Northern Pike were captured during the CLBMON 45 Indexing Program (BC Hydro unpublished data).

Table 6. Summary of backpack electrofishing (EF) total effort (time in hours and length sampled in meters) and Northern Pike (NP) catch-per-unit-effort (CPUE) by location between April 28 and October 30 2020, and boat electrofishing through the CLBMON 45 Indexing Program between October 5 and November 7 2020 (shaded; BC Hydro unpublished data).

Location	Northern Pike Captured	Time Sampled (hrs)	Site Length (m)	CPUE (NP / EF Hour)
Columbia River	0	0.20	360	0.00
Zuckerberg Pond	12	1.87	990	6.43
Columbia River (CLBMON 45)	2	17.49	86,341	0.0003
Total	**14**	**19.57**	**87,691**	**0.71**

Minnow trapping occurred in the LCR Mainstem, lower Kootenay River, and Zuckerberg Pond, and was the only other method resulting in a Northern Pike capture in 2020. The LCR Mainstem had the most effort, but the individual was captured in Zuckerberg Pond (Table 7).

Table 7. Summary of minnow trapping total effort (time in hours) and Northern Pike (NP) catch-per-unit-effort (CPUE) by location between April 28 and October 30 2020.

Location	Northern Pike Captured	Time Sampled (hr)	CPUE (NP / Hour)
Columbia River Mainstem	0	134.97	0.000
Lower Kootenay River	0	21.57	0.000
Zuckerberg Pond	1	121.05	0.008
Total	**1**	**277.58**	**0.004**

The other methods implemented in the 2020 suppression program (larval light trapping, Fyke netting, and angling) did not result in any Northern Pike captures and had a CPUE of zero.

4.2 Distribution and Spawning

In the LCR, adult Northern Pike were captured along the right downstream bank (river right) between Pike Bay (downstream of Celgar Mill) and the Robson Bridge, and in Zuckerberg Pond, or directly upstream of Zuckerberg Pond, in the LCR Mainstem (Fig 6). One adult Northern Pike was captured near Genelle, BC during the CLBMON 45 Indexing Program (Fig 7; BC Hydro unpublished data). All the YOY Northern Pike were captured in Zuckerberg Pond between July 22 and October 24 2020; however, one YOY Northern Pike was observed upstream of the dyke separating the LCR Mainstem from Zuckerberg Pond on August 27 2020.

In the Pend d'Oreille River the majority of Northern Pike were captured near Buckley Campground on the river right downstream side, with two others captured near Tillicum Creek (Fig 8). YOY Northern Pike were not detected in the Pend d'Oreille River in 2020.

Based on spawning condition observations of captured females, the 2020 Northern Pike spawning window in the Pend d'Oreille River was estimated to have begun around May 20 2020, when the first ripe (eggs out of sac) female was observed and water temperature was over 11°C. The eggs of the previous four females captured between May 1 – 8 2020, when water temperature averaged 10.4°C (+/- 0.06°C with 95% CI, n = 192), were still contained within the sac. The egg sacs of the four females captured between May 1 – 8 2020 had an average weight of 1,416 g (+/- 547.8 g with 95% CI), with the heaviest at 1,888 g and the lightest at 623 g. Egg sacs were 14.5% (+/- 3% with 95% CI) of the Northern Pikes' body weight on average. A fecundity estimate was conducted on the female captured on May 8 2020, as her eggs were separated within the sac, unlike the females caught between May 1 and 7 2020. After counting 300 eggs, it was determined there were 10.3 eggs per gram. Using this ratio, it is estimated the four females had an average of 14,651 eggs (+/- 5,666 eggs with 95% CI; Table 8). The eggs of the female captured on May 20 2020 were not weighed because they were no longer contained in a sac. All spawning females in the Pend d'Oreille River were aged at 4 or 5 years old. Spring sampling in the Pend d'Oreille River did not occur after May 20 2020.

Table 8. Fork length (mm), weight (g), egg sac weight (g) and estimated egg count (based on 10.3 eggs/g) for female Northern Pike captured in the Pend d'Oreille River between May 1 and 8 2020.

Northern Pike ID	Length (mm)	Weight (g)	Egg Sac Weight (g)	Estimated Egg Count
NP_2020_PDO_002	1,001	10,376	1,707	17,659
NP_2020_PDO_003	1,062	12,150	1,888	19,531
NP_2020_PDO_004	926	8,860	1,447	14,969
NP_2020_PDO_005	933	6,540	623	6,445

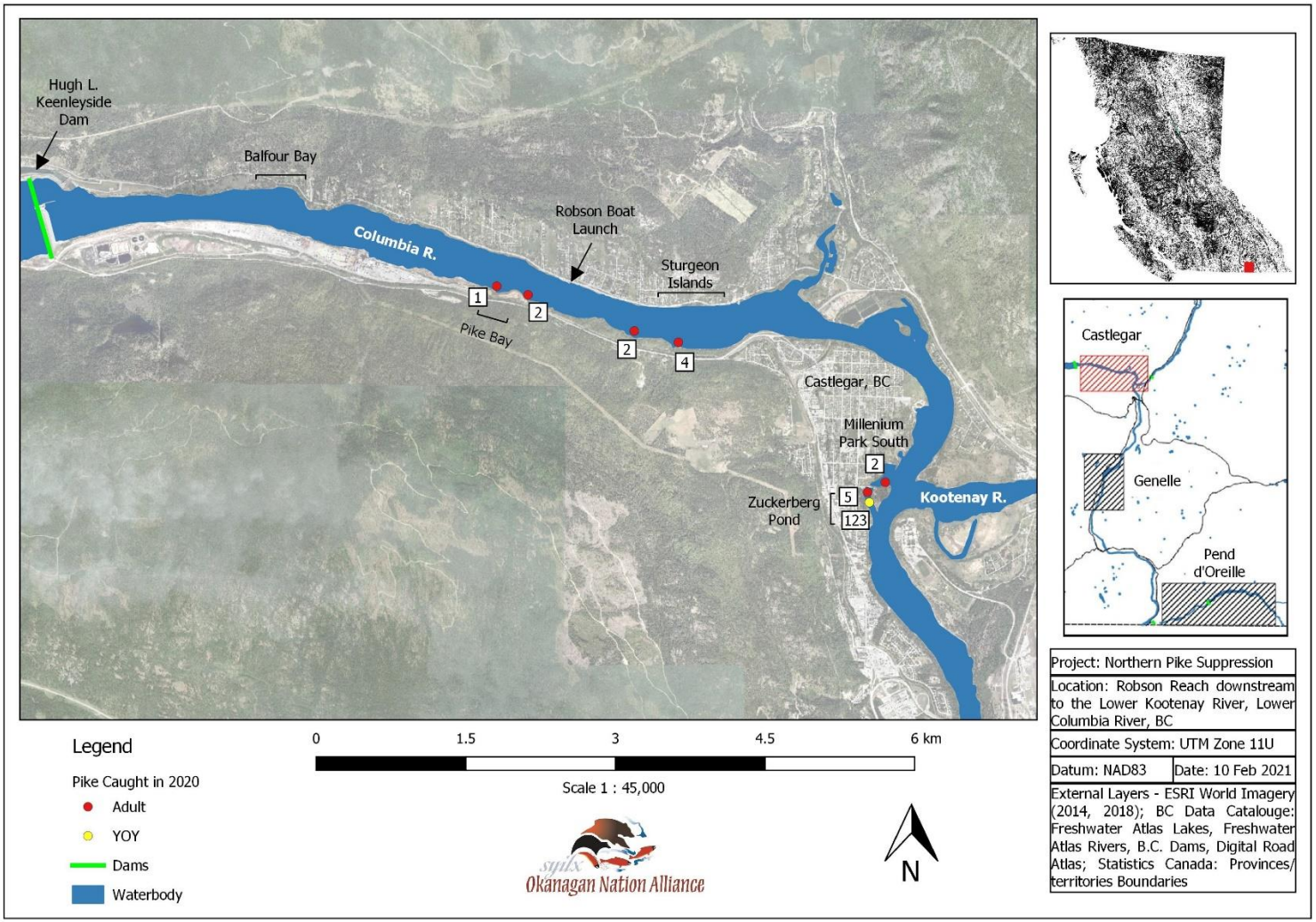

Figure 6. Locations of Northern Pike captured between June 9 and November 7 2020 (all methods including the CLBMON 45 Indexing Program) in the Castlegar area differentiating between adult and young-of-year with values indicating the number of Northern Pike caught at each location (BC Hydro unpublished data).

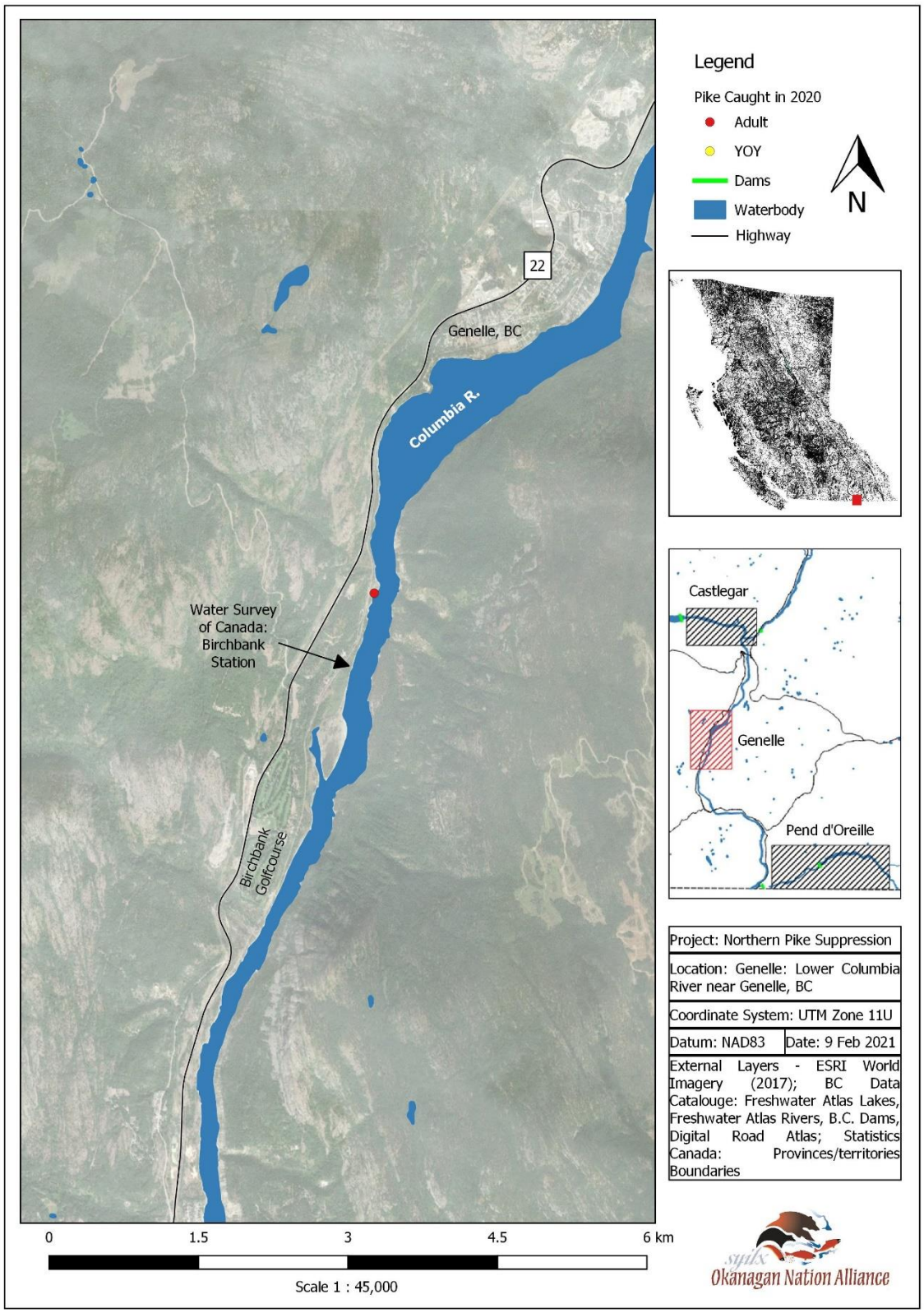

Figure 7. Location of Northern Pike capture (2020) near Genelle, BC differentiating between adults (red) and young-of-year (yellow; BC Hydro unpublished data).

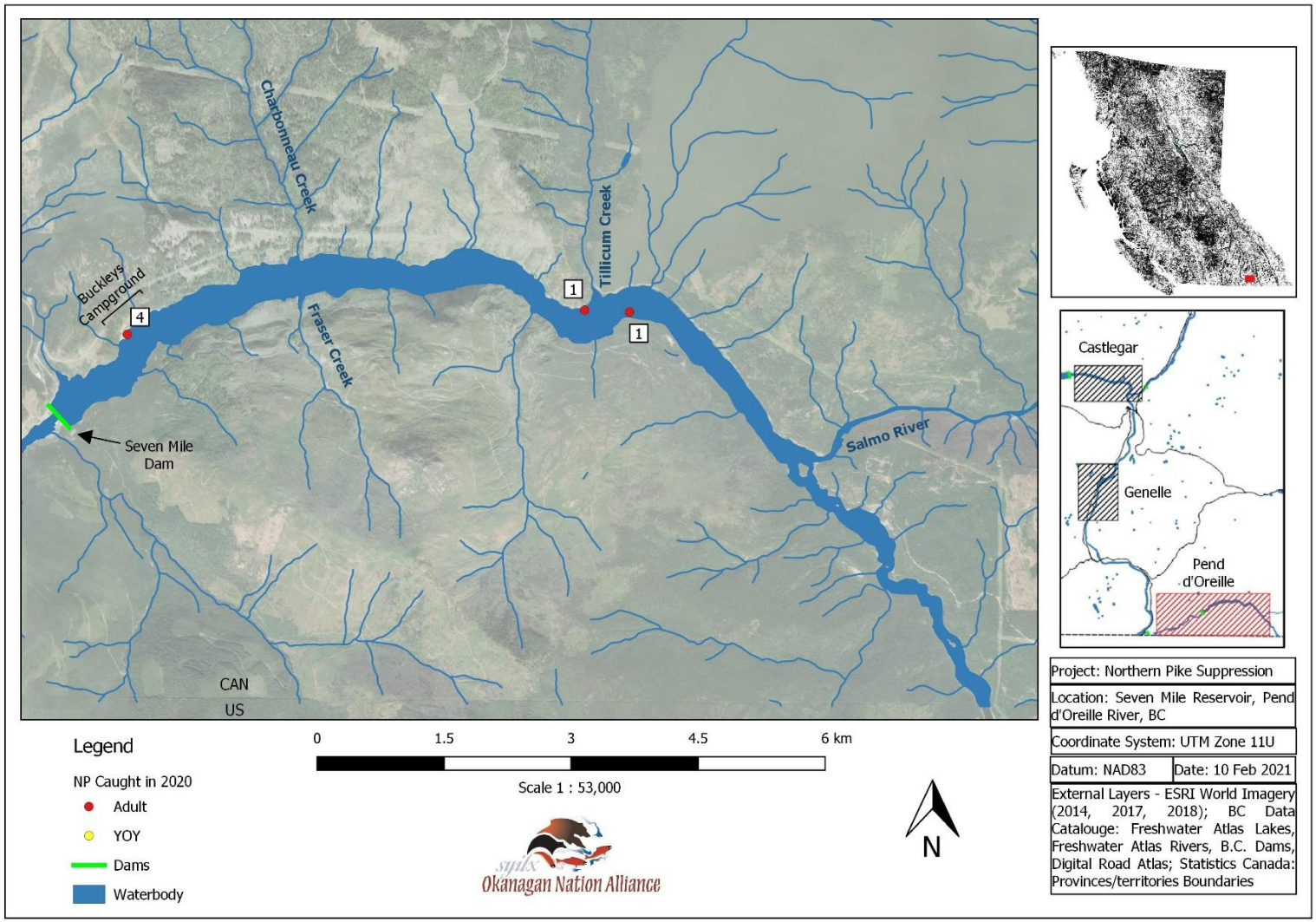

Figure 8. Locations of Northern Pike captured between April 28 and October 30 2020 in the Pend d'Oreille River differentiating between adults (red) and young-of-year (yellow) with values indicating the number of Northern Pike caught at each location.

In the LCR, the Northern Pike spawning window is expected to begin when water temperatures reach 8°C (Baxter and Neufeld 2015; ONA 2019). Based on water temperature data, the 2020 Northern Pike spawning window was suspected to have commenced around May 8 2020 (WSC 2020). However, due to the strict restrictions brought on by the COVID-19 Pandemic, suppression activities in the LCR did not begin until June 9 2020. By June 9 2020, the Northern Pike spawning window is suspected to have ended, based on the capture of six spawned-out adults (3 females and 3 males aged at 2 – 7 years) and one spawning male between June 9 – 12 2020. Between May 8 and June 11 2020 water temperatures averaged 9.7°C (+/- 0.04°C with 95% CI, n = 3,118; WSC 2020).

4.3 Habitat and Habitat Use

Daily water temperatures in the Pend d'Oreille River, averaging 15.9°C (+/- 0.74°C with 95% CI, n = 213), were warmer than the LCR, averaging 12.8°C (+/- 0.56°C with 95% CI, n = 213; WSC 2020), between April 1 and October 31 2020. There was a total of 23 days where the average daily temperature in the Pend d'Oreille River (at 1 meter below the surface) was within the Northern Pike optimal temperature for growth and preference (20°C – 22°C), and only one day (August 19 2020) was at, or exceeded, the upper limit for Northern Pike preference (25°C; Casselman and Lewis 1996). Water temperatures in the LCR did not exceed 19.6°C (WSC 2020; Fig 9).

Zuckerberg Pond had an average temperature of 16.9°C (+/- 2.17°C with 95% CI, n = 19) based on readings from nineteen days between July 22 and October 22 2020. A temperature logger was installed at Zuckerberg Pond, but was stolen one week prior to download. Therefore, temperature data used for Zuckerberg Pond is limited to spot measurements recorded during suppression activities.

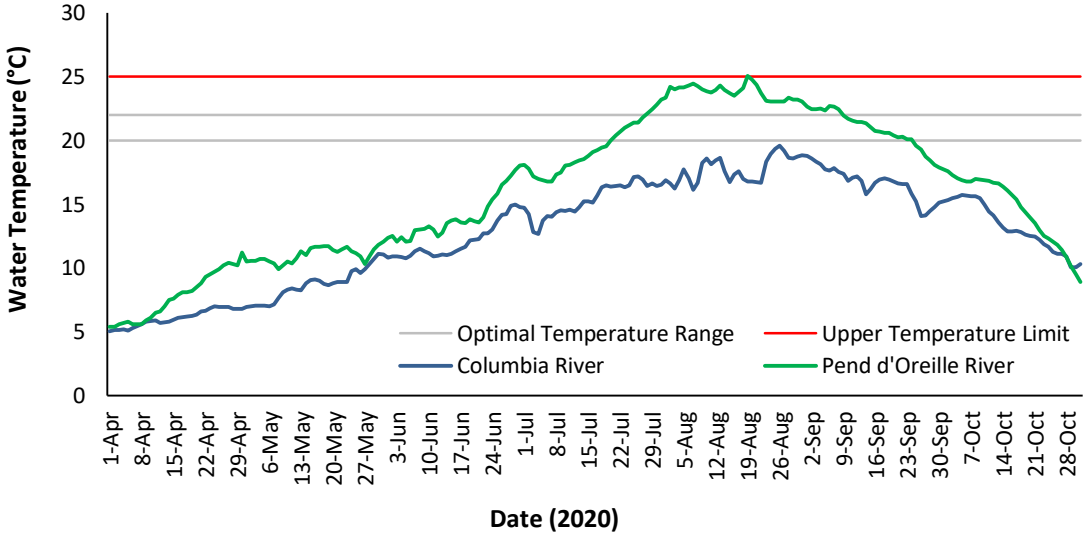

Figure 9. Average daily water temperature (°C) of the Pend d'Oreille River (green) and Columbia River (blue; WSC 2020) between April 1 and October 31 2020 with the optimal temperature range for Northern Pike growth and preference (20°C - 22°C; grey), and the upper preferred temperature limit (25°C; red; Casselman and Lewis 1996).

Adult Northern Pike were typically encountered in water depths between 2 – 7 m and appeared to occur more frequently in sites with a higher percentage of aquatic vegetation; while captures were less frequent in sets with a higher percentage of deep-water habitat and shallow water habitats without cover (see Methods *3.1.7 Habitat Data Collection* for further explanation; Fig 10). Other documented habitat characteristics (interstices, woody debris, and terrestrial vegetation) appeared less significant.

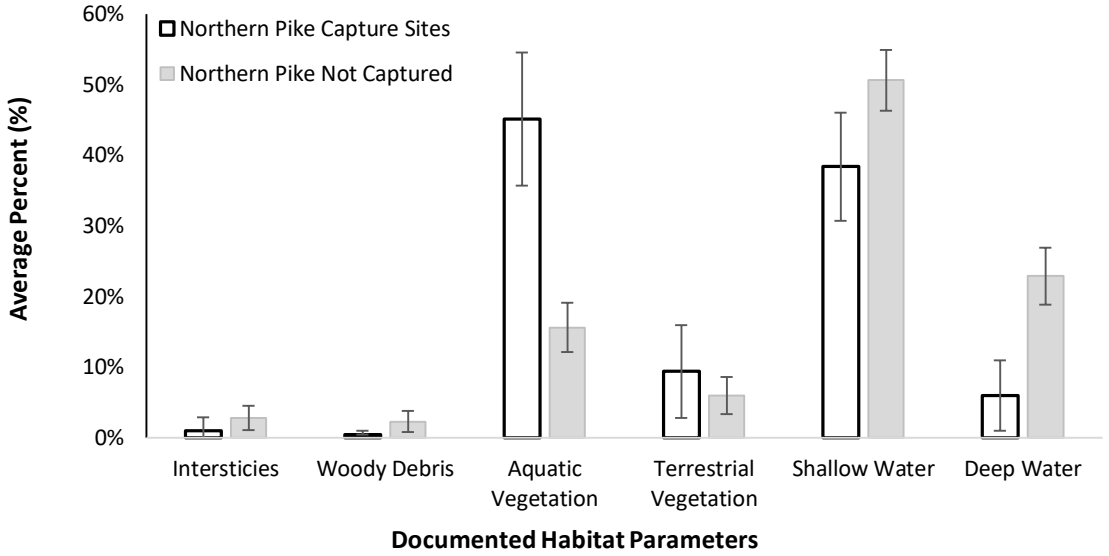

Figure 10. Average percent of habitat characteristics (with 95% confidence intervals) in sites with Northern Pike captures (white; n = 47) and without Northern Pike captures (grey; n = 190).

All YOY Northern Pike captured in 2020 were from Zuckerberg Pond and were in a water depth of 0.2 m – 1.6 m (Fig 11), though one YOY Northern Pike was observed upstream of the dyke separating the LCR Mainstem from Zuckerberg Pond. Typically, Zuckerberg Pond becomes isolated when flows from the LCR Mainstem are reduced through water management at HLK Dam. This restricts immigration and emigration from the pond and results in higher water temperatures (ONA 2019). However, Zuckerberg Pond did not become isolated from LCR Mainstem in 2020, resulting in similar average temperatures (16.9°C +/- 2.17°C with 95% CI, n = 19 in Zuckerberg Pond and 16.4°C +/- 0.36°C with 95% CI, n = 93 in the LCR Mainstem) between July 22 and October 22 2020. Due to the abundance of shallow, weedy habitat, non-native species appeared to be thriving in Zuckerberg Pond and are likely seeding the LCR Mainstem. This assumption is based on 83.3% of the non-native bycatch captured in the LCR between June 9 and October 30 2020 were from Zuckerberg Pond, and non-native species bycatch out-numbered native species bycatch in Zuckerberg Pond 14:1; with 0% of total bycatch in Zuckerberg Pond consisting of a native recreational species (Rainbow Trout). No listed species were observed in Zuckerberg Pond.

Figure 11. Twenty-three young-of-year Northern Pike captured at Zuckerberg Pond on August 27 2020. Photo: Eleanor Duifhuis, Okanagan Nation Alliance.

4.4 Population Dynamics and Growth

More Northern Pike were caught in the Columbia River (138 individuals; 140 when including CLBMON 45 data) than the Pend d'Oreille River (6 individuals; Table 9). Of the adult Northern Pike confidently sexed, the Pend d'Oreille River had a higher percentage of females (83% of catch females) than the LCR (50% of catch females). Females comprised 39% of the total adult catch which tied unknown sex (also 39% of total catch), while males were the lowest percentage of the total catch (22%). Individuals classified as unknown sex were typically aged at 1 – 2 years and sex was difficult to identify. YOY Northern Pike captures were limited to Zuckerberg Pond, but consisted of 84% of the total 2020 catch.

Table 9. Summary of Northern Pike captured between April 28 and October 30 2020 by waterbody differentiating between males, females, unknown sex, young-of-year (YOY) including Northern Pike captured during the CLBMON 45 Indexing Program October 5 – November 7 2020 (shaded; BC Hydro unpublished data).

Location	Adult			YOY	Total
	Male	Female	Unknown		
Pend d'Oreille River	1	5	0	0	6
Columbia River	4	4	7	123	138
Columbia River (CLBMON 45)	0	0	2	0	2

Northern Pike ranged in length from 79 mm – 1,062 mm and were aged between YOY to 7 years old. Northern Pike caught in the LCR had a wider range of ages (YOY to 7 years old) while individuals captured in the Pend d'Oreille River were closer in age (3 – 5 years old; Fig 12). YOY were not detected in the Pend d'Oreille River in 2020. The largest (length x weight) Northern Pike (female aged at 5 years) was captured in the Seven Mile Reservoir (Pend d'Oreille River), near Buckley Campground, and was 1,062 mm (41.8 inches) and weighed 12,150 g (26.8 lbs). The smallest Northern Pike was captured in Zuckerberg Pond and was 79 mm (3.1 inches) and weighed 3 g (0.11 oz; Fig 13). All Northern Pike biological data are available in Appendix D.

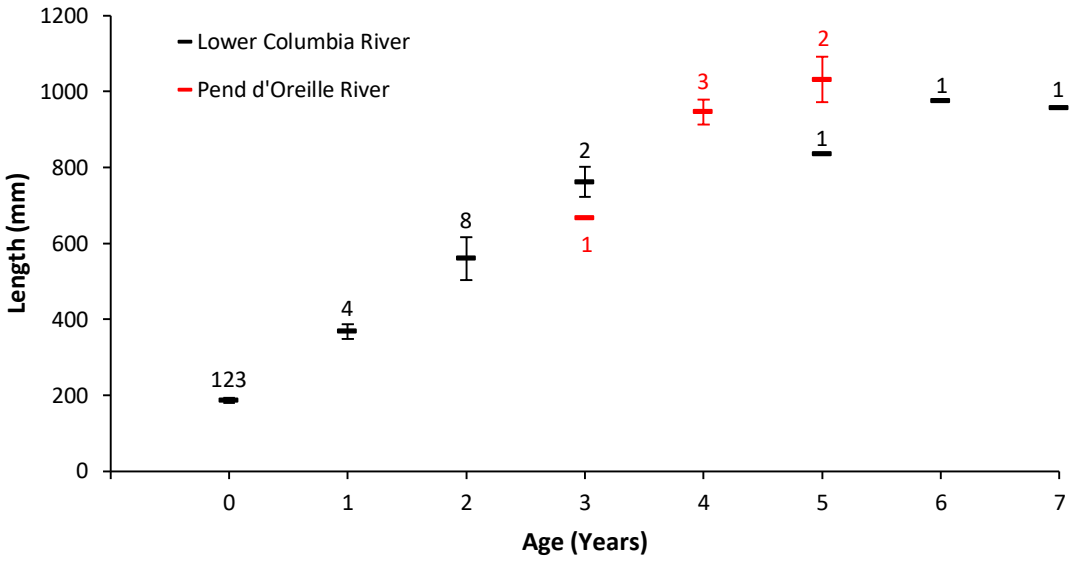

Figure 12. Age of Northern Pike (where 0 = young-of-year) caught between April 28 and October 30 2020, including CLBMON 45 Indexing Program data (October 5 – November 7 2020; BC Hydro unpublished data), by average length (mm; with 95% confidence intervals) and waterbody. Sample number indicates the number of individuals that belonged in the age class for each respective waterbody (black = Columbia River; red = Pend d'Oreille River).

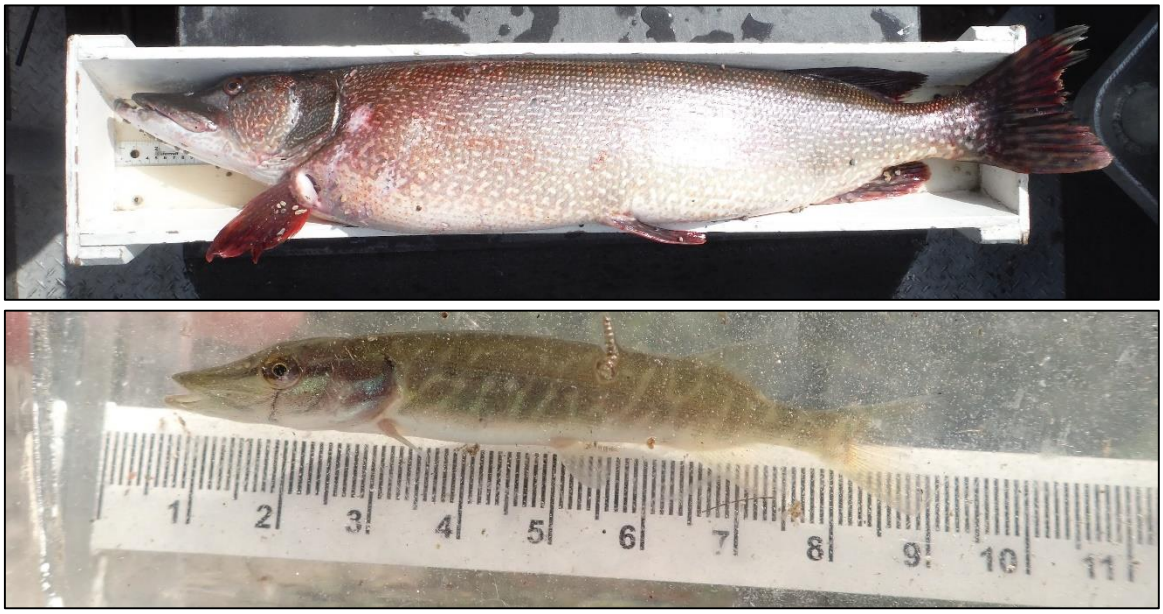

Figure 13. (Top) Largest Northern Pike caught between April 28 and October 30 2020 (aged 5 years) caught on May 5 2020 in the Pend d'Oreille River (Seven Mile Reservoir); (bottom) smallest Northern Pike caught between April 28 and October 30 2020 (aged young-of-year) on July 22 2020 in Zuckerberg Pond. Photos: Eleanor Duifhuis, Okanagan Nation Alliance.

Adult Northern Pike caught during the suppression program in the LCR had an average length of 619 mm (+/- 106.3 mm with 95% CI, n = 15) and an average weight of 2,723 g (+/- 1,262.5 g with 95% CI, n = 15), while adult Northern Pike in the Pend d'Oreille River were larger; having an average length of 928 mm (+/- 109.7 mm with 95% CI, n = 6) and an average weight of 8,182 g (+/- 2,643.7 g with 95% CI, n = 6). YOY Northern Pike had and average length of 187 mm (+/- 7.0 mm with 95% CI, n = 123) and an average weight of 57 g (+/- 5.9 g with 95% CI, n = 123). Overall size of Northern Pike (length x weight) was typically larger in the Pend d'Oreille River than the LCR, but the condition factor of adult Northern Pike did not significantly change between waterbodies (Fig 14).

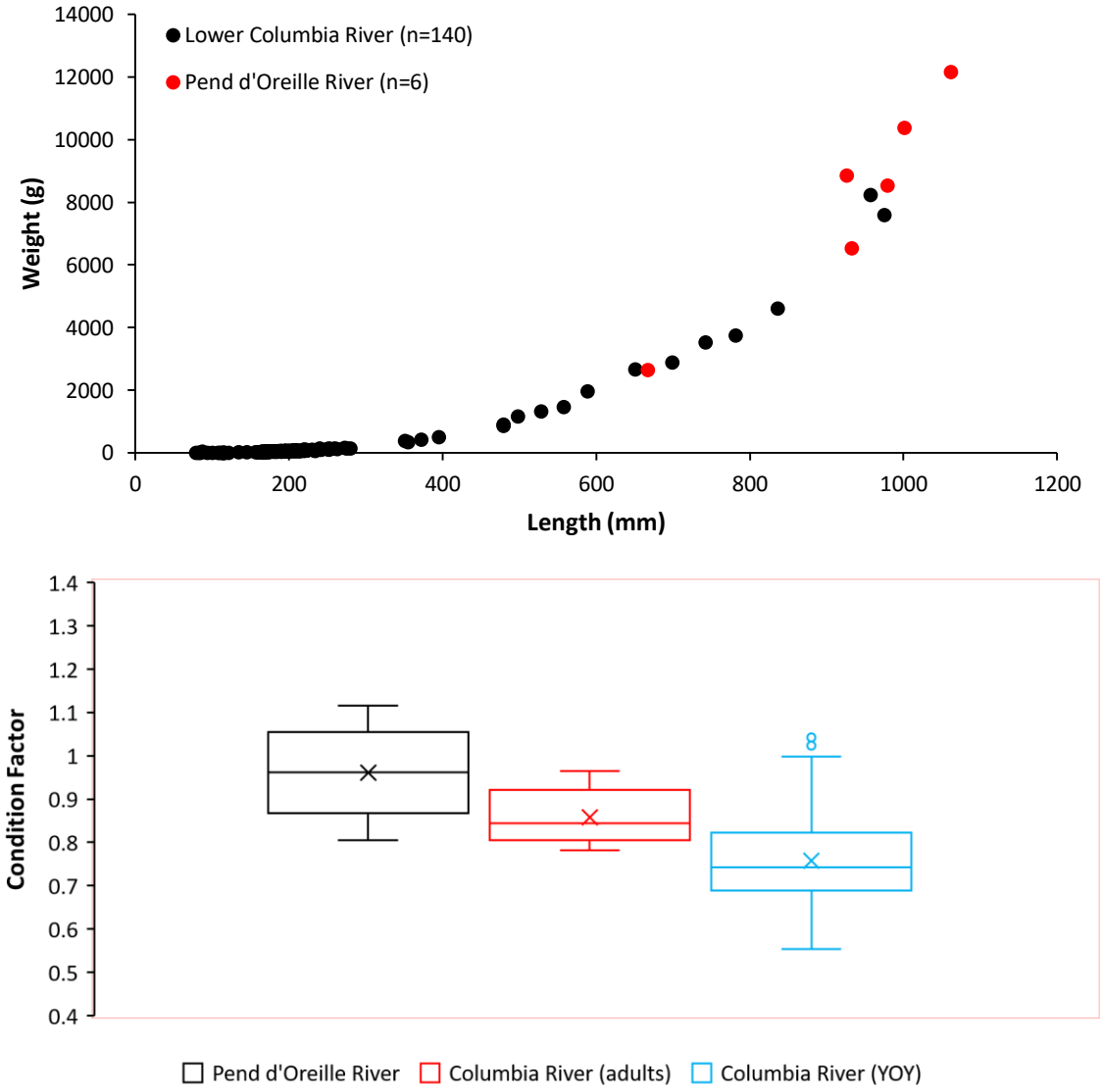

Figure 14. (Top) Size (length by weight) of Northern Pike captured between April 28 and October 30 2020 in the Columbia and Pend d'Oreille Rivers, with sample size (n) described in the legend; (bottom) condition factor of adult Northern Pike caught in the Pend d'Oreille and the Columbia Rivers, and YOY Northern Pike (blue) between April 28 and October 30 2020.

An adult Northern Pike containing an Acoustic Transmitter Tag was captured in the LCR on June 11 2020. This Individual was determined to be from a study conducted by Doutaz (2019) and was tagged in May 2016. Between May 2016 and June 2020 this individual grew by 22.7 cm and 4.93 kg for an average growth rate of 5.57 cm/year and 1.21 kg/year.

Growth rate of YOY Northern Pike in Zuckerberg Pond was estimated to be 1.11 cm/week and 9.4 g/week, based on the average length and weight of Northern Pike captures by week between July 19 and October 24 2020 (Fig 15).

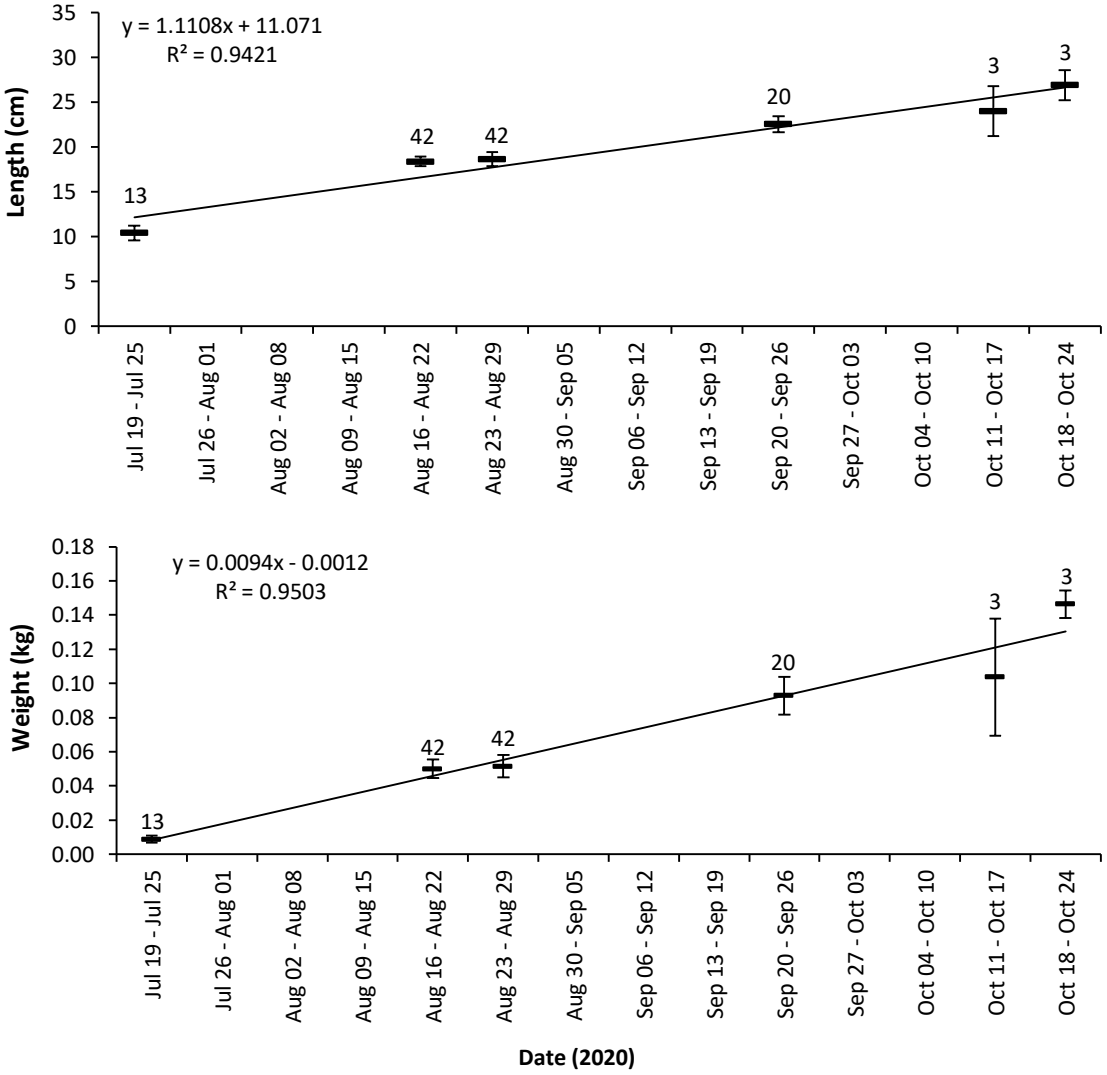

Figure 15. (Top) Average fork length (mm with 95% confidence intervals) of young-of-year Northern Pike captured per week at Zuckerberg Pond between July 19 and October 24 2020, used to estimate linear growth rate; (bottom) average weight (kg with 95% confidence intervals) of young-of-year Northern Pike captured per week at Zuckerberg Pond between July 19 and October 24 2020, used to estimate weight growth.

4.5 Diet and Parasitic Relationships

Fish or fish parts were identified in 67% of inspected Northern Pike stomachs (n = 133). Identified prey included Rainbow Trout, Suckers (*Catostomidae* sp.), Mountain Whitefish (*Prosopium williamsoni*), Lake Whitefish (*Coregonus clupeaformis*), Peamouth Chub (*Mylocheilus caurinus*), Redside Shiner (*Richardsonius balteatus*), Sculpin (*Cottoidea* sp.), and Yellow Perch (*Perca flavescens*). The largest prey observed was a Lake Whitefish (318 mm/463 g) found in an adult male Northern Pike (667 mm/2,637 g) in the Pend d'Oreille River, and was the only prey item identified in the Pend d'Oreille River in 2020. Two instances occurred where prey length was within 10 mm of half the Northern Pike length (example: Fig 16). Other stomach contents included grasshoppers, aquatic sow bugs, wasps, leeches, and other unidentified invertebrates.

The dominant prey species for adult Northern Pike in the LCR (n = 15) were Mountain Whitefish occurring in 20% of inspected stomachs, followed by Suckers and Peamouth Chub occurring in 13% if inspected stomachs. One Rainbow Trout was observed in adult Northern Pike stomach in 2020 (7% of inspected stomachs). YOY Northern Pike (n = 112) in the LCR (Zuckerberg Pond) preyed upon Yellow Perch (in 22% of inspected stomachs) and Sculpin (in 19% of inspected stomachs) more than any other prey item, with Rainbow Trout found in 4% of inspected stomachs. YOY Northern Pike also had the most occurrences of invertebrate predation at 17% (vs an occurrence of 7% in adults).

Figure 16. (Top) Male Northern Pike (667 mm/2,637 g) caught at Buckley Campground in the Seven Mile Reservoir (Pend d'Oreille River) with a 318 mm/463 g Lake Whitefish in its stomach on April 29 2020. Photo: Evan Smith, Okanagan Nation Alliance; (bottom) YOY Northern Pike (220 mm/95 g) caught in Zuckerberg Pond with a Sucker (110 mm) in its stomach on August 21 2020. Photo: Eleanor Duifhuis, Okanagan Nation Alliance.

Parasites were found in the stomach or intestines of 71% of sampled adult Northern Pike and 2% in YOY Northern Pike. These parasites were primarily observed in the stomach and/or intestines and resembled tapeworms. Six specimen samples were collected and sent to the lab. However, the samples were too degraded for a visual identification.

4.6 Bycatch

In total 1,204 fish of 20 different species were captured as bycatch during suppression activities. Of the 1,204 fish, 549 (45.6%) were native species and 655 (54.4%) were non-native species; with Yellow Perch consisting of 33.6% of the total bycatch (Table 10). All non-native species (excluding Walleye and Lake Whitefish) were euthanized in accordance with applicable permitting. In total 457 non-native fish (excluding Walleye, Lake Whitefish, and Northern Pike) were removed during this program. For information regarding total bycatch by location and sample method see Appendix E.

Table 10. Bycatch species captured between April 28 and October 30 2020 in the Columbia River "1" Pend d'Oreille River "2" and lower Kootenay River "3" for all suppression and monitoring methods.

Species	Scientific Name	Status	# Caught
Bull Trout[2]	*Salvelinus confluentus*	Native	9
Cutthroat Trout[2]	*Oncorhynchus clarkii*	Native	3
Sucker (General)[1]	*Catostomidae* sp.	Native	7
Largescale Sucker[1,2,3]	*Catostomus catostomus*	Native	216
Longnose Sucker[1,2,3]	*Catostomus catostomus*	Native	32
Mountain Whitefish[1]	*Prosopium williamsoni*	Native	75
Northern Pikeminnow[1,2,3]	*Ptychocheilus oregonensis*	Native	110
Peamouth Chub[1,2]	*Mylocheilus caurinus*	Native	22
Rainbow Trout [1,2,3]	*Oncorhynchus mykiss*	Native	44
Redside Shiner[1]	*Richardsonius balteatus*	Native	15
Sculpin (General)[1]	*Cottoidea* sp.	Native	1
White Sturgeon[1]	*Acipenser transmontanus*	Native	15
Brook Trout[2]	*Salvelinus fontinalis*	Non-Native	2
Brown Trout[2]	*Salmo trutta*	Non-Native	7
Bullhead/catfish[2]	*Ictaluridae* sp.	Non-Native	1
Lake Trout[2]	*Salvelinus namaycush*	Non-Native	27
Lake Whitefish[1,2,3]	*Coregonus clupeaformis*	Non-Native	107
Smallmouth Bass [1,2]	*Micropterus dolomieu*	Non-Native	13
Tench[1,2]	*Tinca tinca*	Non-Native	7
Walleye[1,2,3]	*Sander vitreus*	Non-Native	87
Yellow Perch[1,2]	*Perca flavescens*	Non-Native	404

4.6.1 Native Species Bycatch

The Pend d'Oreille River had the most instances of native species bycatch with 343 fish of 7 species (62.5% of native species bycatch); followed by the LCR with 179 fish of 9 species (32.6% of total native species bycatch), and the lower Kootenay River with 27 fish of 4 species (4.9% of native species bycatch; Table 11). The combined mortality rate of native species for all sampling methods was 10.4%. Gillnetting and backpack electrofishing contributed to native species mortality (8.7% and 64.7%, respectively); mortality of SARA-listed species did not occur.

Table 11. Native species bycatch by location from April 28 to October 30 2020; the Sucker species includes Longnose Sucker, Largescale Sucker, and unidentified Sucker species.

Location	Species	Scientific Name	# Caught
Pend d'Oreille River	Bull Trout	*Salvelinus confluentus*	9
	Cutthroat Trout	*Oncorhynchus clarkii*	3
	Sucker sp.	*Catostomidae* sp.	192
	Northern Pikeminnow	*Ptychocheilus oregonensis*	88
	Peamouth Chub	*Mylocheilus caurinus*	20
	Rainbow Trout	*Oncorhynchus mykiss*	31
Columbia River	Sucker sp.	*Catostomidae* sp.	52
	Mountain Whitefish	*Prosopium williamsoni*	75
	Northern Pikeminnow	*Ptychocheilus oregonensis*	7
	Redside Shiner	*Richardsonius balteatus*	15
	Peamouth Chub	*Mylocheilus caurinus*	2
	Rainbow Trout	*Oncorhynchus mykiss*	12
	Sculpin (General)	*Cottoidea* sp.	1
	White Sturgeon	*Acipenser transmontanus*	15
Kootenay River	Sucker sp.	*Catostomidae* sp.	11
	Northern Pikeminnow	*Ptychocheilus oregonensis*	15
	Rainbow Trout	*Oncorhynchus mykiss*	1

White Sturgeon were scanned for a PIT tag whenever possible, some individuals escaped gillnets before they could be scanned. White Sturgeon were removed from gillnets while in the river, and were only brought on-board the vessel when necessary. All White Sturgeon were released in good health and gillnet set times were reduced from 4 hours to 2 hours once the occurrence of White Sturgeon bycatch increased. To further reduce instances of White Sturgeon bycatch, sampling was reduced at sites with multiple White Sturgeon captures. For PIT tag information of White Sturgeon see Appendix F.

4.6.2 Non-Native Species Bycatch

The LCR had the highest amount of non-native species bycatch with 479 fish of 4 species (73.1% of total non-native species bycatch); followed by the Pend d'Oreille River with 144 fish of 9 species (22.0% of total non-native species bycatch) and lower Kootenay River with 32 fish of 2 species (4.9% of total non-native species bycatch; Table 12). Zuckerberg Pond near Castlegar BC contained 83.3% of the total LCR non-native bycatch.

Table 12. Non-native species bycatch by location from April 28 to October 30 2020.

Location	Species	Scientific Name	# Caught
Columbia River	Lake Whitefish	*Coregonus clupeaformis*	74
	Tench	*Tinca tinca*	4
	Walleye	*Sander vitreus*	4
	Yellow Perch	*Perca flavescens*	397
Kootenay River	Lake Whitefish	*Coregonus clupeaformis*	29
	Walleye	*Sander vitreus*	3
Pend d'Oreille River	Brook Trout	*Salvelinus fontinalis*	2
	Brown Trout	*Salmo trutta*	7
	Bullhead/catfish	*Ictaluridae* sp.	1
	Lake Trout	*Salvelinus namaycush*	27
	Lake Whitefish	*Coregonus clupeaformis*	4
	Smallmouth Bass	*Micropterus dolomieu*	13
	Tench	*Tinca tinca*	3
	Walleye	*Sander vitreus*	80
	Yellow Perch	*Perca flavescens*	7

4.7 eDNA Sampling Results

In total, 27 eDNA samples were taken at nine sites (three replicate samples per site) at Christina Lake, Kettle River upstream of the confluence with Christina Creek, Syringa Provincial Park on the Arrow Lakes Reservoir, HLK Dam Forebay East, HLK Forebay West, Brilliant Dam Forebay in the Kootenay River, Glade in the Kootenay River, and positive control samples from the Robson Reach in the LCR and the Pend d'Oreille River at Buckley Campground (Fig 17).

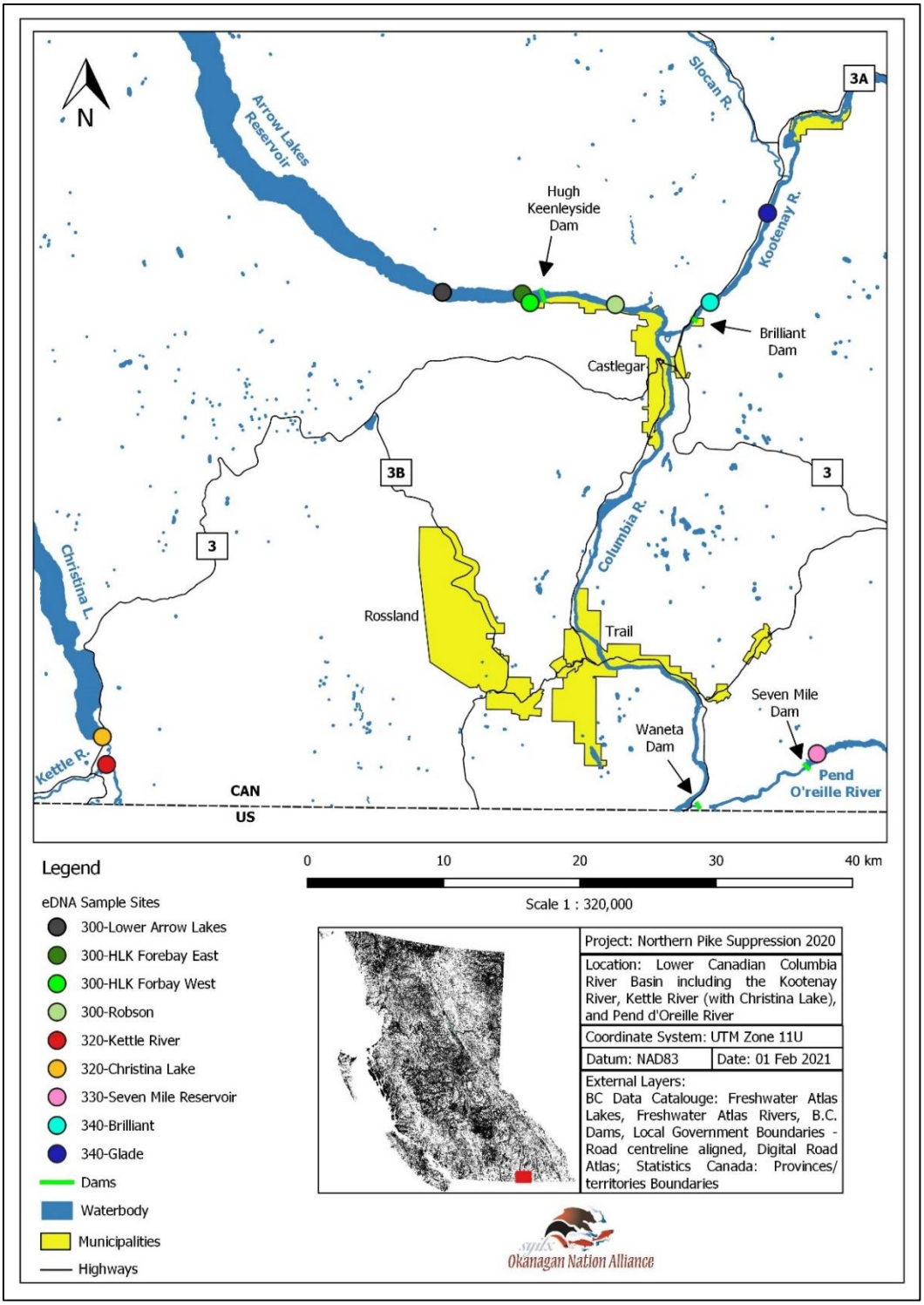

Figure 17. Locations of 2020 eDNA samples, including two positive control samples taken from the Robson Reach in the Columbia River and Pend d'Oreille River.

Due to a lab error, the eDNA samples were not processed so there are no results for the 2020 sampling season.

5.0 Discussion

In general, the 2020 Northern Pike Suppression Program was successful having removed 144 Northern Pike from the Columbia and Pend d'Oreille Rivers; compared to 45 in 2019 (ONA 2020) and 42 in 2018 (Wood 2019). Two additional Northern Pike were removed during the CLBMON 45 Indexing Program in 2020 (BC Hydro unpublished data). Methods used during 2020 were similar to past years and yielded similar results, while additional methods were implemented to varying degrees of success.

5.1 Population and Catch per Unit Effort

The Northern Pike population in the LCR was suspected to have decreased from 2014 to 2017 (Table 13; Baxter and Neufeld 2015; Baxter 2016; Baxter and Doutaz 2017; Baxter and Lawrence 2018), but the accuracy of these estimates are uncertain (Wood 2019).

Table 13. Population estimates on Northern Pike in the Columbia River between 2014 and 2017 using the Lincoln-Petersen mark-recapture method with 95% confidence intervals and their respective sources.

Year	Population Estimate	Minimum Estimate	Maximum Estimate	Northern Pike Removed	Source
2014	725	478	2,759	133	Baxter and Neufeld 2015
2015	410	151	670	116	Baxter 2016
2016	107	59	155	49	Baxter and Doutaz 2017
2017	99	25	172	41	Baxter and Lawrence 2018

Comparable (effort using SPIN nets in April and June in the Columbia River when water temperatures were > 7°C) $CPUE_{8hr}$ decreased by 0.11 Northern Pike/8-hours from 2019 to 2020, but was similar to 2018. Comparable $CPUE_{8hr}$ in 2020 was 86% lower than when suppression began in 2014, and less than the $CPUE_{8hr}$ in 2015 and 2016 (Table 14). Less Northern Pike were caught in 2020 than previous years during this comparable timeframe; however, this may be the result of suppression activities in the LCR beginning in early June.

Suppression efforts in the LCR began later than previous years (June 9 2020) due to the delayed Northern Pike spawning window in the Pend d'Oreille River (see *5.2 Distribution and Spawning*) and complications regarding crew composition and availability brought on by the COVID-19 Pandemic.

Table 14. Comparable (spring: April - June) Northern Pike $CPUE_{8hr}$ (Northern Pike/8-hours) from 2014 to 2020 in the Columbia River.

Year	Total Northern Pike	$CPUE_{8hr}$	Source
2014	92	3.48	Baxter and Neufeld 2015
2015	85	1.52	Baxter 2016
2016	49	1.02	Baxter and Doutaz 2017
2017	18	0.33	Baxter and Lawrence 2018
2018	19	0.41	Wood 2019
2019	14	0.60	ONA 2020
2020	10	0.49	Present

More Northern Pike were removed during the 2020 suppression program than any other suppression program year in the LCR, while the total number of Northern Pike removed in 2020 (including other programs) is comparable to 2014 and 2015, when active suppression began (Table 15). The high Northern Pike count in 2020 can be explained by the focus of effort in Zuckerberg Pond.

Table 15. Known Northern Pike removal numbers from 2010 to 2020, by program, in the Columbia River (LCR), Pend d'Oreille River (PDO), and Christina Lake (XL); with their respective sources. Dashes indicate sampling was not conducted.

Year	Location	Suppression	CLBMON45*	Angler Incentive	By Location	Columbia Basin Total	Source
2010	LCR	-	4	-	4	4	
2011	LCR	-	8	-	8	8	
2012	LCR	-	1	-	1	1	
2013	LCR	-	45	-	45	45	
2014	LCR	133	9	21	163	163	Baxter and Neufeld 2015
2015	LCR	116	3	8	127	131	Baxter 2016
	PDO	-	-	4	4		
2016	LCR	40	4	-	44	44	Baxter and Doutaz 2017
	PDO**	-	-	-	-		Doutaz 2019
2017	LCR	35	4	-	39	82	Baxter and Lawrence 2018
	PDO**	43	-	-	43		Doutaz 2019
2018	LCR	27	2	3	32	48	Wood 2019; ONA 2020
	PDO	15	-	1	16		
2019	LCR	35	17	-	52	62	ONA 2020
	PDO	10	-	-	10		
	XL	0	-	-	0		
2020	LCR	138	2	-	140	146	Present
	PDO	6	-	-	6		
					Total:	**734**	

* All BC Hydro unpublished data
** Doutaz (2019) describes the capture of 43 Northern Pike in the Pend d'Oreille Reservoir between 2016 and 2017, but specific location data and captures by year are not available.

In 2019 the ONA conducted sampling in Zuckerberg Pond which resulted in the removal of 19 YOY Northern Pike, through gillnetting, between August 27 and 30 2019 (ONA 2020). Zuckerberg Pond was estimated to be providing quality rearing habitat for Northern Pike and other invasive species, so suppression efforts were increased in 2020 (203.77 net-hours in 2020 vs 78.68 net-hours in 2019; ONA 2020). In addition, multiple methods were utilized in Zuckerberg Pond between July 22 and August 18 2020, with varying success, to target YOY Northern Pike too small for gillnets. This resulted in the capture of 12 YOY Northern Pike through electrofishing (effort: 1.87 hours, CPUE: 6.43, July 22 – August 18 2020) and one YOY Northern Pike through minnow trapping (effort: 121.05 hours, CPUE: 0.008, July 23 – 28 2020). Previous to 2019, suppression efforts (for spawning adults and juveniles) around Zuckerberg Island appeared to be focused on the upstream bay in the LCR Mainstem, and not in Zuckerberg Pond itself (Wood 2019; Baxter and Lawrence 2018). Therefore, the increased number of Northern Pike removed from the LCR in 2020 is likely a result of increased effort in Zuckerberg Pond for YOY Northern Pike, and not a general increase of the Northern Pike population.

Northern Pike population estimates in the Pend d'Oreille River (Seven Mile and Waneta Reservoirs) have not been conducted. Spring (April and June) Northern Pike $CPUE_{8hr}$ in the Pend d'Oreille River decreased by 26% from 2019 to 2020 despite doubling the effort (536.78 net-hours in 2019 and 1,238.48 net-hours in 2020), and has decreased steadily since 2018; which may indicate a reduction in population from 2018 to 2020 (Table 16). However, the 2020 spawning window appeared to be later in 2020 than in 2019, so catchability of Northern Pike during this timeframe may not be equal. Northern Pike spring CPUE in the Pend d'Oreille River is not available prior to 2018.

Table 16. Comparable (spring: April - June) Northern Pike $CPUE_{8hr}$ (Northern Pike/8-hours) from 2018 to 2020 in the Pend d'Oreille River.

Year	Total Northern Pike	$CPUE_{8hr}$	Source
2018	15	0.39	Wood 2019
2019	10	0.15	ONA 2020
2020	6	0.04	Present

A summary of effort by sample type targeting Northern Pike between 2014 and 2020 is available in Appendix G.

5.2 Distribution and Spawning

LCR Northern Pike capture locations in 2020 were consistent with previous years, with the majority of captures occurring in the Robson Reach and by Zuckerberg Island (Baxter and Neufeld 2015; Baxter 2016; Baxter and Doutaz 2019; Baxter and Lawrence 2018; Wood 2019; ONA 2020). Adult Northern Pike in the LCR are predominantly encountered along the right downstream bank of the Robson Reach between Celgar Mill and the Robson Bridge, and near Zuckerberg Island and the Kootenay Oxbow downstream of the Robson Reach (Fig 18). YOY Northern Pike have mostly been encountered in Zuckerberg Pond and the Robson Reach, upstream of the Robson Boat Launch along the left bank to Sturgeon Island. One adult Northern Pike, captured during the CLBMON 45 Indexing Program, was located south of Genelle, BC outside of the typical suppression area (Fig 7 in *4.2 Distribution and Spawning*).

Northern Pike capture locations in the Pend d'Oreille River were consistent with previous years, with the majority of captures occurring at Buckley Campground and near Tillicum Creek (Wood 2019; ONA 2020). Northern Pike have primarily been captured south of Waneta Launch on the left downstream bank in the Waneta Reservoir, and at Buckley Campground, the mouth of Fraser Creek, and near Tillicum Creek in the Seven Mile Reservoir (Fig 19).

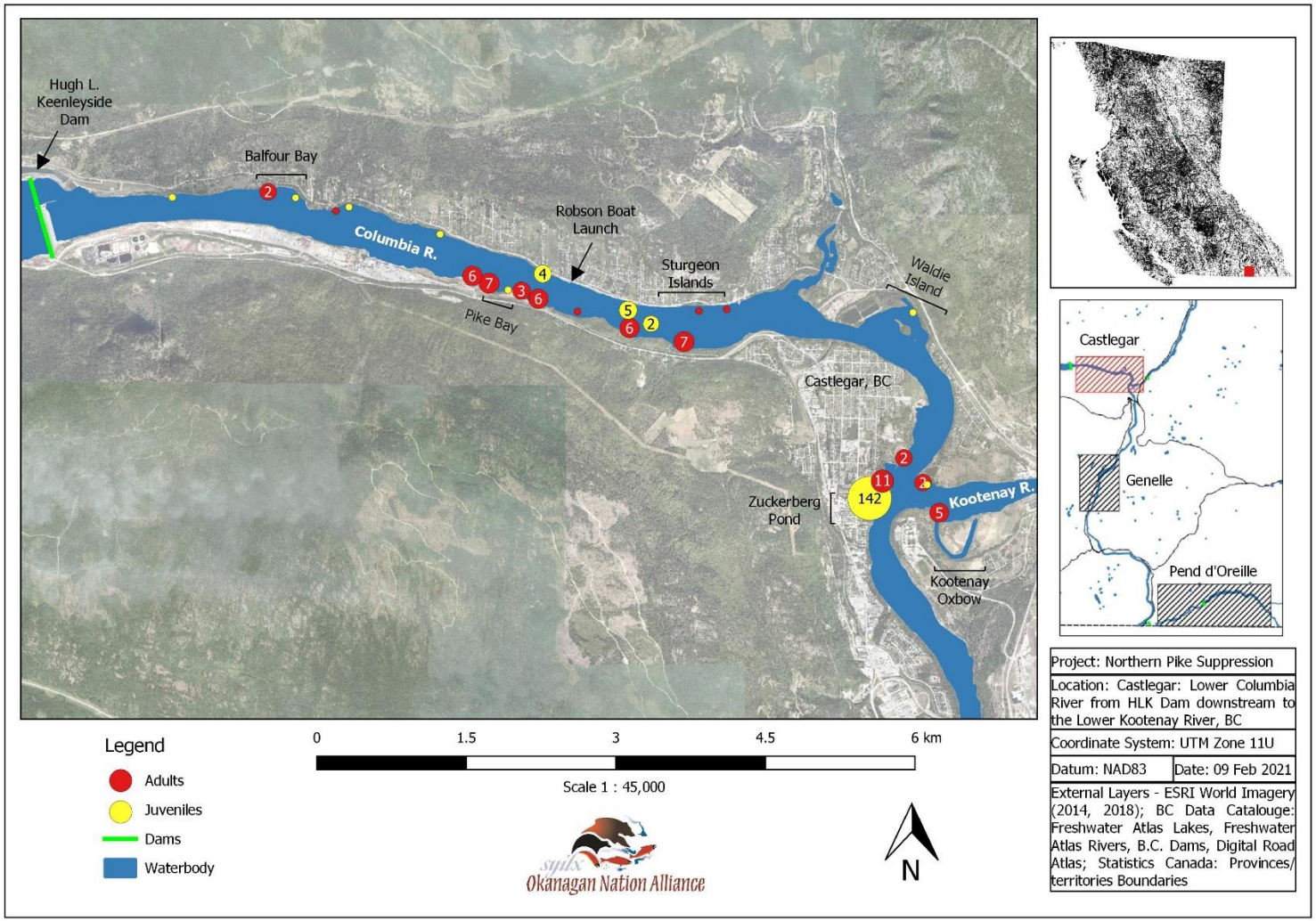

Figure 18. General Northern Pike capture locations (2018 – 2020) in the Castlegar area differentiating between adults (red) and young-of-year (yellow). When more than one Northern Pike were captured in a location, the total number of Northern Pike captured at the location is identified within the data point, while data points without a number have one Northern Pike captured at that location (BC Hydro unpublished data; Wood 2019; ONA 2020).

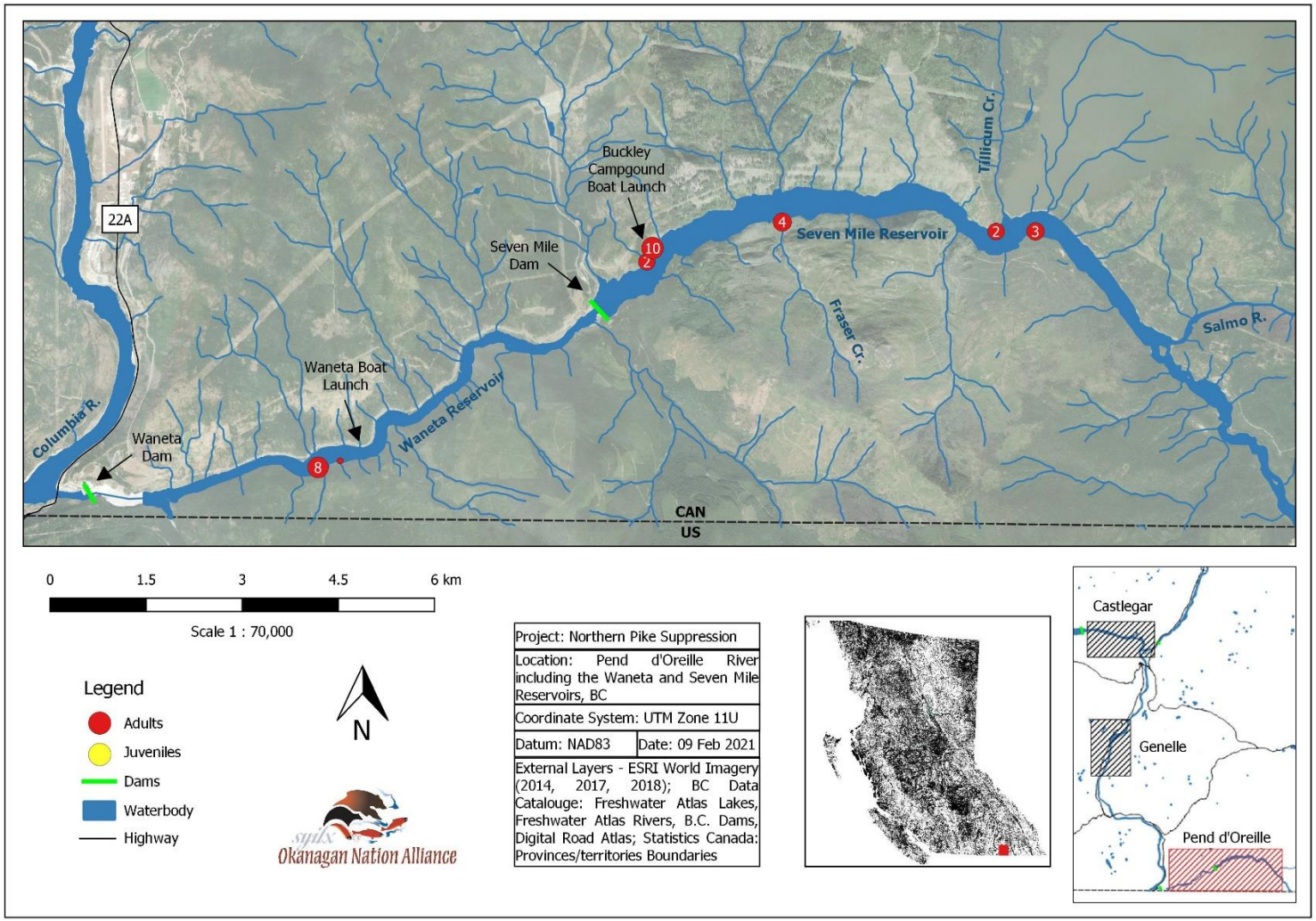

Figure 19. General Northern Pike capture locations (2018 – 2020) in the Pend d'Oreille River differentiating between adults (red) and young-of-year (yellow). When more than one Northern Pike were captured in a location, the total number of Northern Pike captured at the location is identified within the data point, while data points without a number have one Northern Pike captured at that location (Wood 2019; ONA 2020).

5.2.1 Pend d'Oreille River Spawning

Northern Pike appeared to begin spawning in the Seven Mile Reservoir around May 20 2020, approximately 18 – 20 days later than observations in 2018 and 2019 (Wood 2019; ONA 2020). Temperature is thought to have a significant influence on the Northern Pike spawning window in the LCR, and typically occurs around 8°C (Baxter and Neufeld 2015, Wood 2019, ONA 2020). In 2018 water temperatures reached 8°C on April 25 and the first spawning Northern Pike was observed five days later on April 30 (Wood 2019). Similarly, water temperatures reached 8°C on April 22 2019 and the first spawning Northern Pike was observed 10 days later on May 2 (ONA 2020). However, in 2020 water temperatures reached 8°C on April 16 and the first spawning Northern Pike was observed 34 days later on May 20 (with four Northern Pike females observed in pre-spawning condition May 1 – 8 2020; Fig 20). This indicates an additional variable which affects Northern Pike spawn timing in the Pend d'Oreille River.

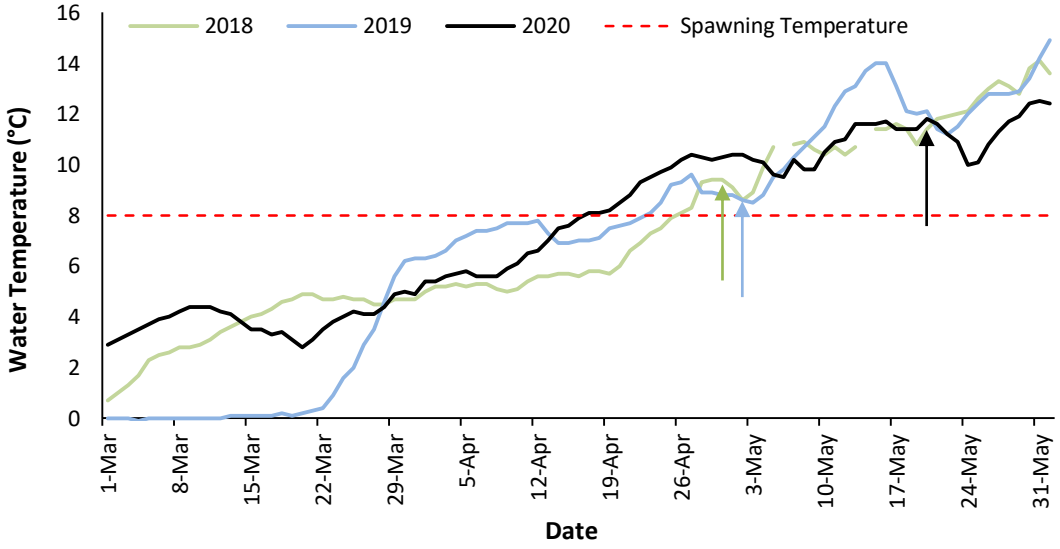

Figure 20. Water temperature (°C) in the Pend d'Oreille River (Seven Mile Reservoir) between March 1 and May 31 2018, 2019, and 2020, with the Northern Pike spawning temperature (red) and arrows approximating the date of the first observed spawning Northern Pike in each respective year (green = 2018, blue = 2019; black = 2020; BC Hydro unpublished data; Wood 2019; ONA 2020).

One theory is the operation of Seven Mile Dam; specifically, the drafting of Seven Mile Reservoir may affect the timing of Northern Pike spawning. In 2018 the Seven Mile Reservoir drafting event between March 1 and May 31 was relatively brief, drafting to 521.57 m (2.86 m below the average elevation during that timeframe), with three days between the more average elevations on April 9 (524.58 m) and April 13 (524.38 m); water temperatures at this time were between 5 – 6°C (BC Hydro unpublished data). As previously stated water temperatures reached 8°C on April 25 and the first spawning Northern Pike was observed five days later on April 30, so the drafting of Seven Mile Reservoir likely had no impact on the Northern Pike spawning window in 2018 (Wood 2019).

The Seven Mile Reservoir drafting event in 2019 (between March 1 and May 31) was more pronounced than in 2018, achieving a minimum elevation of 518.07 m (5.25 m below the average elevation during that timeframe), with six days between more average water elevations on April 19 (523.93 m) and April 26 (524.74 m); water temperatures reached 8°C during the drawdown event on April 22 (BC Hydro unpublished data). The timing of the 2019 drafting event coincided with Northern Pike spawning temperatures within four days, and the first spawning Northern Pike was observed six days after water elevations returned to average, so the drafting event in 2019 likely had little to no impact on the Northern Pike spawning window.

However, the Seven Mile Reservoir drafting event in 2020 (between March 1 and May 31) was the most pronounced, achieving a minimum elevation of 518.86 m (4.46 m below the average elevation during that timeframe), with 10 days between more average water elevations on April 24 (524.94 m) and May 4 (525.05 m); water temperatures reached 8°C prior to the drafting event on April 16 (BC Hydro unpublished data). The 2020 drafting event occurred nine days after water temperatures reached 8°C, concurrent with the expected Northern Pike spawning window, and the first spawning Northern Pike was observed sixteen days after reservoir levels returned to average (Fig 21).

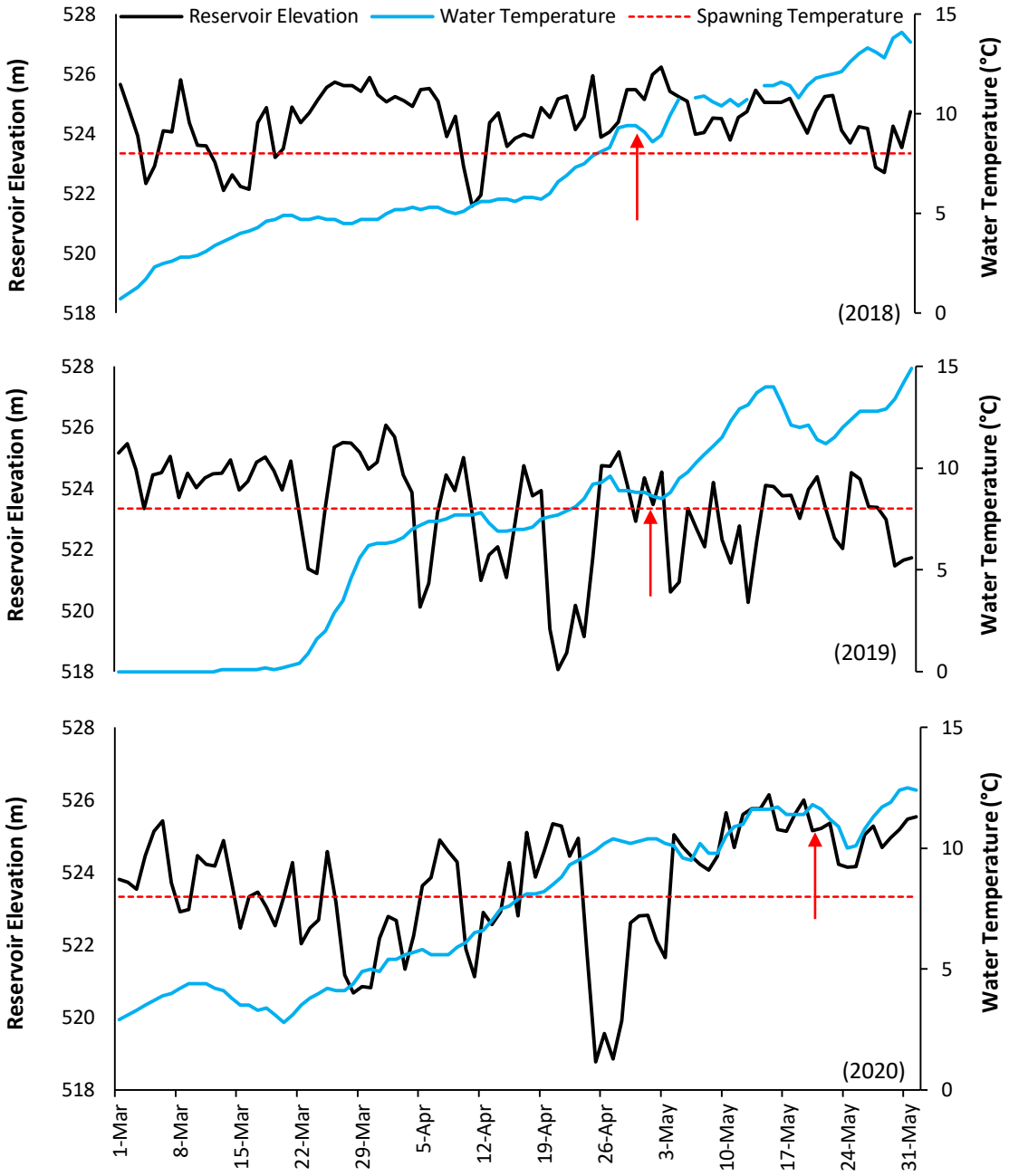

Figure 21. Pend d'Oreille River (Seven Mile Reservoir) reservoir elevation (m) and water temperature (°C) data between March 1 and May 31 2018, 2019, and 2020, depicting the suspected Northern Pike spawning temperature (8°C) and the first Northern Pike spawning observation (red arrow) of each year (BC Hydro unpublished data; Wood 2019; ONA 2020).

The drafting of Seven Mile Reservoir likely does not impact Northern Pike directly, but the vegetation on which they spawn. Coontail (*Ceratophyllum demersum*), an obligate hydrophyte with a widespread global range and native to British Columbia (Warrington 1980; Stiers *et al.* 2011; Global Invasive Species Database 2020), was observed at Buckley Campground (among other locations in the Seven Mile Reservoir) where Northern Pike are suspected to spawn (pers obs). Coontail is found throughout southern British Columbia in lakes, ponds, quiet streams, and irrigation ditches (Warrington 1980; Klinkenberg 2020) and can remain intact overwinter, but also exhibits multiple means of reproduction including seeds, fragmentation, and the formation of turions; allowing it to be among the first colonizers of lakes and ponds (Warrington 1980). These plants are tolerant to fluctuating water levels, low light and turbidity, and typically form dense mats in the water column; though they are intolerant to dewatering and cannot survive brief exposures (Warrington 1980; Stiers *et al*. 2011). Coontail have been found in depths ranging from 0.5 – 15 m and have an optimal growing temperature of 10 – 25°C (Warrington 1980; Invasive Species Compendium 2019; Global Invasive Species Database 2020). This species provides cover for juvenile/small fish, habitat for aquatic insects, and forage for waterfowl (Warrington 1980). However, it also displays invasive characteristics: outcompeting other native aquatic vegetation and competing with primary producers (phytoplankton; Warrington 1980; Pełechata and Pełechaty 2010). In the Pend d'Oreille Reservoir Coontail was observed to grow at an approximate elevation of 521 m.

The Northern Pike spawning window may have been delayed in 2020 because the timing of the Seven Mile Reservoir draft event coincided with the optimal growing temperature of Coontail and, intolerant of dewatering, the Coontail died off at elevations between 518 m – 520 m. During the dewatering event Northern Pike may have moved into deeper water, potentially unsuitable for spawning, and returned to their spawning areas when reservoir elevations returned to 523 m. The Coontail then re-colonized the area, to some degree, in a period of two weeks when the first spawning Northern Pike was observed.

The differences between the 2019 and 2020 drafting events are the duration of the draft and the timing. The 2019 draft began prior to water temperatures reaching 8°C and ended four days after the temperature was reached, giving Coontail, and other aquatic vegetation, time to grow before Northern Pike were ready to spawn. Whereas the 2020 drafting event may have begun as Northern Pike were preparing to spawn, interrupting the process and forcing Northern Pike to deeper waters, while impacting the vegetation on which they spawn. Therefore, future suppression activities may consider water management activities, in addition to temperature, when planning for the Northern Pike spawning window in the Pend d'Oreille Reservoir.

The locations of spawning/pre-spawn adult Northern Pike in 2020 support previous data that Buckley Campground and Tillicum Creek are potential spawning locations in the Pend d'Oreille River (Wood 2019; ONA 2020). To date, Buckley Campground, Tillicum Creek (right and left bank), and a bench in the Waneta Reservoir (downstream of the Waneta Launch) are identified as potential Northern Pike spawning locations. YOY have not been detected in the Seven Mile or Waneta Reservoirs.

5.2.2 Columbia River Spawning

The LCR spawning window was nearly ended by the time sampling began on June 9 2020 as evident by the capture of six spawned-out adult Northern Pike, and one spawning, between June 9 – 12 2020. Based on the assumption of water temperatures of 8°C initiating Northern Pike spawning (Baxter and Neufeld; Wood 2019; ONA 2020), the 2020 Northern Pike spawning window was likely between May 8 2020 and June 9 2020. The effect of river elevations on the LCR Northern Pike spawning window does not appear to be as significant as in the Pend d'Oreille River.

The locations of spawning/spawned-out adults and YOY Northern Pike in 2020 support previous data that the Robson Reach and Zuckerberg Island are Northern Pike spawning sites (Baxter and Neufeld 2015; Baxter and Lawrence 2018; Wood 2019; ONA 2020). To date, the Robson Reach (both banks from HLK to Robson Bridge), Waldie Island, Zuckerberg Island, Millennium Park, and the Kootenay Oxbow have all been identified as potential Northern Pike Spawning Locations.

5.3 Habitat and Habitat Use

General Northern Pike habitat characteristics (shallow water with low flow and aquatic vegetation) are present in the Columbia and Pend d'Oreille Rivers and typically coincide with Northern Pike capture locations. More Northern Pike have been captured in the LCR than the Pend d'Oreille River between 2018 – 2020, though Pend d'Oreille Northern Pike are typically larger and older (Fig 22; Wood 2019; ONA 2020). This may indicate recruitment in the LCR is more prevalent than in the Pend d'Oreille River, possibly due to elevation changes in the Seven Mile and Waneta Reservoirs.

Water temperatures in the Pend d'Oreille River appear to be more suitable for Northern Pike growth than the LCR, having 23 days in 2020 where the average daily water temperature was within the Northern Pike optimal temperature for growth and preference (20°C – 22°C) whereas the LCR Mainstem did not reach 20°C in 2020 (Cassleman and Lewis 1996; WSC 2020). However, off-channel habitats are present in the LCR which do reach optimal Northern Pike growing temperatures (Zuckerberg Pond).

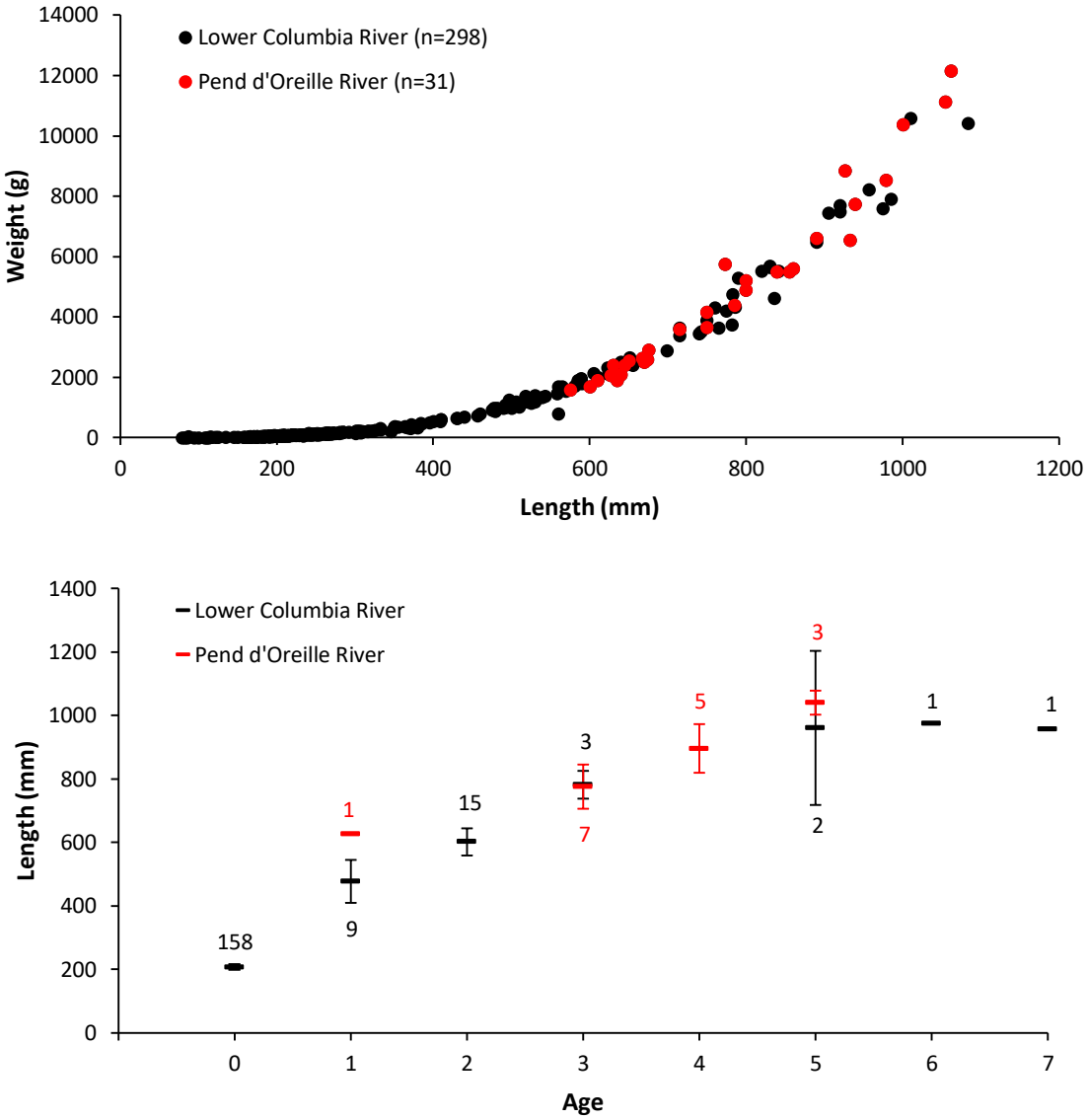

Figure 22. (Top) Size (length by weight) of Northern Pike in the Columbia River (black) and Pend d'Oreille River (red), with sample size (n) described in the legend, captured between 2010 and 2020 through the CLBMON 45 Indexing Program (2010 – 2020), and suppression programs (2018 – 2020; BC Hydro unpublished data; Wood 2019; ONA 2020) and (bottom) age of Northern Pike in the Columbia River (black) and Pend d'Oreille River (red), with the sample size (n) displayed above each data point, for all captures between 2019 and 2020 (ONA 2020).

5.3.1 Adult Northern Pike

Adult Northern Pike appeared to be utilizing similar habitats to previous years, primarily areas with aquatic vegetation in depths of 2 – 7 m (Baxter and Neufeld 2015; Baxter 2016; Baxter and Doutaz 2017; Baxter and Lawrence 2018; Wood 2019; ONA 2020). This habitat appears abundant in the Robson Reach of the LCR, where the majority of adult Northern Pike captures have occurred.

The one tagged Northern Pike captured in 2020 had a growth rate of 5.57 cm/year and 1.21 kg/year between 2016 and 2020. The linear growth rate was 1.63 cm/year lower than rates determined by Baxter and Neufeld (2015; averaging 7.20 cm/year), but weight growth was similar at 1.21 kg/year and 1.42 kg/year (average; Baxter and Neufeld 2015). The individual captured in 2020 was a male, while growth rates from 2015 were calculated with females. As female Northern Pike grow larger than males, it stands to reason that growth rates of males and females may have some variation; temperature and age may also contribute to variation in Northern Pike growth rates (McPhail 2007; Cassleman and Lewis 1996).

5.3.2 Young-of-Year Northern Pike

The capture of 123 YOY Northern Pike in 2020 supports previous data and observations that Zuckerberg Pond/Island provides rearing habitat for YOY Northern Pike (Wood 2019; ONA 2020). Kootenay Oxbow, Waldie Island, and the Robson Reach have also been identified as potential YOY Northern Pike rearing habitats (ONA 2016, Baxter and Lawrence 2018, Wood 2019, ONA 2020).

The YOY Northern Pike growth rate in Zuckerberg Pond (1.11 cm/week) was similar to that of YOY Northern Pike studied on two shallow lakes on Manitoulin Island in Lake Huron between 1968 and 1971 (1.04 cm/week; Cassleman and Lewis 1996). However, temperature is a significant factor in Northern Pike growth (Cassleman and Lewis 1996; McPhail 2007) and some annual variation in growth is likely to occur. Similarly, YOY Northern Pike in the LCR Mainstem likely have a lower growth rate, based on ONA (2020) data which compared YOY Northern Pike size in the LCR Mainstem to that of Zuckerberg Pond in 2019 (Fig. 23). This is significant considering fecundity of Northern Pike is proportional to body size, which can be 9,000 eggs per pound (454 g; Scott and Crossman 1973). Therefore, individuals rearing in Zuckerberg Pond have the potential to become more prolific spawners, due to their accelerated growth rate, than those rearing in the LCR Mainstem. As a result, suppression activities targeting YOY Northern Pike should prioritize Zuckerberg Pond and similar habitats.

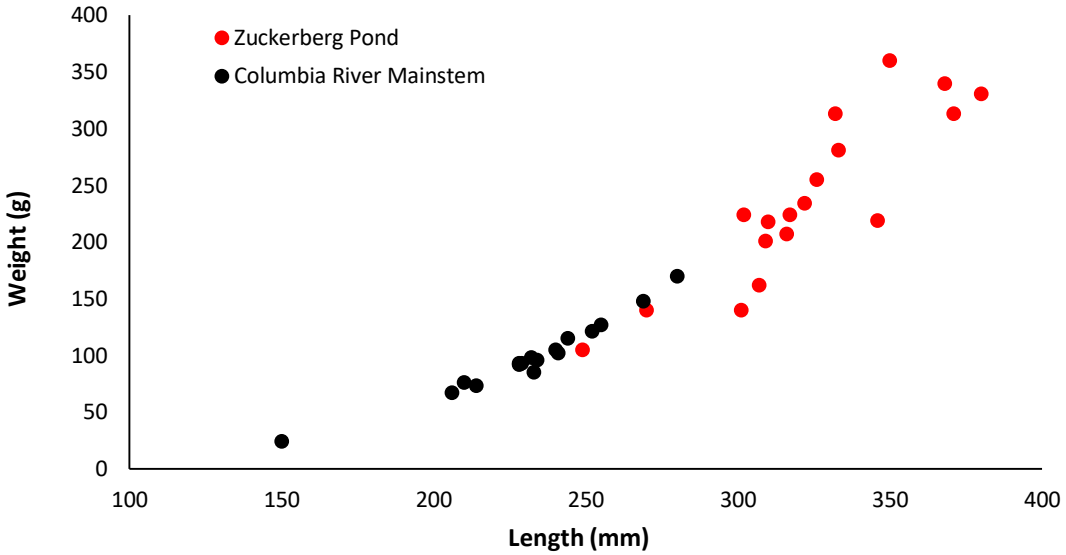

Figure 23. (Top) Size (length by weight) of young-of-year Northern Pike captured in Zuckerberg Pond (n = 18; August 27 to August 30 2019) and the Columbia River Mainstem (n = 17; August 22 to November 1 2019), including data from the CLBMON 45 Indexing Program (BC Hydro unpublished data; ONA 2020).

YOY Northern Pike were typically found in depths of 0.2 – 1.5 m, with individuals < 150 mm length often in a depth of 0.2 – 0.5 m of water with abundant vegetation; consistent with previous observations (Baxter and Lawrence 2018; ONA 2020). YOY Northern Pike appear to frequent shallow habitat and move deeper as they grow; a general rule being 10 cm of water depth per 10 mm of body length for every week after peak-spawning until they reach 150 mm (Cassleman and Lewis 1996). This may explain the lack of success with larval light traps, as when YOY Northern Pike are small enough to enter the light traps, they may be in shallower locations than where light traps have been previously set.

The targeting of YOY Northern Pike should focus on habitats which are shallow and possess abundant aquatic vegetation, with priority given to sites with water temperatures higher than the LCR average. Sites capable of reaching the optimum temperature for YOY growth and recruitment (22 – 24°C) should be a particular priority (Cassleman and Lewis 1996).

The Pend d'Oreille River appears to possess suitable YOY Northern Pike rearing habitat, though none have been encountered during active suppression between 2018 and 2020 (Wood 2019; ONA 2020).

5.4 Diet and Predation

Whitefish (Mountain and Lake) and other salmonids appear to be preferred prey of adult Northern Pike in the LCR, and are typically the largest prey item observed (Baxter and Neufeld 2015, Doutaz 2019; Wood 2019; ONA 2020). Rainbow Trout, Kokanee (*Oncorhynchus nerka*), Suckers, Sculpin, Northern Pikeminnow, Redside Shiners, Yellow Perch, and Dace have also been identified as Northern Pike prey species in the LCR (Baxter and Neufeld 2015; Doutaz 2019; Wood 2019; ONA 2020). Non-fish prey items included grasshoppers, aquatic sow bugs, wasps, leeches, and other unidentified invertebrates.

The dominant prey species of YOY Northern Pike in the LCR appears to be Yellow Perch and Sculpin, with Rainbow Trout occurring in 3% of YOY Northern Pike stomachs between 2019 and 2020 (n = 131). However, this may be a product of availability, as YOY Northern Pike were primarily captured in Zuckerberg Pond, which contained 83.3% of the LCR non-native bycatch in 2020.

Yellow Perch and Smallmouth Bass appear to be the preferred prey in the Pend d'Oreille River, with Yellow Perch having the highest frequency (Doutaz 2019; Wood 2019; ONA 2020). Rainbow Trout, Whitefish, Northern Pikeminnow, and Suckers have also been identified as Northern Pike prey species (Doutaz 2019; Wood 2019; ONA 2020). The frequency of empty stomachs is typically higher in the Pend d'Oreille River than the Columbia River, but individuals in the Pend d'Oreille River have primarily been captured while (or near) spawning and may not be eating as much, while individuals in the LCR are caught more frequently into the summer and fall, when predation increases (Baxter and Neufeld 2015, Doutaz 2019; Wood 2019; ONA 2020).

The predation of Sculpin and Dace in the LCR, particularly prevalent in YOY Northern Pike, is concerning due to the presence Shorthead Sculpin and Umatilla Dace; identified species at-risk. Though neither species has been positively identified, due to the condition of specimens at the time of observation, it is likely Northern Pike would consume Shorthead Sculpin or Umatilla Dace if encountered. White Sturgeon, another at-risk species, has not been observed in a Northern Pike stomach in the LCR as of 2020.

5.5 Parasitic Relationships

A high number of adult Northern Pike have been observed with parasites in the stomach or intestine in both the LCR and Pend d'Oreille Rivers (Baxter and Neufeld 2015; Wood 2019; ONA 2020). In 2014 pathology samples from Northern Pike in the LCR were sent to Provincial Freshwater Fisheries Society of BC Fish Health Lab for the screening of viral tests, bacterial tests, and parasites, the results of which did not identify any concerns (Baxter and Neufeld 2015). Tapeworms observed in Northern Pike are likely *Eubothrium* or *Proteocepahlus* (Baxter and Neufeld 2015). However, pathology sampling in the Pend d'Oreille River has not occurred, and observations of parasites are more frequent in this location (Wood 2019; ONA 2020).

Parasites can cause behavioural changes and adverse health effects in fish depending on: host and parasite species, concentration and diversity of parasites in the host, and environmental stressors (pollution, temperatures, angling pressure, etc.; Dick and Watson 1997; Barber et *al*. 2000). Of particular interest is the species *Triaenophorus crassus*, a tapeworm closely associated with Whitefish and Northern Pike (Dick and Watson 1977). *Triaenophorus crassus* typically begins its life cycle by parasitizing a small copepod (*Cyclops bicuspidatus*), and only continues its lifecycle when ingested by a plankton feeding Cisco or Whitefish; the final stage of *Triaenophorus crassus* occurs when it is ingested by a Northern Pike (Dick and Watson 1977). The possible presence of *Triaenophorus crassus* in the Columbia and Pend d'Oreille Rivers is concerning when considering ongoing salmon re-introduction efforts to the Columbia River above the Grand Coulee Dam by various Tribal and Frist Nation organizations (including the ONA) and Canada and United States governments, as a high percentage of Sockeye (*Oncorhynchus nerka*) smolts were documented to be parasitized by *Triaenophorus crassus* in the Wood River Lakes, Alaska (Groot and Margolis 1991). Presently, the Bering Sea drainage (Alaska) is the only know instance of *Triaenophorus crassus* parasitizing Sockeye due to the co-existence of Sockeye and Northern Pike in local lakes (Groot and Margolis 1991). Dick and Watson (1977) identified Northern Pike removal as the easiest way to reduce *Triaenophorus crassus* in waterbodies.

5.6 Observations of Other Non-Native Species

While conducting the Northern Pike suppression program opportunistic data on Walleye and Lake Trout were collected in the Pend d'Oreille River; including observations on spawning, predation, biological data, and relative abundance.

5.6.1 Walleye in the Pend d'Oreille River

Between April 28 and May 20 2020, 80 Walleye were encountered in the Pend d'Oreille River (Seven Mile Reservoir); an increase of 44 Walleye from 2019 (Fig 24; ONA 2019). However, Walleye $CPUE_{8hr}$ was similar between 2019 and 2020 (0.46 in 2019 and 0.48 in 2020). Walleye encountered in 2020 were between 262 mm and 512 mm in length and weighed between 155 g and 1,558 g. Twelve Walleye cleithra (six females, two males, and four unknown) were opportunistically collected between May 6 and 20 2020 for aging, with an attempt to select a variety of length classes (Table 17). Sampled Walleye were determined to be between 1 and 4 years old, with the most individuals in the 3-year class (Fig 25). Identified prey items included Yellow Perch, occurring in 17% of inspected stomachs (n = 41), and Rainbow Trout occurring in 2% (one individual) of inspected stomachs (n = 41). All other stomach contents were either empty or contained unidentifiable fish. For all sites with Walleye observations see Table 26 In *Appendix E: Bycatch Data*. Two juvenile Walleye (possibly 1+ years) were observed near Tillicum Creek on April 15 2019, and their presence was thought to indicate Walleye may be spawning in the Pend d'Oreille River (ONA 2019). In 2020, further evidence of Walleye spawning activity in the Pend d'Oreille River was observed with the capture of a spawning female, and two spawning males, in a slow moving section upstream of the Salmo River's confluence with the Pend d'Oreille River (Fig. 26).

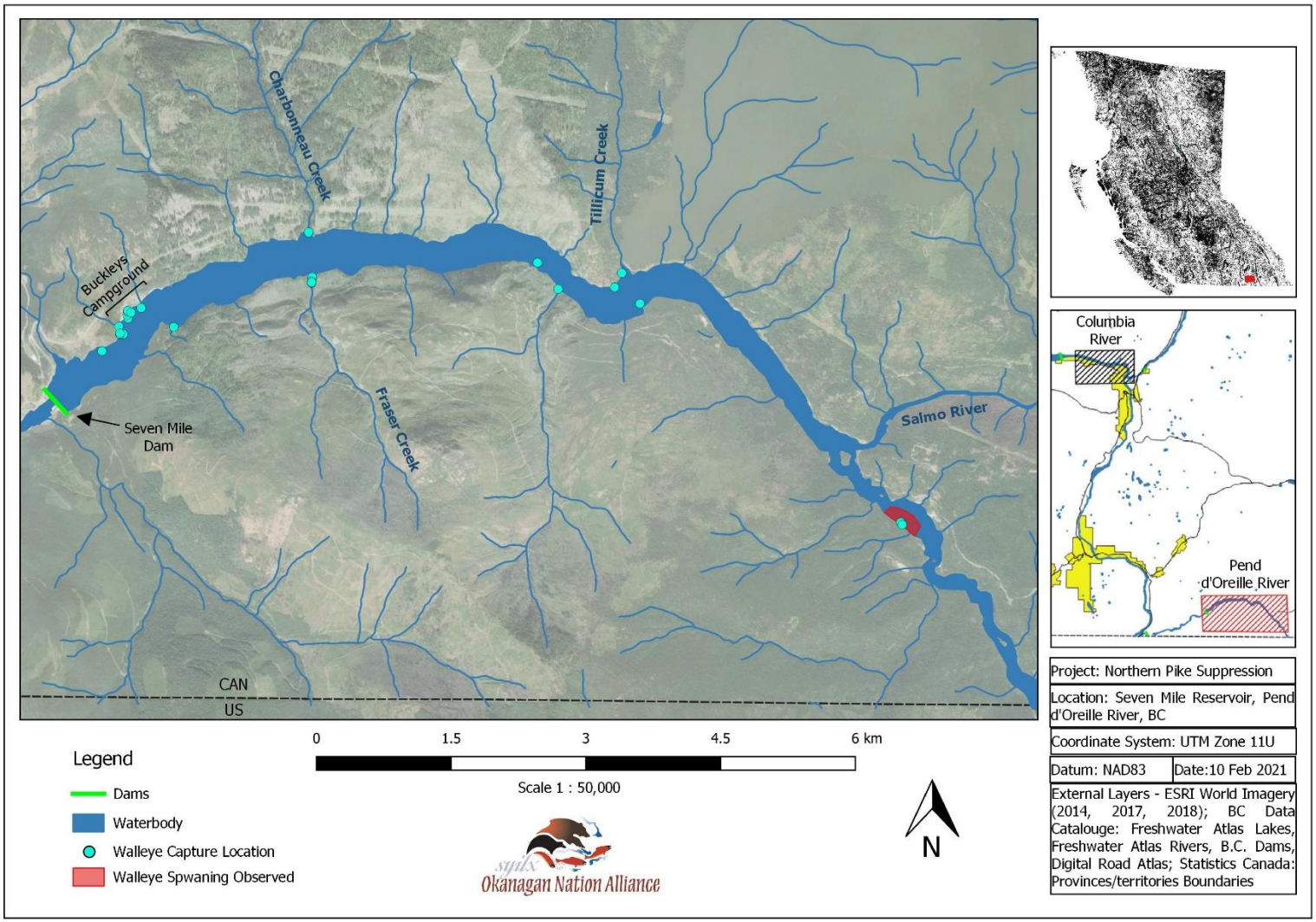

Figure 24. Walleye capture locations (blue) between April 28 – May 20 2020 in the Pend d'Oreille River (Seven Mile Reservoir) with the suspected spawning area highlighted in red.

Table 17. Information on twelve Walleye collected in 2020 for aging; including the date of collection, site ID, maturity, sex, fork length (mm), weight (g), and the determined age.

Number	Date	Site	Maturity	Sex	Length (mm)	Weight (g)	Age
1	05/06/20	GNPDO23_2	Adult	Unknown	358	484	3
2	05/06/20	GNPDO23_2	Adult	Unknown	421	792	3
3	05/06/20	GNPDO23_2	Adult	Female	508	1375	4
4	05/07/20	GNPDO17_5	Adult	Unknown	318	324	1
5	05/07/20	GNPDO26_1	Adult	Male	374	495	1
6	05/07/20	GNPDO26_1	Adult	Female	460	1094	4
7	05/08/20	GNPDO17_7	Adult	Female	494	1347	4
8	05/20/20	GNPDO28_1	Adult	Male	413	752	3
9	05/20/20	GNPDO28_1	Adult	Female	447	874	3
10	05/20/20	GNPDO28_1	Adult	Female	492	1231	3
11	05/21/20	GNPDO29_3	Adult	Unknown	318	313	1
12	05/21/20	GNPDO28_3	Adult	Female	509	1493	4

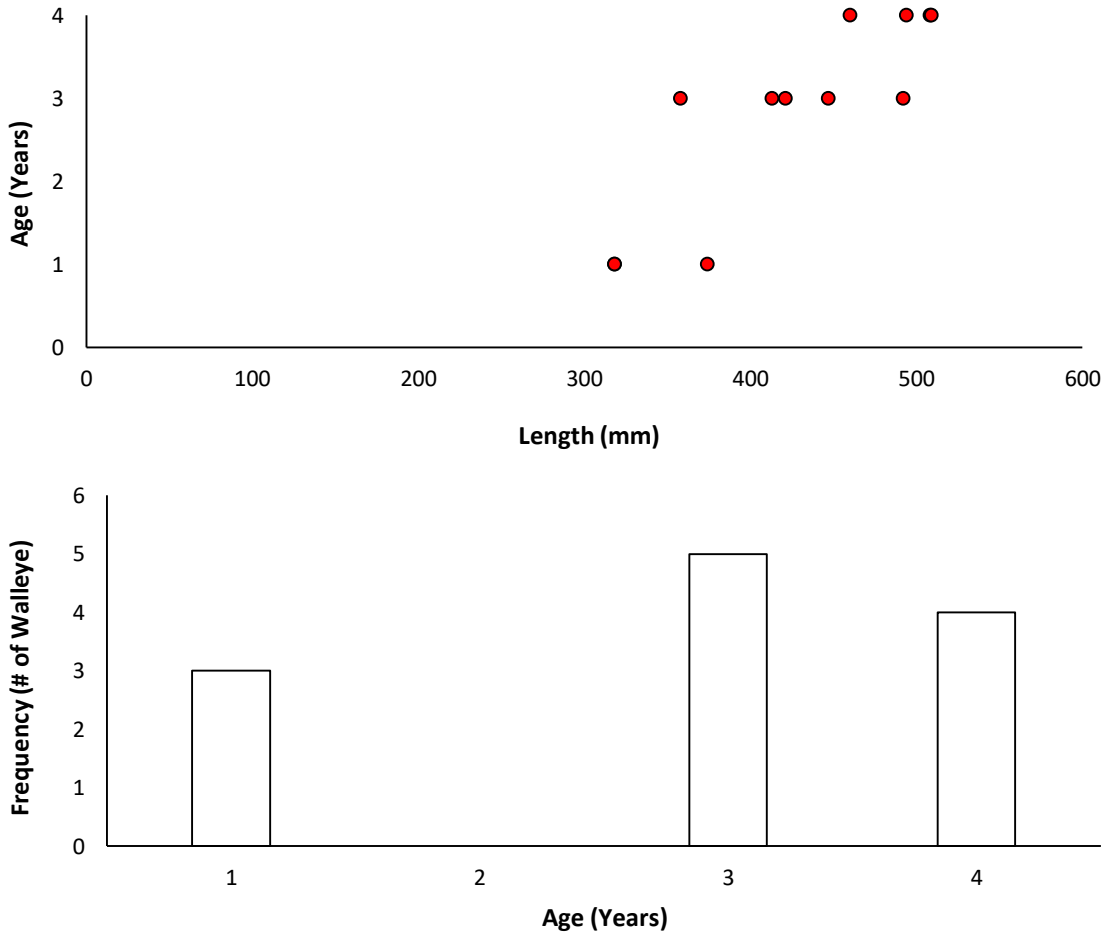

Figure 25. (Top) Walleye fork length (mm) by age based on twelve Walleye collected from the Pend d'Oreille River (Seven Mile Reservoir) between May 6 – 20 2020 (bottom) Walleye age frequency in the Pend d'Oreille River (Seven Mile Reservoir) based on twelve Walleye collected from the between May 6 – 20 2020.

Figure 26. Gravid female Walleye captured in the Seven Mile Reservoir, with to two spawning males, on May 1 2020. Photo: Eleanor Duifhuis, Okanagan Nation Alliance.

5.6.2 Lake Trout in the Pend d'Oreille River

Between April 28 and May 20 2020, 27 Lake Trout were encountered in the Pend d'Oreille River; compared to one Lake Trout in 2019 (Fig 27; ONA 2019). Lake Trout $CPUE_{8hr}$ increased from 0.01 in 2019 to 0.16 in 2020. Lake Trout encountered in 2020 were between 377 mm and 487 mm in length and weighed between 543 g and 1,180 g. Seven Lake Trout (six females and one male) heads were opportunistically collected on April 28 and 29 2020 for aging (using the same structures and methods as Northern Pike), with an attempt to select a variety of length classes (Table 18). Sampled Lake Trout were determined to be between 3 and 7 years old, with the most individuals in the 6-year class (Fig 28). Yellow Perch were the only identifiable fish prey item occurring in 30% of inspected stomachs (n = 27). Other prey items included unidentifiable fish, flying ants, and aquatic invertebrates. None of the Lake Trout observed appeared to be in spawning condition, though this is expected as they spawn in the fall (McPhail 2007). Based on the age and size of the Lake Trout observed in the Pend d'Oreille River in 2020, and the increase of $CPUE_{8hr}$ from 2019, the Lake Trout observed in 2020 are suspected to have originated from Box Canyon Reservoir. For all site locations with Lake Trout observations see Table 26 In *Appendix E: Bycatch Data*.

Table 18. Information on the seven Lake Trout collected in 2020 for aging; including the date of collection, site ID, maturity, sex, fork length (mm), weight (g), and the determined age.

Number	Date	Site	Maturity	Sex	Length (mm)	Weight (g)	Age
1	04/28/20	GNPDO03	Adult	Female	377	543	3
2	04/28/20	GNPDO04	Adult	Male	418	709	4
3	04/29/20	GNPDO01	Adult	Female	460	1014	7
4	04/29/20	GNPDO01	Adult	Female	430	842	7
5	04/29/20	GNPDO04	Adult	Female	435	833	6
6	04/29/20	GNPDO05	Adult	Female	434	856	6
7	04/29/20	GNPDO05	Adult	Female	441	863	6

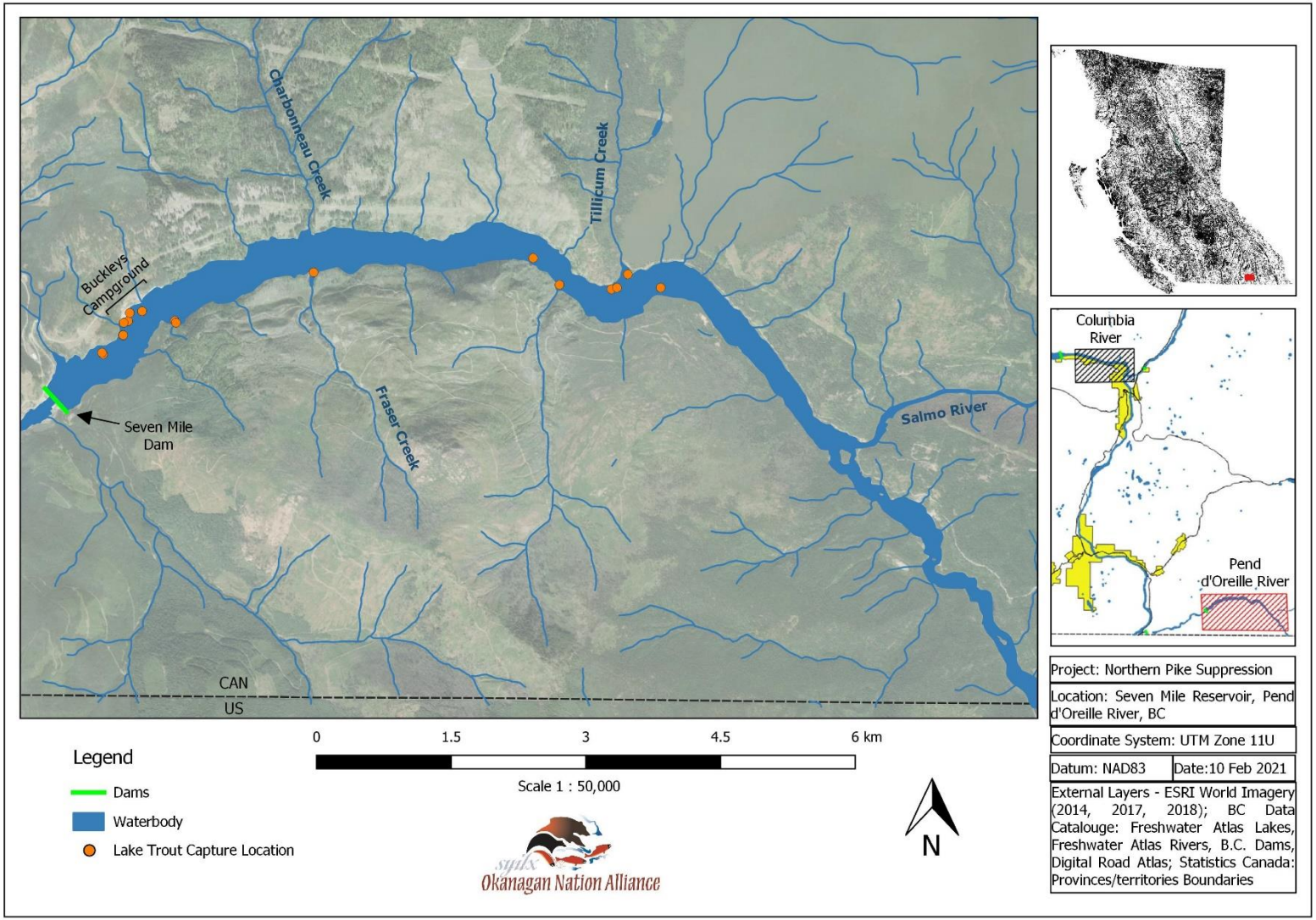

Figure 27. Lake Trout capture locations (orange) between April 28 – May 20 2020 in the Pend d'Oreille River (Seven Mile Reservoir).

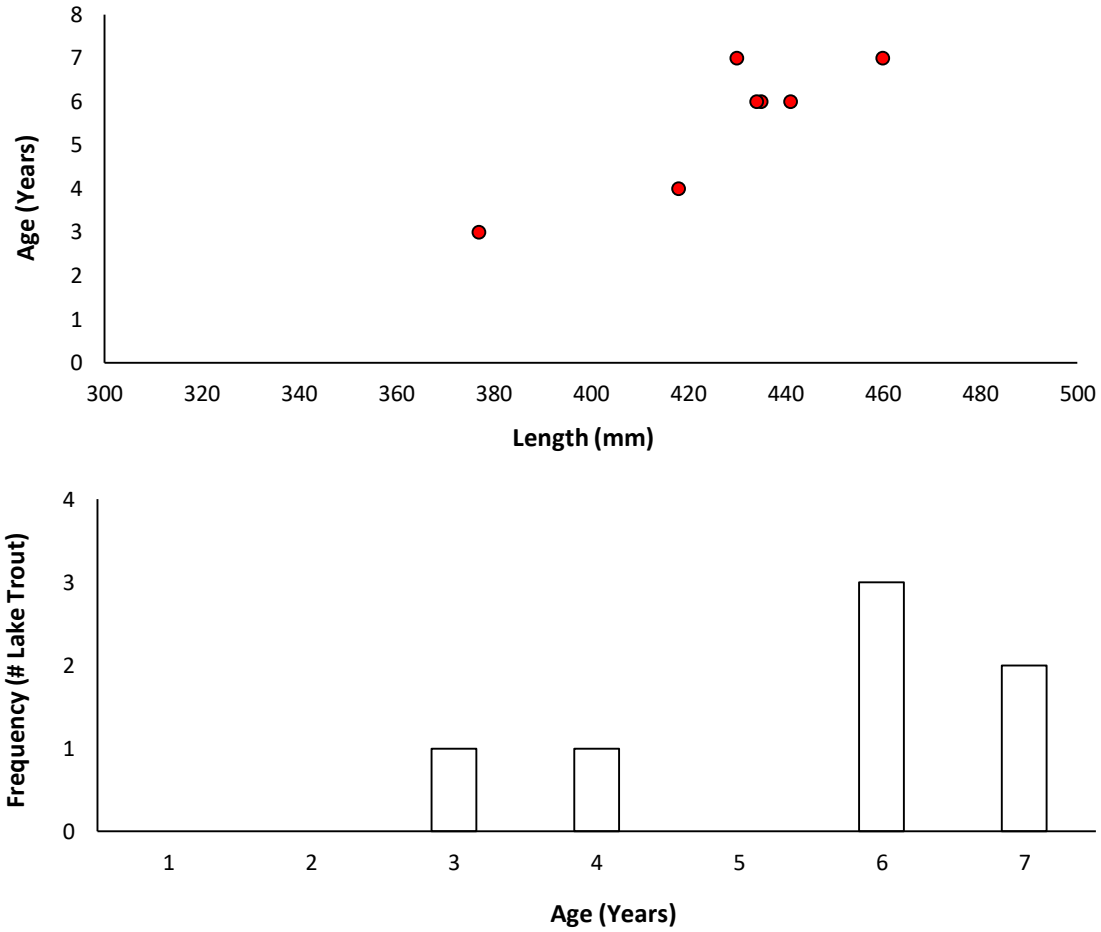

Figure 28. (Top) Lake Trout fork length (mm) by age based on seven Lake Trout collected from the Pend d'Oreille River (Seven Mile Reservoir) on April 28 and 29 2020 (bottom) Lake Trout age frequency in the Pend d'Oreille River (Seven Mile Reservoir) based on seven Lake Trout collected from the on April 28 and 29 2020.

6.0 Recommendations

The following are recommended to improve the Northern Pike Suppression and Monitoring Program in 2021:

1. Spring sampling effort for adult Northern Pike should focus on the Northern Pike spawning window in the LCR (when water temperatures reach 8°C), Pend d'Oreille River (when water temperatures reach 8°C, or ~ 1 week after a large drafting event in the Seven Mile Reservoir), and Christina Lake (when water temperatures reach 8°C) using SPIN nets and electrofishing. The timing of the spawning windows may occur concurrently and up to three crews may be required. If three crews are not feasible, priority should be given to the LCR. Night electrofishing should occur in the Pend d'Oreille River and LCR after Northern Pike start spawning.

Fall sampling effort for YOY Northern Pike should be focused mid-July to late October using 1" monofilament nets. In the LCR, juvenile nets should be placed in locations where YOY Northern Pike were previously caught (Fig 18). Night electrofishing for YOY should occur in the Pend d'Oreille River to identify rearing habitat, and in the Robson Reach if other gillnetting or electrofishing programs are not occurring.

Based on 2020 and past efforts, the priority windows are:

a. Pend d'Oreille River	April 20 to May 20 & August 20 – October 30
b. Christina Lake	April 20 to May 20
c. Columbia River	May 1 to June 20 & July 20 – October 30

Actual sampling dates may change based on field conditions and Northern Pike encounters in 2021.

2. Spring Northern Pike spawn monitoring should occur at locations where YOY have been identified (Fig 18), with exploratory sampling at Birchbank Snye (UTM 11U 447399, 5446340), the Genelle Backchannel (UTM 11U 448658, 5450312) and Fort Sheppard Eddy (UTM 11U 455112, 5431131). The correlation between Zuckerberg Pond's isolation from the LCR Mainstem and the river level measured at Birchbank Station should be identified to direct timing of suppression activities. Light traps should be deployed in late-May/early-June at Zuckerberg Pond to ensure effort near Northern Pike hatch. Other, more intrusive options to control Northern Pike in Zuckerberg Pond should be explored, such as:

    a. Draining Zuckerberg Pond and removing all invasive species while salvaging native species (short-term), and
    b. Permanently re-connect Zuckerberg Pond to the Columbia River Mainstem to reduce habitat for non-native species (increase flow, lower water temperature, reduce available aquatic vegetation), or
    c. Permanently isolate Zuckerberg Pond from the Columbia River Mainstem to reduce seeding of non-native species

3. At least two Northern Pike in each of the Columbia and Pend d'Oreille Rivers should be collected and sent to the ONA kɬ cp̓ɛlk̓ stim̓ Fish Health and Diagnostics Laboratory in Penticton, BC for identification of parasites in the stomach, intestines, mussel tissues, and gills (if/when present).

4. Continue the eDNA sampling program, with consideration of similar programs to avoid duplicate sampling, to monitor Northern Pike range expansion (through natural migration of the introduced population and/or anthropogenic introductions) in the Columbia Basin at high risk sites which may include but are not limited to
    - Christina Lake (South) (UTM 11U 411539, 5433064)

- Christina Lake (North) (UTM 11U 405817, 5450693)
- Christina Creek/Kettle River Confluence (UTM 11U 412140, 5431472)
- Hugh Keenleyside Dam Forebay (East) (UTM 11U 441778, 5465902)
- Hugh Keenleyside Dam Forebay (West) (UTM 11U 443334, 5465080)
- Syringa Provincial Park (UTM 11U 436681, 5465733)
- Brilliant Headpond (UTM 11U 455230, 5464280)
- Glade (UTM 11U 460400, 5471570)
- Revelstoke Wetlands (East) (UTM 11U 417283, 5646158)
- Revelstoke Wetlands (North) (UTM 11U 415658, 5647599)
- Revelstoke Wetlands (South) (UTM 11U 417318, 5645621)

5. Northern Pike monitoring at Christina Lake presents a unique opportunity. The Christina Lake Stewardship Society (CLSS) is highly interested in Northern Pike monitoring and eager to participate. It is recommended the ONA partners with CLSS and provide training and equipment so CLSS members can volunteer and contribute to Northern Pike monitoring in Christina Lake.

6. Implement surveys to increase Northern Pike habitat data. This may involve the creation of defined sites through the Columbia and Pend d'Oreille Rivers with the documentation of depth, aquatic vegetation/cover types, general hydrologic characteristics, and substrate types at each site. Sites with and without Northern Pike presence could then be more effectively compared.

7. Incorporate Northern Pike capture data from Baxter and Neufeld (2015), Baxter (2016), Baxter and Doutaz (2017), and Baxter and Lawrence (2018) into Fig 18 and Fig 19 to consolidate all known Northern Pike capture locations.

7.0 References

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7.1 Map Layer Sources

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Appendix A: Northern Pike Suppression and Monitoring Sites by Method

Appendix A-1: Gillnet Sites

Table 19. 2020 gillnet sites by waterbody (Seven Mile Reservoir = Pend d'Oreille River; Columbia Mainstem, Lower Kootenay River, and Zuckerberg Pond = Columbia River) with coordinates, set depths (m), dates, set/pull times and temperatures (°C), and Northern Pike (NP) presence.

Set	Location	Site ID	Location (UTM Zone 11U)				Depth (m)		Set			Pull			# NP
			Start		End										
			Easting	Northing	Easting	Northing	Min	Max	Date	Time	Temp	Date	Time	Temp (°C)	
1	Seven Mile Reservoir	GN_PDO_01_1	463749	5431503	463760	5431452	2.0	4.0	04/28/20	9:27	10.3	04/28/20	13:31	11.7	0
2	Seven Mile Reservoir	GN_PDO_01_2	463749	5431503	463760	5431452	2.0	4.0	04/28/20	13:31	11.7	04/29/20	9:45	10.0	0
3	Seven Mile Reservoir	GN_PDO_01_3	463749	5431503	463760	5431452	2.0	4.0	04/29/20	9:45	10.0	04/30/20	9:38	10.1	0
4	Seven Mile Reservoir	GN_PDO_01_4	463749	5431503	463760	5431452	2.0	4.0	04/30/20	9:38	10.1	04/30/20	14:33	10.1	0
5	Seven Mile Reservoir	GN_PDO_02_1	463984	5431690	463977	5431643	0.5	9.8	04/28/20	9:36	10.4	04/28/20	13:40	11.3	0
6	Seven Mile Reservoir	GN_PDO_02_2	463984	5431690	463977	5431643	0.5	9.8	04/28/20	13:40	11.3	04/29/20	10:30	10.0	0
7	Seven Mile Reservoir	GN_PDO_03_1	464039	5431870	464037	5431821	3.0	9.8	04/28/20	9:45	10.4	04/28/20	13:51	11.9	0
8	Seven Mile Reservoir	GN_PDO_03_2	464039	5431870	464037	5431821	3.0	9.8	04/28/20	13:51	11.9	04/29/20	10:50	10.0	1
9	Seven Mile Reservoir	GN_PDO_03_3	464039	5431870	464037	5431821	3.0	9.8	04/29/20	10:50	10.0	04/30/20	10:07	10.2	0
10	Seven Mile Reservoir	GN_PDO_03_4	464039	5431870	464037	5431821	3.0	9.8	04/30/20	10:07	10.2	04/30/20	14:50	10.1	0
11	Seven Mile Reservoir	GN_PDO_04_1	464185	5431984	464194	5431932	5.2	11.7	04/28/20	9:52	10.4	04/28/20	14:29	11.7	0
12	Seven Mile Reservoir	GN_PDO_04_2	464185	5431984	464194	5431932	5.2	11.7	04/28/20	14:29	11.7	04/29/20	11:36	10.1	0
13	Seven Mile Reservoir	GN_PDO_04_3	464185	5431984	464194	5431932	5.2	11.7	04/29/20	11:36	10.1	04/30/20	10:33	10.3	0
14	Seven Mile Reservoir	GN_PDO_05_1	466088	5432327	466103	5432364	4.5	11.3	04/28/20	10:02	10.4	04/28/20	15:00	11.1	0
15	Seven Mile Reservoir	GN_PDO_05_2	466088	5432327	466103	5432364	4.5	11.3	04/28/20	15:00	11.1	04/29/20	12:15	10.6	0
16	Seven Mile Reservoir	GN_PDO_06_1	469554	5432348	469602	5432343	4.5	10.0	04/28/20	10:16	9.6	04/28/20	15:18	9.8	0
17	Seven Mile Reservoir	GN_PDO_06_2	469554	5432348	469602	5432343	4.5	10.0	04/28/20	15:18	9.8	04/29/20	13:39	9.7	0
18	Seven Mile Reservoir	GN_PDO_06_3	469554	5432348	469602	5432343	4.5	10.0	04/29/20	13:39	9.7	04/30/20	12:32	10.1	0
19	Seven Mile Reservoir	GN_PDO_07_1	470387	5432318	470342	5432324	5.0	12.0	04/28/20	10:35	9.8	04/28/20	15:24	10.0	0
20	Seven Mile Reservoir	GN_PDO_08_1	468597	5432488	468548	5432524	2.3	5.1	04/28/20	15:38	9.9	04/29/20	13:59	9.8	0
21	Seven Mile Reservoir	GN_PDO_08_2	468597	5432488	468548	5432524	2.3	5.1	04/29/20	13:59	9.8	04/30/20	11:50	9.8	0
22	Seven Mile Reservoir	GN_PDO_09_1	466088	5432327	466103	5432364	2.5	7.8	04/29/20	12:15	10.6	04/30/20	11:20	10.8	0
23	Seven Mile Reservoir	GN_PDO_09_2	466088	5432327	466103	5432364	2.5	7.8	04/30/20	11:20	10.8	04/30/20	15:30	10.7	0
24	Seven Mile Reservoir	GN_PDO_10_1	466049	5432818	466023	5432785	4.0	10.5	04/30/20	10:57	10.2	04/30/20	15:13	10.1	0
25	Seven Mile Reservoir	GN_PDO_10_2	466049	5432818	466023	5432785	4.0	10.5	04/30/20	15:13	10.1	05/01/20	10:18	10.0	0
26	Seven Mile Reservoir	GN_PDO_11_1	468826	5432194	468845	5432239	2.0	9.0	04/30/20	12:14	9.8	04/30/20	15:53	10.2	0
27	Seven Mile Reservoir	GN_PDO_11_2	468826	5432194	468845	5432239	2.0	9.0	04/30/20	15:53	10.2	05/01/20	11:07	10.0	0
28	Seven Mile Reservoir	GN_PDO_12_1	472640	5429595	472673	5429631	3.5	5.4	04/30/20	12:58	10.3	05/01/20	12:08	10.5	0
29	Seven Mile Reservoir	GN_PDO_13_1	463761	5431524	463747	5431469	4.0	6.7	04/30/20	14:33	10.1	05/01/20	8:51	10.0	0

Set	Location	Site ID	Location (UTM Zone 11U) Start		Location (UTM Zone 11U) End		Depth (m)		Set			Pull			# NP
			Easting	Northing	Easting	Northing	Min	Max	Date	Time	Temp	Date	Time	Temp (°C)	
30	Seven Mile Reservoir	GN_PDO_14_1	464029	5431904	464048	5431858	3.1	7.9	04/30/20	14:50	10.1	05/01/20	9:23	10.1	1
31	Seven Mile Reservoir	GN_PDO_15_1	466082	5432281	466084	5432330	3.0	5.0	04/30/20	15:30	10.7	05/01/20	10:40	10.3	0
32	Seven Mile Reservoir	GN_PDO_16_1	463937	5431778	463988	5431803	3.4	14.8	05/04/20	15:53	10.0	05/05/20	9:30	10.1	0
33	Seven Mile Reservoir	GN_PDO_17_1	464037	5431944	464056	5431912	1.5	5.2	05/04/20	15:59	10.1	05/05/20	10:31	10.2	1
34	Seven Mile Reservoir	GN_PDO_17_2	464037	5431944	464056	5431912	1.5	5.2	05/05/20	10:31	10.2	05/05/20	15:16	10.4	0
35	Seven Mile Reservoir	GN_PDO_17_3	464037	5431944	464056	5431912	1.5	5.2	05/05/20	15:16	10.4	05/06/20	9:20	9.6	0
36	Seven Mile Reservoir	GN_PDO_17_4	464037	5431944	464056	5431912	1.5	5.2	05/06/20	9:20	9.6	05/06/20	16:19	9.2	0
37	Seven Mile Reservoir	GN_PDO_17_5	464037	5431944	464056	5431912	1.5	5.2	05/06/20	16:19	9.2	05/07/20	10:10	10.0	0
38	Seven Mile Reservoir	GN_PDO_17_6	464037	5431944	464056	5431912	1.5	5.2	05/07/20	10:10	10.0	05/07/20	14:52	9.8	0
39	Seven Mile Reservoir	GN_PDO_17_7	464037	5431944	464056	5431912	1.5	5.2	05/07/20	14:52	9.8	05/08/20	9:03		0
40	Seven Mile Reservoir	GN_PDO_18_1	466081	5432264	466085	5432315	3.4	6.9	05/04/20	16:11	11.1	05/05/20	11:24	10.7	0
41	Seven Mile Reservoir	GN_PDO_18_2	466081	5432264	466085	5432315	3.4	6.9	05/05/20	11:24	10.7	05/05/20	15:31	10.9	0
42	Seven Mile Reservoir	GN_PDO_18_3	466081	5432264	466085	5432315	3.4	6.9	05/05/20	15:31	10.9	05/06/20	9:57	9.4	0
43	Seven Mile Reservoir	GN_PDO_18_4	466081	5432264	466085	5432315	3.4	6.9	05/06/20	9:57	9.4	05/06/20	16:37	9.4	0
44	Seven Mile Reservoir	GN_PDO_18_5	466081	5432264	466085	5432315	3.4	6.9	05/06/20	16:37	9.4	05/07/20	10:41	9.9	0
45	Seven Mile Reservoir	GN_PDO_18_6	466081	5432264	466085	5432315	3.4	6.9	05/07/20	10:41	9.9	05/07/20	15:15	10.2	0
46	Seven Mile Reservoir	GN_PDO_18_7	466081	5432264	466085	5432315	3.4	6.9	05/07/20	15:15	10.2	05/08/20	10:07	10.6	0
47	Seven Mile Reservoir	GN_PDO_19_1	466048	5432828	466037	5432783	4.5	9.1	05/04/20	16:17	10.4	05/05/20	11:47	9.8	0
48	Seven Mile Reservoir	GN_PDO_19_2	466048	5432828	466037	5432783	4.5	9.1	05/05/20	11:47	9.8	05/05/20	15:38	10.0	0
49	Seven Mile Reservoir	GN_PDO_19_3	466048	5432828	466037	5432783	4.5	9.1	05/05/20	15:38	10.0	05/06/20	10:21	9.2	0
50	Seven Mile Reservoir	GN_PDO_20_1	468823	5432180	468841	5432226	3.5	8.0	05/04/20	16:28	10.1	05/05/20	12:08	9.5	0
51	Seven Mile Reservoir	GN_PDO_20_2	468823	5432180	468841	5432226	3.5	8.0	05/05/20	12:08	9.5	05/05/20	15:48	10.1	0
52	Seven Mile Reservoir	GN_PDO_21_1	469534	5432372	469586	5432376	4.6	9.3	05/04/20	16:40	10.0	05/05/20	12:42	9.6	0
53	Seven Mile Reservoir	GN_PDO_22_1	463949	5431691	463981	5431665	2.1	2.5	05/05/20	9:57	10.0	05/05/20	15:07	9.8	0
54	Seven Mile Reservoir	GN_PDO_22_2	463949	5431691	463981	5431665	2.1	2.5	05/05/20	15:07	9.8	05/06/20	8:55	9.5	0
55	Seven Mile Reservoir	GN_PDO_22_3	463949	5431691	463981	5431665	2.1	2.5	05/06/20	8:55	9.5	05/06/20	16:08	9.2	0
56	Seven Mile Reservoir	GN_PDO_22_4	463949	5431691	463981	5431665	2.1	2.5	05/06/20	16:08	9.2	05/07/20	9:56	9.7	0
57	Seven Mile Reservoir	GN_PDO_23_1	469737	5432031	469704	5431972	3.4	9.8	05/05/20	13:00	10.0	05/05/20	16:04	11.1	0
58	Seven Mile Reservoir	GN_PDO_23_2	469737	5432031	469704	5431972	3.4	9.8	05/05/20	16:04	11.1	05/06/20	11:44	9.2	0
59	Seven Mile Reservoir	GN_PDO_24_1	469455	5432214	469420	5432177	2.6	7.9	05/05/20	15:53	9.7	05/06/20	11:00	9.0	1
60	Seven Mile Reservoir	GN_PDO_24_2	469455	5432214	469420	5432177	2.6	7.9	05/06/20	11:00	9.0	05/06/20	17:00	9.3	0
61	Seven Mile Reservoir	GN_PDO_24_3	469455	5432214	469420	5432177	2.6	7.9	05/06/20	17:00	9.3	05/07/20	10:56	9.9	0
62	Seven Mile Reservoir	GN_PDO_24_4	469455	5432214	469420	5432177	2.6	7.9	05/07/20	10:56	9.9	05/07/20	15:37	10.0	0
63	Seven Mile Reservoir	GN_PDO_24_5	469455	5432214	469420	5432177	2.6	7.9	05/07/20	15:37	10.0	05/08/20	10:30	10.0	0
64	Seven Mile Reservoir	GN_PDO_25_1	469973	5432152	469967	5432194	2.1	6.3	05/06/20	17:05	9.5	05/07/20	11:12	10.0	0

Set	Location	Site ID	Location (UTM Zone 11U) Start		Location (UTM Zone 11U) End		Depth (m)		Set			Pull			# NP
			Easting	Northing	Easting	Northing	Min	Max	Date	Time	Temp	Date	Time	Temp (°C)	
65	Seven Mile Reservoir	GN_PDO_25_2	469973	5432152	469967	5432194	2.1	6.3	05/07/20	11:12	10.0	05/07/20	15:45	10.1	0
66	Seven Mile Reservoir	GN_PDO_25_3	469973	5432152	469967	5432194	2.1	6.3	05/07/20	15:45	10.1	05/08/20	10:50	10.1	1
67	Seven Mile Reservoir	GN_PDO_26_1	472634	5429592	472678	5429613	4.5	7.8	05/06/20	17:20	9.9	05/07/20	11:49	10.8	0
68	Seven Mile Reservoir	GN_PDO_26_2	472634	5429592	472678	5429613	4.5	7.8	05/07/20	11:49	10.8	05/07/20	15:58	11.0	0
69	Seven Mile Reservoir	GN_PDO_26_3	472634	5429592	472678	5429613	4.5	7.8	05/07/20	15:58	11.0	05/08/20	11:31	9.9	0
70	Seven Mile Reservoir	GN_PDO_27_1	464548	5431771	464559	5431824	2.1	12.2	05/07/20	10:23	9.7	05/07/20	15:03	10.1	0
71	Seven Mile Reservoir	GN_PDO_27_2	464548	5431771	464559	5431824	2.1	12.2	05/07/20	15:03	10.1	05/08/20	9:50	10.2	0
72	Seven Mile Reservoir	GN_PDO_28_1	463950	5431700	463983	5431665	6.0	13.5	05/19/20	17:10	10.9	05/20/20	9:15	11.0	0
73	Seven Mile Reservoir	GN_PDO_28_2	463950	5431700	463983	5431665	6.0	13.5	05/20/20	9:15	11.0	05/20/20	16:06	11.1	0
74	Seven Mile Reservoir	GN_PDO_28_3	463950	5431700	463983	5431665	6.0	13.5	05/20/20	16:06	11.1	05/21/20	9:22	11.0	0
75	Seven Mile Reservoir	GN_PDO_29_1	464035	5431954	464062	5431927	1.7	6.5	05/19/20	17:15	10.8	05/20/20	9:47	11.0	1
76	Seven Mile Reservoir	GN_PDO_29_2	464035	5431954	464062	5431927	1.7	6.5	05/20/20	9:47	11.0	05/20/20	16:15	11.1	0
77	Seven Mile Reservoir	GN_PDO_29_3	464035	5431954	464062	5431927	1.7	6.5	05/20/20	16:15	11.1	05/21/20	10:00	11.2	0
78	Seven Mile Reservoir	GN_PDO_30_1	464072	5431933	464070	5431877	6.5	9.8	05/19/20	17:21	10.8	05/20/20	10:17	11.4	0
79	Seven Mile Reservoir	GN_PDO_31_1	466082	5432268	466091	5432308	3.1	7.0	05/19/20	17:29	11.5	05/20/20	10:39	11.1	0
80	Seven Mile Reservoir	GN_PDO_31_2	466082	5432268	466091	5432308	3.1	7.0	05/20/20	10:39	11.1	05/20/20	16:52	11.2	0
81	Seven Mile Reservoir	GN_PDO_31_3	466082	5432268	466091	5432308	3.1	7.0	05/20/20	16:52	11.2	05/21/20	10:53	11.2	0
82	Seven Mile Reservoir	GN_PDO_32_1	470034	5432147	470065	5432202	2.1	3.7	05/19/20	17:43	11.1	05/20/20	11:14	11.2	0
83	Seven Mile Reservoir	GN_PDO_32_2	470034	5432147	470065	5432202	2.1	3.7	05/20/20	11:14	11.2	05/20/20	17:20	11.2	0
84	Seven Mile Reservoir	GN_PDO_32_3	470034	5432147	470065	5432202	2.1	3.7	05/20/20	17:20	11.2	05/21/20	11:30	11.1	0
85	Seven Mile Reservoir	GN_PDO_33_1	464563	5431754	464571	5431804	2.7	7.8	05/20/20	10:27	11.1	05/20/20	16:36	11.1	0
86	Seven Mile Reservoir	GN_PDO_33_2	464563	5431754	464571	5431804	2.7	7.8	05/20/20	16:36	11.1	05/21/20	10:30	11.1	0
87	Seven Mile Reservoir	GN_PDO_34_1	469482	5432250	469481	5432193	1.7	4.9	05/20/20	11:02	11.1	05/20/20	17:09	11.2	0
88	Seven Mile Reservoir	GN_PDO_34_2	469482	5432250	469481	5432193	1.7	4.9	05/20/20	17:09	11.2	05/21/20	11:07	11.1	0
89	Seven Mile Reservoir	GN_PDO_35_1	472657	5429569	472684	5429603	3.0	8.1	05/20/20	11:30	11.9	05/20/20	17:41	11.8	0
90	Seven Mile Reservoir	GN_PDO_35_2	472657	5429569	472684	5429603	3.0	8.1	05/20/20	17:41	11.8	05/21/20	12:05	11.8	0
91	Columbia Mainstem	GN_LCR_01_1	450240	5464257	450228	5464311	2.4	13.4	06/09/20	9:44	12.7	06/09/20	11:55	12.8	1
92	Columbia Mainstem	GN_LCR_02_1	449797	5464366	449786	5464415	2.4	12.7	06/09/20	9:57	12.7	06/09/20	12:37	12.7	0
93	Columbia Mainstem	GN_LCR_03_1	448490	5464811	448453	5464836	2.1	10.9	06/09/20	10:13	12.7	06/09/20	13:08	12.7	0
94	Columbia Mainstem	GN_LCR_04_1	446246	5465767	446248	5465726	2.0	13.0	06/09/20	10:26	12.5	06/09/20	13:44	12.5	0
95	Lower Kootenay River	GN_LKR_01_1	452861	5462399	452837	5462359	2.1	2.4	06/11/20	10:00	10.0	06/11/20	14:33	10.1	0
96	Lower Kootenay River	GN_LKR_02_1	452934	5462171	452973	5462145	1.7	2.5	06/11/20	10:06	9.9	06/11/20	15:00	9.8	0
97	Columbia Mainstem	GN_LCR_05_1	452366	5462842	452316	5462882	1.5	2.4	06/11/20	10:15	12.1	06/11/20	15:35	13.0	1
98	Columbia Mainstem	GN_LCR_06_1	452611	5464558	452566	5464563	1.6	2.1	06/11/20	10:44	10.9	06/11/20	15:57	10.9	0
99	Columbia Mainstem	GN_LCR_07_1	450211	5464244	450228	5464311	1.2	7.1	06/11/20	10:57	11.5	06/11/20	13:00	11.5	2

Set	Location	Site ID	Location (UTM Zone 11U) Start		Location (UTM Zone 11U) End		Depth (m)		Set			Pull			# NP
			Easting	Northing	Easting	Northing	Min	Max	Date	Time	Temp	Date	Time	Temp (°C)	
100	Columbia Mainstem	GN_LCR_07_2	450211	5464244	450228	5464311	1.2	7.1	06/11/20	13:00	11.5	06/11/20	16:12	11.2	0
101	Columbia Mainstem	GN_LCR_08_1	448736	5464729	448784	5464754	1.8	12.5	06/11/20	11:14	11.2	06/11/20	13:54	11.3	2
102	Columbia Mainstem	GN_LCR_08_2	448736	5464729	448784	5464754	1.8	12.5	06/11/20	13:54	11.3	06/11/20	16:20	11.1	0
103	Columbia Mainstem	GN_LCR_09_1	448735	5464734	448779	5464745	2.0	7.5	06/12/20	11:14	11.4	06/12/20	13:36	12.0	0
104	Columbia Mainstem	GN_LCR_10_1	449782	5464356	449806	5464392	1.3	6.5	06/12/20	11:22	11.4	06/12/20	14:00	12.5	0
105	Columbia Mainstem	GN_LCR_11_1	450216	5464251	450241	5464271	1.3	4.0	06/12/20	11:29	11.4	06/12/20	14:56	11.8	0
106	Columbia Mainstem	GN_LCR_12_1	450432	5464216	450463	5464256	1.3	3.0	06/12/20	11:36	11.2	06/12/20	15:03	11.6	0
107	Columbia Mainstem	GN_LCR_13_1	452325	5462848	452355	5462883	1.7	3.6	06/12/20	11:46	11.6	06/12/20	15:20	12.1	1
108	Columbia Mainstem	GN_LCR_14_1	452383	5462992	452391	5463038	2.0	2.9	06/12/20	11:53	11.9	06/12/20	15:37	13.1	0
109	Columbia Mainstem	GN_LCR_15_1	448779	5464712	448771	5464761	1.4	10.1	06/15/20	9:10	12.8	06/15/20	11:34	13.1	0
110	Columbia Mainstem	GN_LCR_15_2	448779	5464712	448771	5464761	1.4	10.1	06/15/20	11:34	13.1	06/15/20	14:00	13.0	0
111	Columbia Mainstem	GN_LCR_16_1	449590	5464468	449618	5464514	2.0	13.0	06/15/20	9:17	12.8	06/15/20	12:06	13.2	0
112	Columbia Mainstem	GN_LCR_16_2	449590	5464468	449618	5464514	2.0	13.0	06/15/20	12:06	13.2	06/15/20	14:11	12.8	0
113	Columbia Mainstem	GN_LCR_17_1	449761	5464393	449802	5464399	1.4	10.0	06/15/20	9:24	12.7	06/15/20	12:25	13.1	0
114	Columbia Mainstem	GN_LCR_17_2	449761	5464393	449802	5464399	1.4	10.0	06/15/20	12:25	13.1	06/15/20	14:23	12.9	0
115	Columbia Mainstem	GN_LCR_18_1	450178	5464589	450125	5464562	1.3	5.4	06/15/20	9:30	12.7	06/15/20	12:44	12.8	0
116	Columbia Mainstem	GN_LCR_19_1	450275	5464249	450309	5464265	1.4	9.6	06/15/20	9:38	12.7	06/15/20	12:56	13.5	0
117	Columbia Mainstem	GN_LCR_19_2	450275	5464249	450309	5464265	1.4	9.6	06/15/20	12:56	13.5	06/15/20	14:38	13.5	0
118	Columbia Mainstem	GN_LCR_20_1	452298	5462860	452351	5462867	1.6	1.6	06/15/20	9:52	13.1	06/15/20	13:42	13.7	0
119	Columbia Mainstem	GN_LCR_21_1	448739	5464734	448756	5464765	1.7	8.8	06/18/20	10:55	13.0	06/18/20	16:21	13.3	0
120	Columbia Mainstem	GN_LCR_22_1	450218	5464251	450241	5464288	1.0	9.2	06/18/20	11:04	12.6	06/18/20	16:32	12.8	0
121	Columbia Mainstem	GN_LCR_23_1	450165	5464595	450145	5464560	1.5	7.3	06/18/20	11:12	12.5	06/18/20	16:42	12.4	0
122	Columbia Mainstem	GN_LCR_24_1	452613	5464558	452579	5464533	1.0	1.8	06/18/20	11:24	12.2	06/18/20	16:52	12.6	0
123	Columbia Mainstem	GN_LCR_25_1	452300	5462857	452324	5462882	1.0	3.6	06/18/20	11:35	12.8	06/18/20	17:02	15.0	0
124	Lower Kootenay River	GN_LKR_03_1	452953	5462462	452928	5462505	1.0	2.0	06/18/20	11:43	11.7	06/18/20	17:09	11.0	0
125	Lower Kootenay River	GN_LKR_04_1	452862	5462463	452846	5462509	2.0	2.5	06/27/20	11:36	17.0	06/27/20	14:57	18.3	0
126	Columbia Mainstem	GN_LCR_26_1	452302	5462850	452342	5462870	2.6	4.0	06/27/20	11:44	16.4	06/27/20	15:00	17.0	0
127	Columbia Mainstem	GN_LCR_27_1	452623	5464486	452656	5464410	3.7	4.1	06/27/20	11:53	15.6	06/27/20	15:22	15.7	0
128	Columbia Mainstem	GN_LCR_28_1	450330	5464215	450333	5464253	2.6	10.0	06/27/20	12:02	15.6	06/27/20	15:44	15.7	1
129	Columbia Mainstem	GN_LCR_29_1	449764	5464372	449807	5464396	3.2	11.6	06/27/20	12:09	15.6	06/27/20	16:00	15.7	1
130	Columbia Mainstem	GN_LCR_30_1	448686	5464757	448717	5464774	3.6	5.0	06/27/20	12:16	15.6	06/27/20	16:21	15.7	0
131	Columbia Mainstem	GN_LCR_31_1	450213	5464233	450229	5464283	1.9	4.0	06/28/20	10:55	14.6	06/28/20	14:11	14.8	0
132	Columbia Mainstem	GN_LCR_32_1	450495	5464208	450501	5464258	2.3	9.6	06/28/20	11:01	14.6	06/28/20	14:03	14.8	0
133	Columbia Mainstem	GN_LCR_33_1	449842	5464367	449894	5464367	3.8	6.6	06/28/20	11:13	14.6	06/28/20	14:21	14.8	1
134	Columbia Mainstem	GN_LCR_34_1	449640	5464427	449667	5464460	2.9	11.4	06/28/20	11:19	14.6	06/28/20	14:43	14.8	0

Set	Location	Site ID	Location (UTM Zone 11U) Start		Location (UTM Zone 11U) End		Depth (m)		Set			Pull			# NP
			Easting	Northing	Easting	Northing	Min	Max	Date	Time	Temp	Date	Time	Temp (°C)	
135	Columbia Mainstem	GN_LCR_35_1	449029	5464602	449080	5464612	3.1	11.3	06/28/20	11:29	14.7	06/28/20	14:58	14.7	0
136	Columbia Mainstem	GN_LCR_36_1	448727	5464736	448756	5464770	3.3	12.1	06/28/20	11:37	14.7	06/28/20	15:10	14.7	0
137	Zuckerberg Pond	GN_LCR_37_1	452196	5462780	452182	5462812	0.1	2.0	08/18/20	9:46	21.4	08/18/20	13:36	21.4	3
138	Zuckerberg Pond	GN_LCR_38_1	452134	5462719	452184	5462733	1.0	1.7	08/18/20	10:02	21.4	08/18/20	14:54	21.4	4
139	Zuckerberg Pond	GN_LCR_39_1	452186	5462763	452147	5462794	0.1	2.5	08/18/20	10:20	21.4	08/18/20	14:19	21.4	1
140	Zuckerberg Pond	GN_LCR_40_1	452200	5462665	452159	5462653	0.1	1.5	08/18/20	10:30	21.4	08/18/20	15:37	21.4	8
141	Zuckerberg Pond	GN_LCR_41_1	452205	5462595	452198	5462632	0.1	1.8	08/20/20	10:19	18.4	08/20/20	14:15	18.4	3
142	Zuckerberg Pond	GN_LCR_42_1	452196	5462664	452161	5462651	0.1	2.0	08/20/20	10:27	18.4	08/20/20	14:50	18.4	8
143	Zuckerberg Pond	GN_LCR_43_1	452179	5462722	452128	5462732	0.1	1.7	08/20/20	10:37	18.4	08/20/20	15:55	18.4	7
144	Zuckerberg Pond	GN_LCR_44_1	452129	5462769	452169	5462764	0.1	2.7	08/20/20	10:50	18.4	08/20/20	16:18	18.4	1
145	Zuckerberg Pond	GN_LCR_45_1	452216	5462806	452171	5462791	0.1	3.0	08/20/20	11:10	18.4	08/20/20	16:30	18.4	0
146	Zuckerberg Pond	GN_LCR_46_1	452216	5462619	452170	5462628	0.1	1.7	08/21/20	9:30	16.0	08/21/20	13:40	18.1	3
147	Zuckerberg Pond	GN_LCR_47_1	452131	5462715	452175	5462696	0.1	2.0	08/21/20	9:45	16.0	08/21/20	14:16	18.1	3
148	Zuckerberg Pond	GN_LCR_48_1	452130	5462754	452173	5462754	0.1	2.5	08/21/20	10:00	16.0	08/21/20	14:36	18.1	1
149	Zuckerberg Pond	GN_LCR_49_1	452155	5462815	452128	5462776	0.1	1.8	08/21/20	10:15	16.0	08/21/20	14:56	18.1	5
150	Zuckerberg Pond	GN_LCR_50_1	452187	5462809	452197	5462781	0.1	1.8	08/21/20	10:30	16.0	08/21/20	15:20	18.1	0
151	Zuckerberg Pond	GN_LCR_51_1	452196	5462582	452185	5462625	0.2	1.3	08/24/20	10:45	16.0	08/24/20	14:00	16.0	4
152	Zuckerberg Pond	GN_LCR_52_1	452201	5462662	452159	5462656	0.2	1.5	08/24/20	11:00	16.0	08/24/20	14:31	16.0	8
153	Zuckerberg Pond	GN_LCR_53_1	452171	5462697	452132	5462712	0.2	1.6	08/24/20	11:15	16.0	08/24/20	15:00	16.0	0
154	Zuckerberg Pond	GN_LCR_54_1	452155	5462814	452133	5462777	0.1	1.2	08/24/20	11:35	16.0	08/24/20	15:20	16.0	1
155	Zuckerberg Pond	GN_LCR_55_1	452206	5462789	452174	5462815	0.5	1.8	08/24/20	11:50	16.0	08/24/20	15:30	16.0	0
156	Zuckerberg Pond	GN_LCR_56_1	452212	5462573	452217	5462609	0.2	0.5	08/26/20	10:49	17.0	08/26/20	13:20	17.0	3
157	Zuckerberg Pond	GN_LCR_57_1	452171	5462631	452212	5462620	0.3	1.0	08/26/20	11:05	17.0	08/26/20	13:49	17.0	0
158	Zuckerberg Pond	GN_LCR_58_1	452207	5462638	452164	5462642	0.3	1.2	08/26/20	11:20	17.0	08/26/20	14:18	17.0	3
159	Zuckerberg Pond	GN_LCR_59_1	452136	5462787	452161	5462765	0.1	1.2	08/26/20	11:30	17.0	08/26/20	14:25	17.0	0
160	Zuckerberg Pond	GN_LCR_60_1	452226	5462536	452219	5462576	0.1	1.2	08/27/20	9:50	16.0	08/27/20	14:00	16.2	8
161	Zuckerberg Pond	GN_LCR_61_1	452208	5462629	452170	5462631	0.1	1.8	08/27/20	10:00	16.0	08/27/20	14:39	16.2	2
162	Zuckerberg Pond	GN_LCR_62_1	452192	5462661	452162	5462648	0.1	2.0	08/27/20	10:15	16.0	08/27/20	15:05	16.2	6
163	Zuckerberg Pond	GN_LCR_63_1	452178	5462809	452144	5462782	0.1	2.5	08/27/20	10:35	16.0	08/27/20	15:45	16.2	7
164	Lower Kootenay River	GN_LKR_05_1	452895	5462493	452883	5462550	0.2	1.9	09/22/20	12:18	17.5	09/22/20	14:20	17.6	0
165	Columbia Mainstem	GN_LCR_64_1	452476	5463145	452509	5463117	0.3	1.1	09/22/20	12:28	16.1	09/22/20	14:35	17.2	0
166	Columbia Mainstem	GN_LCR_65_1	452601	5464576	452604	5464536	0.4	0.8	09/22/20	12:46	15.6	09/22/20	14:50	15.9	0
167	Columbia Mainstem	GN_LCR_66_1	450193	5464593	450181	5464561	1.0	4.5	09/22/20	13:00	15.5	09/22/20	15:10	15.5	0
168	Zuckerberg Pond	GN_LCR_67_1	452192	5462654	452162	5462637	0.2	1.2	09/23/20	10:37	15.8	09/23/20	14:15	15.8	8
169	Zuckerberg Pond	GN_LCR_68_1	452199	5462653	452154	5462663	0.3	1.5	09/23/20	10:50	15.8	09/23/20	14:25	15.8	1

Set	Location	Site ID	Location (UTM Zone 11U) Start		End		Depth (m)		Set			Pull			# NP
			Easting	Northing	Easting	Northing	Min	Max	Date	Time	Temp	Date	Time	Temp (°C)	
170	Zuckerberg Pond	GN_LCR_69_1	452169	5462689	452138	5462711	0.1	1.3	09/23/20	11:12	15.8	09/23/20	14:43	15.8	0
171	Zuckerberg Pond	GN_LCR_70_1	452185	5462769	452171	5462806	0.4	2.0	09/23/20	11:23	15.8	09/23/20	15:05	15.8	9
172	Zuckerberg Pond	GN_LCR_71_1	452208	5462795	452182	5462811	0.1	1.2	09/23/20	11:39	15.8	09/23/20	15:38	15.8	2
173	Zuckerberg Pond	GN_LCR_72_1	452214	5462609	452164	5462648	0.3	1.1	10/13/20	10:28	9.9	10/13/20	13:27	9.9	0
174	Zuckerberg Pond	GN_LCR_73_1	452204	5462642	452159	5462653	0.1	1.0	10/13/20	10:53	9.9	10/13/20	13:37	9.9	0
175	Zuckerberg Pond	GN_LCR_74_1	452151	5462790	452125	5462760	0.2	0.8	10/13/20	11:05	9.9	10/13/20	13:50	9.9	0
176	Zuckerberg Pond	GN_LCR_75_1	452211	5462803	452171	5462805	0.4	1.3	10/13/20	11:20	9.9	10/13/20	14:11	9.9	3
177	Zuckerberg Pond	GN_LCR_76_1	452189	5462783	452184	5462770	0.3	0.8	10/13/20	11:22	9.9	10/13/20	14:45	9.9	0
178	Zuckerberg Pond	GN_LCR_77_1	452202	5462603	452242	5462642	0.2	0.5	10/20/20	10:10	9.0	10/20/20	13:55	8.9	0
179	Zuckerberg Pond	GN_LCR_78_1	452195	5462649	452169	5462639	0.1	1.0	10/20/20	10:22	9.0	10/20/20	14:02	8.9	0
180	Zuckerberg Pond	GN_LCR_79_1	452154	5462682	452158	5462723	0.3	0.8	10/20/20	10:39	9.0	10/20/20	14:15	8.9	1
181	Zuckerberg Pond	GN_LCR_80_1	452122	5462759	452164	5462760	0.1	1.0	10/20/20	10:50	9.0	10/20/20	14:31	8.9	0
182	Zuckerberg Pond	GN_LCR_81_1	452144	5462777	452183	5462768	0.3	1.2	10/20/20	11:13	9.0	10/20/20	14:44	8.9	1
183	Zuckerberg Pond	GN_LCR_82_1	452207	5462791	452160	5462795	0.4	1.3	10/20/20	11:21	9.0	10/20/20	15:03	8.9	1
184	Zuckerberg Pond	GN_LCR_83_1	452213	5462573	452192	5462623	0.2	1.2	10/21/20	10:32	9.0	10/21/20	13:39	9.0	0
185	Zuckerberg Pond	GN_LCR_84_1	452179	5462663	452158	5462658	0.1	0.8	10/21/20	10:43	9.0	10/21/20	13:45	9.0	0
186	Zuckerberg Pond	GN_LCR_85_1	452120	5462758	452160	5462738	0.1	1.3	10/21/20	10:56	9.0	10/21/20	14:05	9.0	0
187	Zuckerberg Pond	GN_LCR_86_1	452154	5462791	452180	5462773	0.4	1.2	10/21/20	11:09	9.0	10/21/20	14:15	9.0	0
188	Zuckerberg Pond	GN_LCR_87_1	452158	5462795	452187	5462778	0.2	1.0	10/21/20	11:26	9.0	10/21/20	14:30	9.0	0
189	Zuckerberg Pond	GN_LCR_88_1	452201	5462630	452179	5462638	0.3	1.0	10/22/20	10:13	8.1	10/22/20	14:07	8.1	0
190	Zuckerberg Pond	GN_LCR_89_1	452162	5462741	452119	5462746	0.2	1.0	10/22/20	10:27	8.1	10/22/20	14:23	8.1	0
191	Zuckerberg Pond	GN_LCR_90_1	452146	5462787	452180	5462764	0.3	1.4	10/22/20	10:34	8.1	10/22/20	14:39	8.1	0
192	Zuckerberg Pond	GN_LCR_91_1	452154	5462795	452190	5462782	0.3	1.1	10/22/20	10:45	8.1	10/22/20	15:01	8.1	0
193	Zuckerberg Pond	GN_LCR_92_1	452213	5462800	452156	5462797	0.3	0.9	10/22/20	10:55	8.1	10/22/20	15:06	8.1	0
194	Seven Mile Reservoir	GN_PDO_36_1	463962	5431856	463961	5431824	0.4	1.0	10/28/20	10:06	9.2	10/28/20	13:23	9.2	0
195	Seven Mile Reservoir	GN_PDO_37_1	463988	5431931	463971	5431906	0.5	1.5	10/28/20	10:21	9.2	10/28/20	13:40	9.2	0
196	Seven Mile Reservoir	GN_PDO_38_1	463977	5431890	464001	5431900	2.0	4.0	10/28/20	10:39	9.2	10/28/20	13:53	9.2	0
197	Seven Mile Reservoir	GN_PDO_39_1	464046	5431923	464006	5431910	2.0	4.5	10/28/20	10:49	9.2	10/28/20	14:12	9.2	0
198	Seven Mile Reservoir	GN_PDO_40_1	464049	5431931	464002	5431922	2.3	3.5	10/29/20	8:45	8.6	10/29/20	13:18	8.6	0
199	Seven Mile Reservoir	GN_PDO_41_1	464051	5431915	464005	5431900	5.5	7.5	10/29/20	8:57	8.6	10/29/20	13:24	8.6	0
200	Seven Mile Reservoir	GN_PDO_42_1	464011	5431846	464086	5431887	4.0	6.0	10/29/20	9:13	8.6	10/29/20	13:39	8.6	0
201	Seven Mile Reservoir	GN_PDO_43_1	463979	5431861	464002	5431893	3.0	5.0	10/29/20	9:33	8.6	10/29/20	13:49	8.6	0
202	Seven Mile Reservoir	GN_PDO_44_1	463978	5431917	464004	5431884	1.2	7.0	10/29/20	9:47	8.6	10/29/20	14:01	8.6	0
203	Seven Mile Reservoir	GN_PDO_45_1	464086	5431948	464050	5431972	0.4	4.6	10/29/20	9:56	8.6	10/29/20	14:14	8.6	0
204	Seven Mile Reservoir	GN_PDO_46_1	464106	5431949	464063	5431981	1.0	3.8	10/29/20	10:21	8.6	10/29/20	14:23	8.6	0

Set	Location	Site ID	Location (UTM Zone 11U) Start		End		Depth (m)		Set			Pull			# NP
			Easting	Northing	Easting	Northing	Min	Max	Date	Time	Temp	Date	Time	Temp (°C)	
205	Seven Mile Reservoir	GN_PDO_47_1	463969	5431694	463920	5431664	1.2	3.4	10/29/20	10:38	8.6	10/29/20	14:43	8.6	0
206	Seven Mile Reservoir	GN_PDO_48_1	463868	5431561	463855	5431584	0.3	10.0	10/30/20	9:22	8.1	10/30/20	13:53	8.1	0
207	Seven Mile Reservoir	GN_PDO_49_1	463942	5431701	463927	5431657	0.1	4.0	10/30/20	9:36	8.1	10/30/20	14:08	8.1	0
208	Seven Mile Reservoir	GN_PDO_50_1	463969	5431756	463944	5431747	0.2	7.0	10/30/20	9:48	8.1	10/30/20	14:16	8.1	0
209	Seven Mile Reservoir	GN_PDO_51_1	463965	5431783	463929	5431790	0.4	10.0	10/30/20	10:08	8.1	10/30/20	14:28	8.1	0
210	Seven Mile Reservoir	GN_PDO_52_1	463993	5431838	463959	5431858	0.2	3.0	10/30/20	10:21	8.1	10/30/20	14:57	8.1	0
211	Seven Mile Reservoir	GN_PDO_53_1	464198	5432008	464160	5432023	1.2	7.5	10/30/20	10:37	8.1	10/30/20	15:10	8.1	0
212	Seven Mile Reservoir	GN_PDO_54_1	464055	5431926	464037	5431968	0.5	9.0	10/30/20	11:20	8.1	10/30/20	15:22	8.1	0

Appendix A-2: Electrofishing Sites

Table 20. 2020 Electrofishing sites in the Columbia River with coordinates, site depths (m), dates, start and end times, effort in seconds and length of site sampled (m), and the number of Northern Pike (NP) at the site.

Location	Site ID	UTM Zone 11 U Start		End		Electrofishing Specifications				Date	Time Start	Time End	Average Depth (m)	# NP
		Easting	Northing	Easting	Northing	Time (s)	Length (m)	Voltage	HZ					
Zuckerberg Pond	EF_LCR_01	452221	5462807	452203	5462784	219	30	210	30	7/22/2020	11:44	11:50	1.0	0
Zuckerberg Pond	EF_LCR_02	452203	5462784	452199	5462718	299	50	210	35	7/22/2020	11:52	11:58	1.0	0
Zuckerberg Pond	EF_LCR_03	452199	5462718	452203	5462654	282	50	210	35	7/22/2020	12:00	12:08	1.0	0
Zuckerberg Pond	EF_LCR_04	452203	5462654	452238	5462454	786	120	250	50	7/22/2020	12:12	12:30	0.5	0
Zuckerberg Pond	EF_LCR_05	452238	5462545	452221	5462807	2567	200	305	70	7/22/2020	12:38	13:31	0.5	4
Zuckerberg Pond	EF_LCR_06	452221	5462807	452117	5462759	800	100	305	70	7/22/2020	15:25	15:55	0.5	6
Columbia Mainstem	EF_LCR_07	452437	5462990	452182	5462830	525	300	305	70	7/23/2020	10:32	11:25	0.4	0
Columbia Mainstem	EF_LCR_08	452265	5462860	452327	5462843	187	60	305	70	7/23/2020	13:00	13:10	0.4	0
Zuckerberg Pond	EF_LCR_09	452165	5462818	452225	5462535	1236	350	305	70	7/23/2020	13:25	13:57	0.4	2
Zuckerberg Pond	EF_LCR_10	452230	5462557	452204	5462566	317	40	305	70	8/18/2020	12:40	12:55	0.6	0
Zuckerberg Pond	EF_LCR_11	452124	5462741	452218	5462803	210	50	305	70	8/18/2020	13:10	13:20	0.5	0

Appendix A-3: Fyke Net, Minnow Trap, and Larval Light Trap Sites

Table 21. 2020 Fyke net, minnow trap, and larval light trap locations in the Columbia River by location with coordinates, site depths (m), dates, start and end times, and the number of Northern Pike (NP) at the site.

Set	Type	Location	Site ID	Location (UTM Zone 11U)		Depth (m)	Set			Pull			Comments	# NP
				Easting	Northing		Date	Time	Temp (°C)	Date	Time	Temp (°C)		
224	Minnow Trap	Columbia Mainstem	MT_LCR_01_1	452233	5462833	0.8	07/23/20	14:30	20.0	07/24/20	10:43	20.0	Light + bait	0
225	Minnow Trap	Zuckerberg Pond	MT_LCR_02_1	452217	5462798	1	07/23/20	14:20	20.0	07/24/20	10:35	20.0	Light + bait	1
226	Minnow Trap	Zuckerberg Pond	MT_LCR_03_1	452187	5462706	1	07/23/20	14:45	20.0	07/24/20	10:08	20.0	Light	0
227	Minnow Trap	Zuckerberg Pond	MT_LCR_04_1	452191	5462676	7	07/23/20	14:37	20.0	07/24/20	10:12	20.0	Light + bait	0
228	Minnow Trap	Zuckerberg Pond	MT_LCR_05_1	452210	5462640	0.8	07/23/20	14:48	20.0	07/24/20	9:54	20.0	Bait	0
229	Minnow Trap	Columbia Mainstem	MT_LCR_06_1	449177	5464857	1.2	07/27/20	13:55	15.5	07/28/20	10:35	14.8	Bait	0
230	Minnow Trap	Columbia Mainstem	MT_LCR_07_1	450059	5464609	1	07/27/20	14:02	15.6	07/28/20	11:44	14.5	Bait	0
231	Minnow Trap	Columbia Mainstem	MT_LCT_07_2	450059	5464609	1	07/28/20	11:44	14.5	07/28/20	15:20	14.8	Bait	0
232	Minnow Trap	Columbia Mainstem	MT_LCR_08_1	450259	5464223	0.8	07/27/20	14:08	15.6	07/28/20	10:50	14.8	Bait	0
233	Minnow Trap	Columbia Mainstem	MT_LCR_08_2	450259	5464223	0.8	07/28/20	10:50	14.8	07/28/20	15:29	15.0	Bait	0
234	Minnow Trap	Columbia Mainstem	MT_LCR_09_1	452643	5464531	0.5	07/27/20	14:16	15.8	07/28/20	11:57	14.6	Bait	0
235	Minnow Trap	Columbia Mainstem	MT_LCR_10_1	452333	5462851	1	07/27/20	14:26	16.3	07/28/20	12:11	15.7	Bait	0
236	Minnow Trap	Lower Kootenay River	MT_LKR_01_1	452831	5462507	1	07/27/20	14:31	17.8	07/28/20	12:05	17.5	Bait	0
237	Minnow Trap	Zuckerberg Pond	MT_LCR_11_1	452122	5462742	0.4	07/28/20	12:25	20.8	07/29/20	9:55	20.8	Bait	0
238	Minnow Trap	Zuckerberg Pond	MT_LCR_12_1	452208	5462567	0.8	07/28/20	12:36	20.8	07/29/20	9:50	20.8	Bait	0
239	Light Trap	Zuckerberg Pond	LT_LCR_01_1	452191	5462676		07/22/20	15:34	20.0	07/23/20	10:40	20.0	Red light	0
240	Light Trap	Zuckerberg Pond	LT_LCR_02_1	452187	5462706		07/22/20	15:38	20.0	07/23/20	10:35	20.0	Yellow light	0
241	Light Trap	Zuckerberg Pond	LT_LCR_03_1	452217	5462798		07/22/20	15:47	20.0	07/23/20	10:20	20.0	White light	0
242	Light Trap	Columbia Mainstem	LT_LCR_04_1	452233	5462833		07/22/20	15:54	19.0	07/23/20	10:25	20.0	Orange light	0
243	Light Trap	Lower Kootenay River	LT_LKR_01_1	452831	5462507	1.2	07/27/20	15:00	18.3	07/28/20	12:02	17.5		0
244	Light Trap	Columbia Mainstem	LT_LCR_05_1	452333	5462851	1.2	07/27/20	15:16	17.4	07/28/20	12:10	15.7		0
245	Light Trap	Columbia Mainstem	LT_LCR_06_1	452643	5464531	2.0	07/27/20	15:29	15.7	07/28/20	11:56	14.6		0
246	Light Trap	Columbia Mainstem	LT_LCR_07_1	450259	5464223	1.0	07/27/20	15:57	15.7	07/28/20	10:48	14.8		0
247	Fyke Net	Zuckerberg Pond	FN_LCR_01_1	452195	5462638		07/23/20	11:38	20.0	07/23/20	15:30	20.0		0
248	Fyke Net	Zuckerberg Pond	FN_LCR_01_2	452195	5462638		07/23/20	15:30	20.0	07/24/20	9:09	20.0		0

Appendix B: Maps of Suppression Effort

Appendix B-1: Columbia River

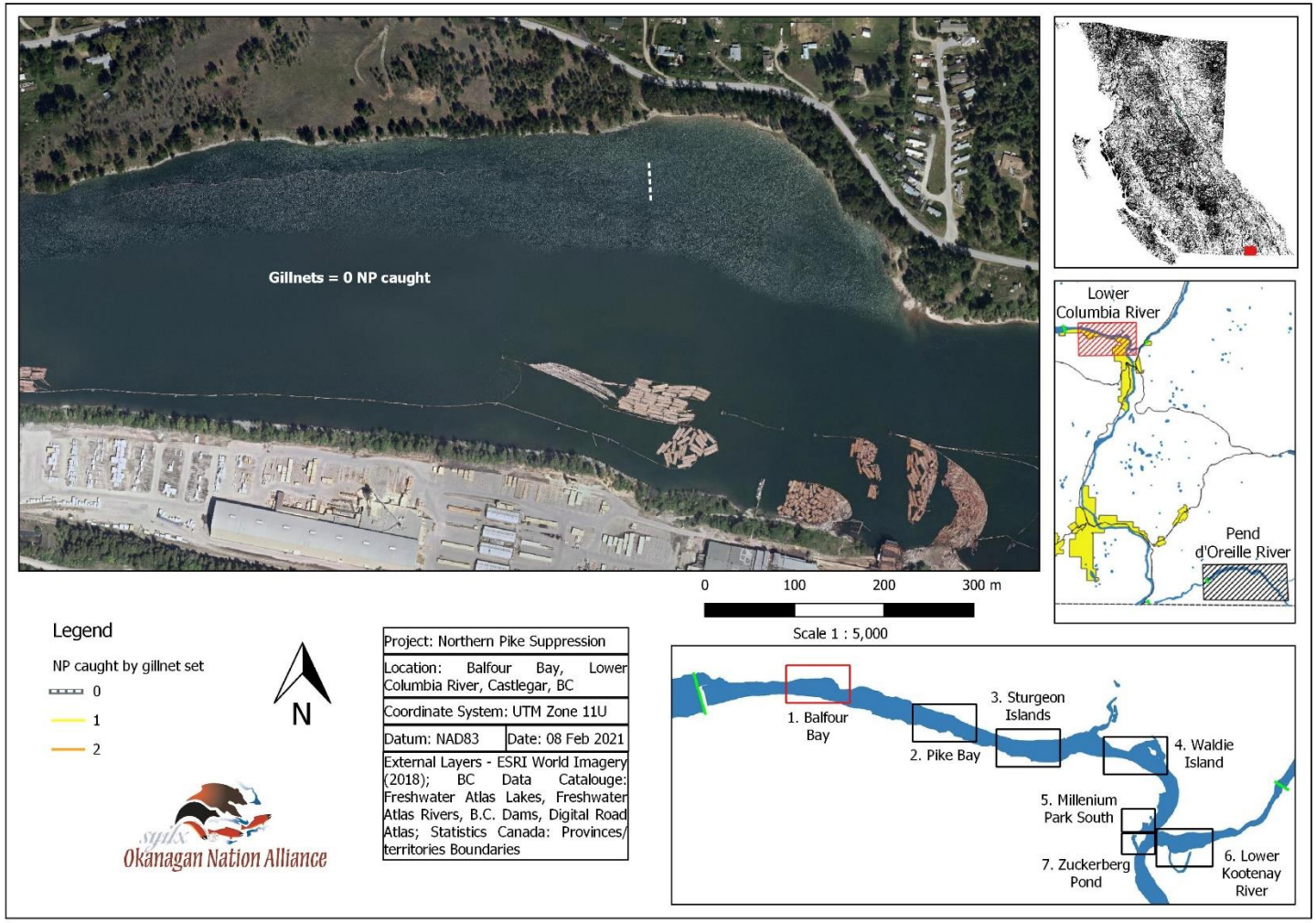

Figure 29. Balfour Bay in the Columbia River depicting gillnet locations (lines) differentiating between number of Northern Pike caught by gillnet between June 2020 and October 30 2020 where 0 = white hatched line, 1 = yellow line, 2 = orange line, with the total number of Northern Pike displayed.

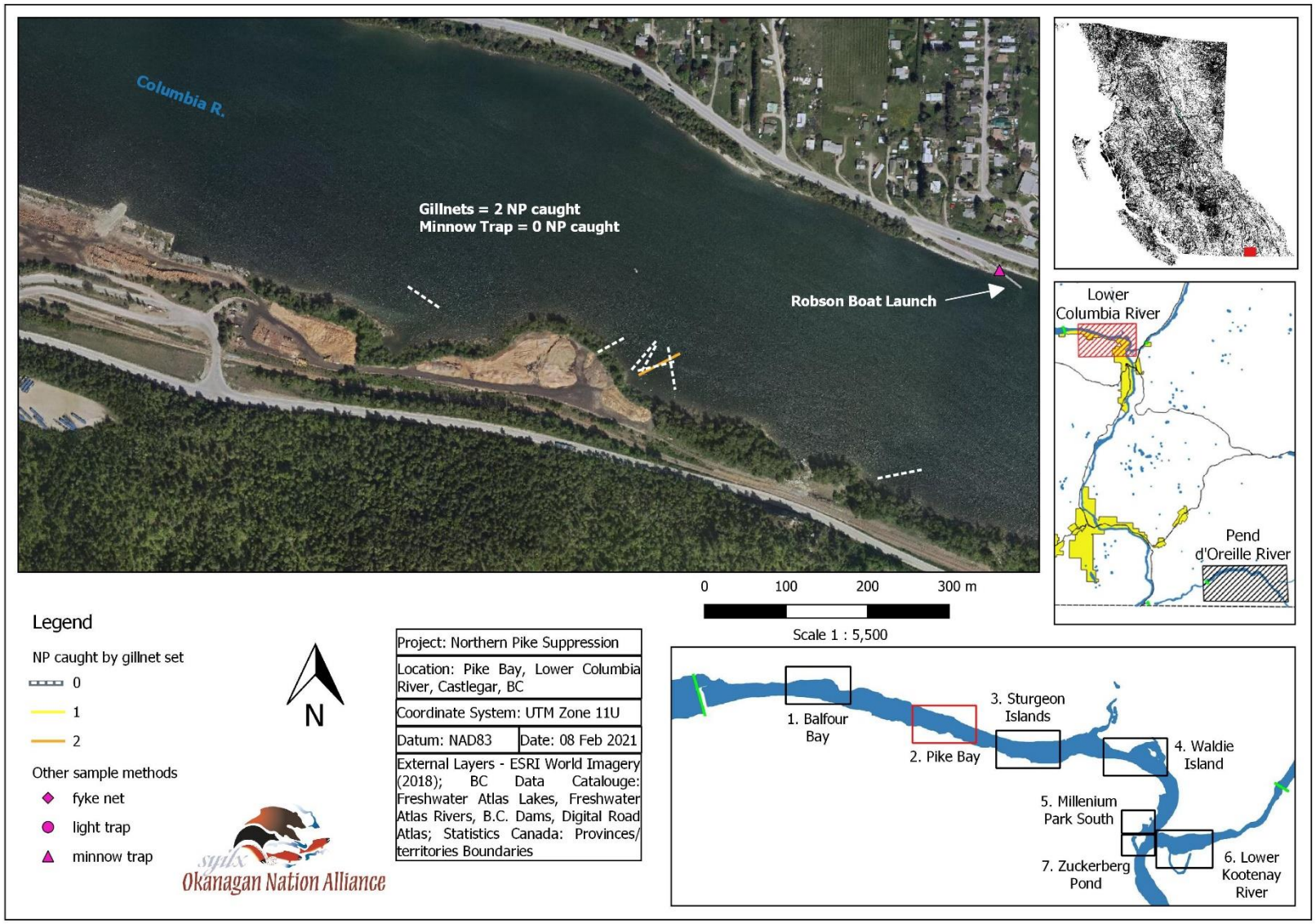

Figure 30. Pike Bay in the Columbia River depicting a minnow trap location (triangle) and gillnet locations (lines), differentiating between number of Northern Pike caught by gillnet between June 9 2020 and October 30 2020 where 0 = white hatched line, 1 = yellow line, 2 = orange line, and minnow trap location with the total number of Northern Pike displayed.

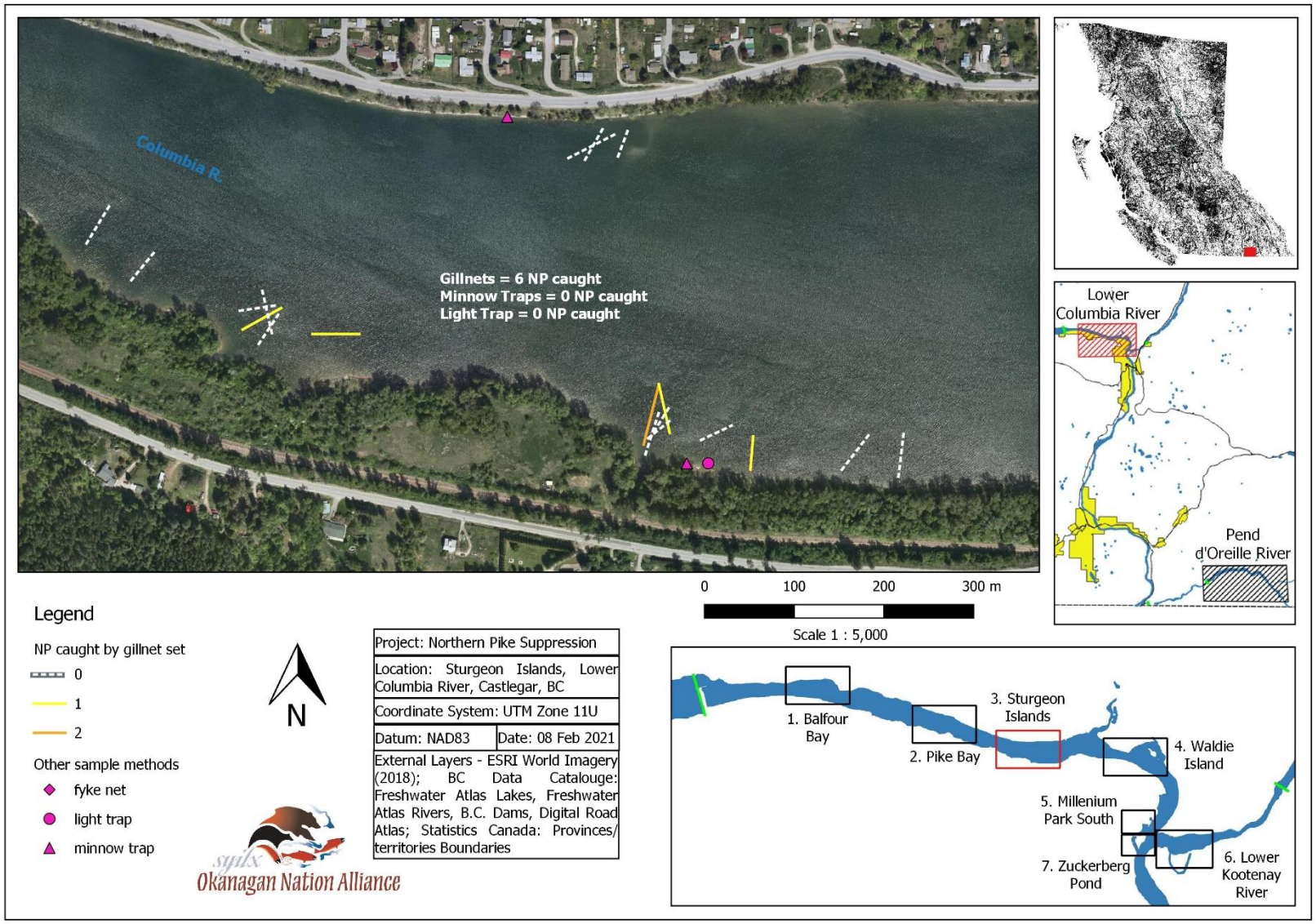

Figure 31. Sturgeon Islands in the Columbia River depicting minnow trap (triangle), light trap (circle), and gillnet (lines) locations differentiating between number of Northern Pike caught by gillnet between June 2020 and October 30 2020 where 0 = white hatched line, 1 = yellow line, 2 = orange line, with the total number of Northern Pike displayed.

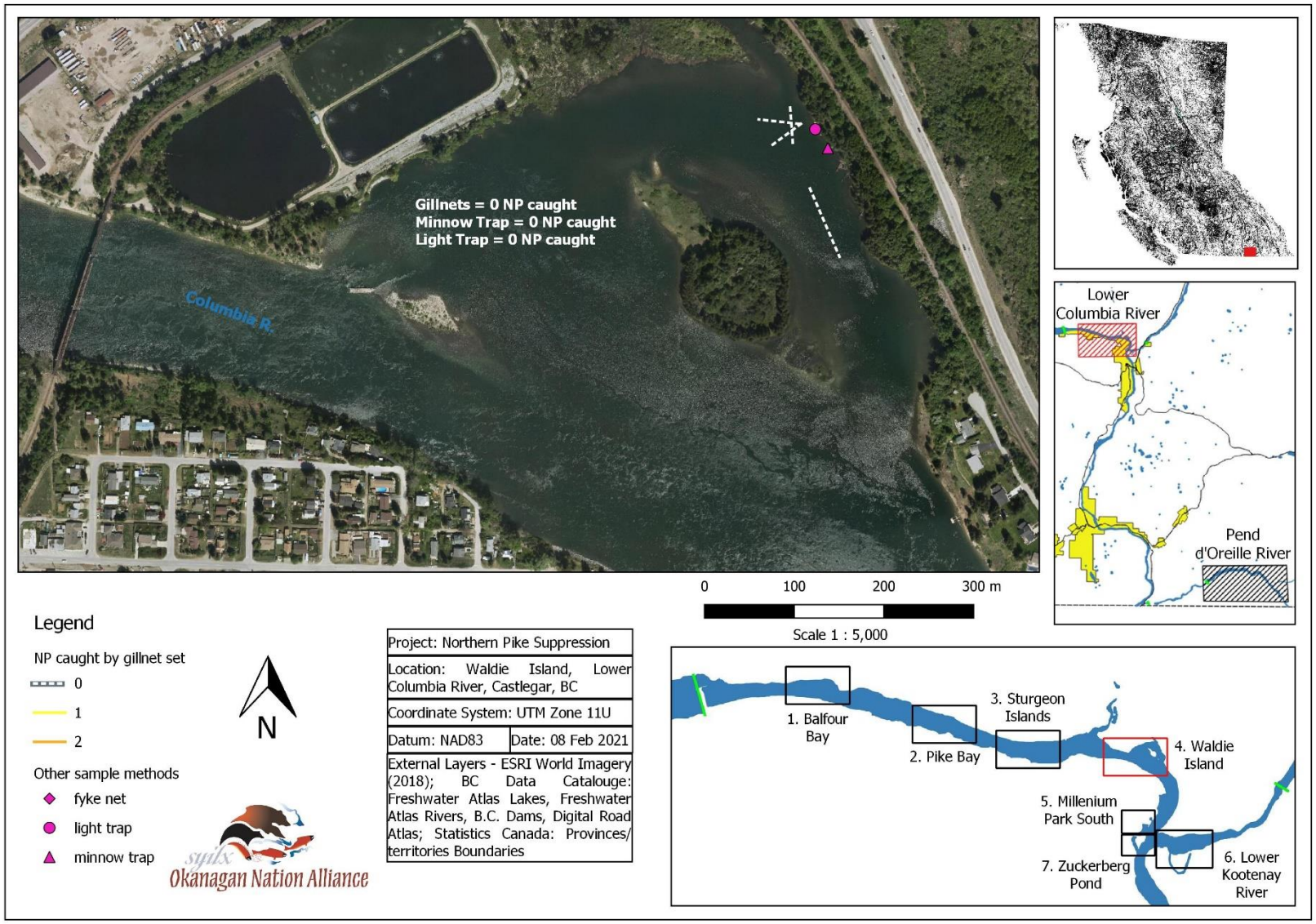

Figure 32. Waldie Island in the Columbia River depicting minnow trap (triangle), light trap (circle) and gillnet (short lines) locations differentiating between number of Northern Pike caught by gillnet between June 9 2020 and October 30 2020 where 0 = white hatched line, 1 = yellow line, 2 = orange line, with the total number of Northern Pike displayed.

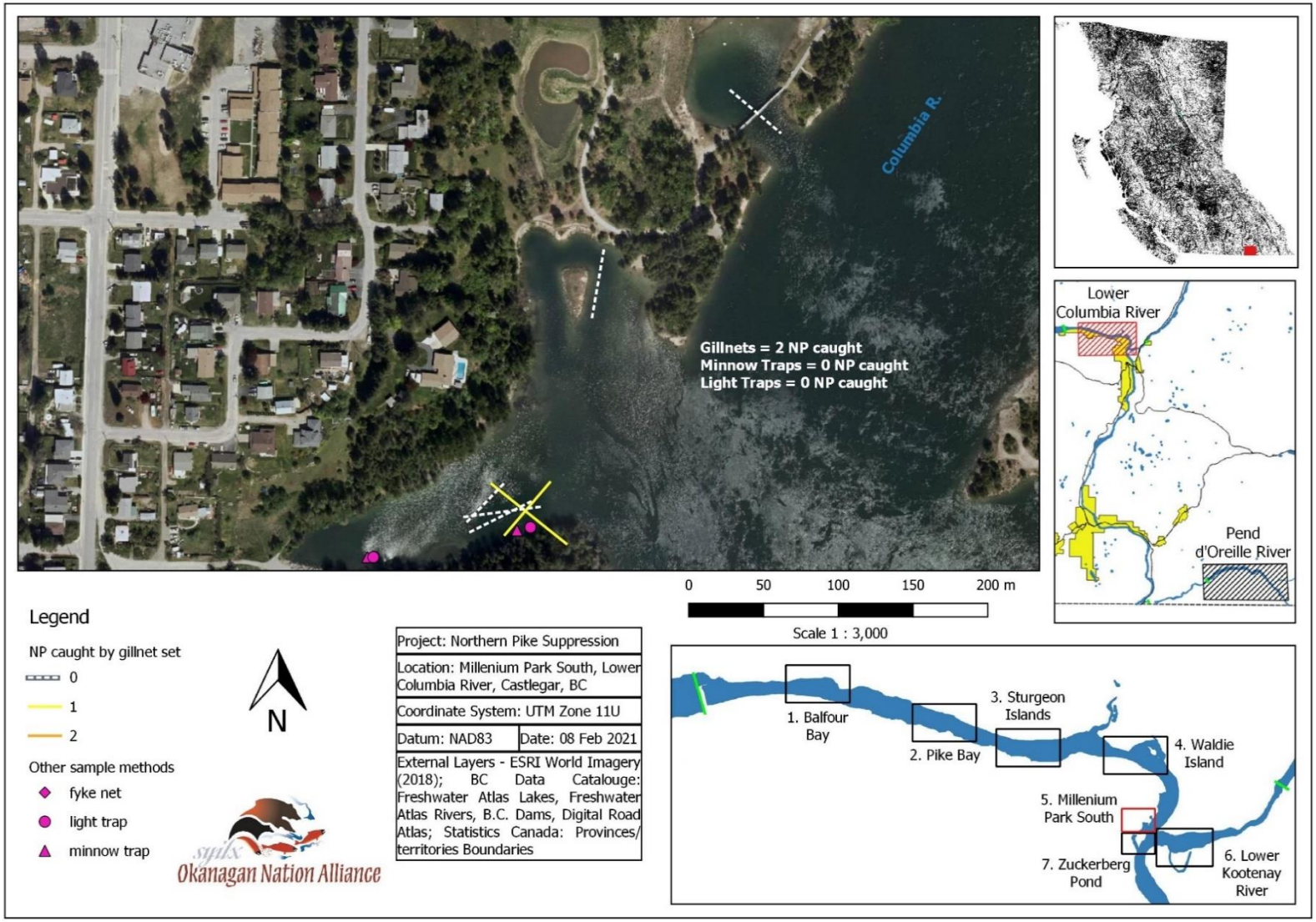

Figure 33. Millennium Park South in the Columbia River depicting minnow trap (triangle), light trap (circles), and gillnet (short lines) locations differentiating between number of Northern Pike caught by gillnet between June 9 2020 and October 30 2020 where 0 = white hatched line, 1 = yellow line, 2 = orange line, with the total number of Northern Pike displayed.

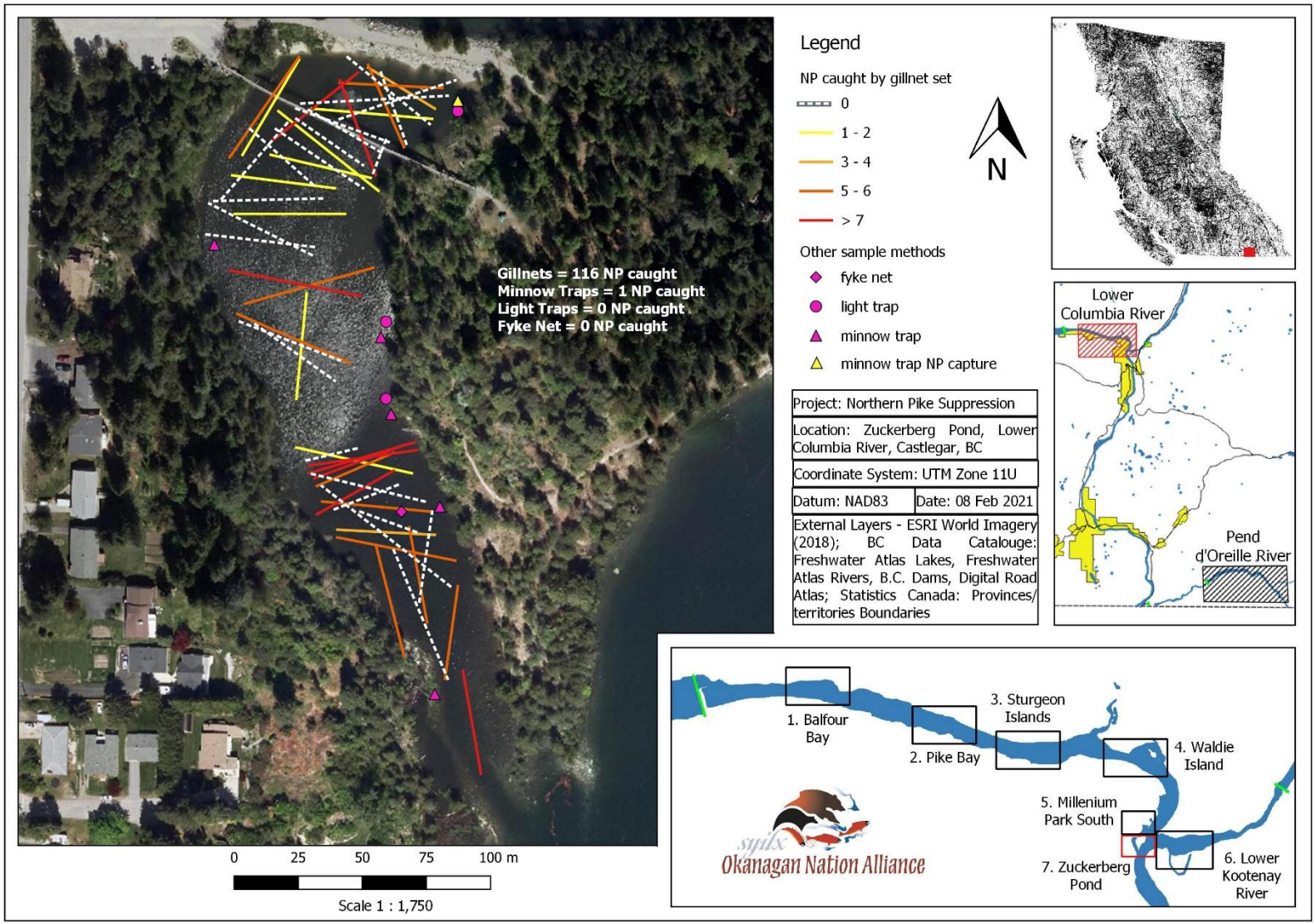

Figure 34. Zuckerberg Pond in the Columbia River depicting minnow trap (triangle), light trap (circle), fyke net (diamond), and gillnet (short lines) locations differentiating between number of Northern Pike caught by gillnet between June 9 2020 and October 30 2020 where 0 = white hatched line, 1-2 = yellow line, 3-4 = light-orange line, 5-6 = dark-orange line and >7 = red line, and minnow traps where yellow = 1, with the total number of Northern Pike displayed.

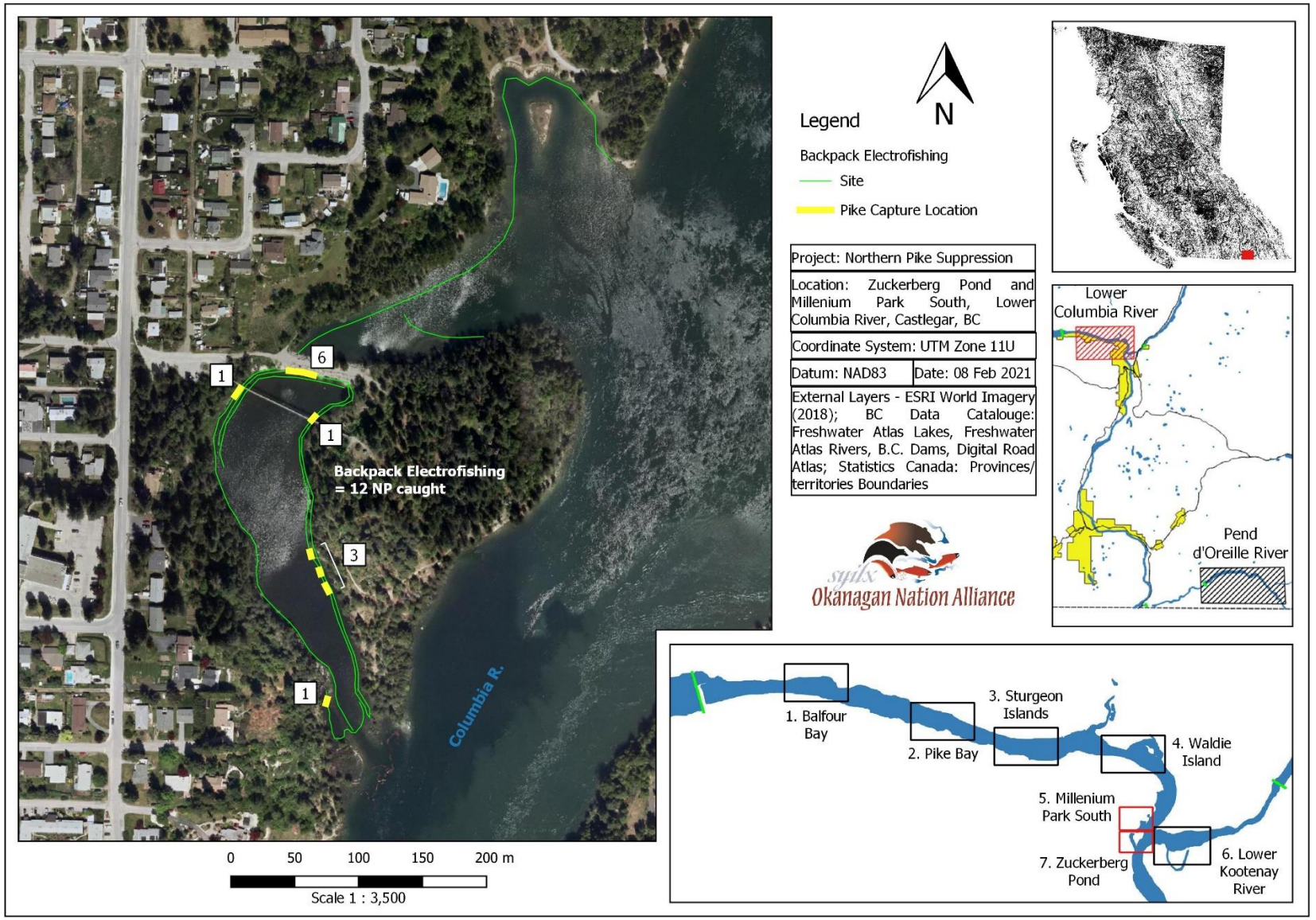

Figure 35. Zuckerberg Pond in the Columbia River depicting electrofishing locations differentiating between sample sites (green) and locations of captured Northern Pike (yellow) between June 9 2020 and October 30 2020 with the total number of Northern Pike displayed.

Appendix B-2: Pend d'Oreille River

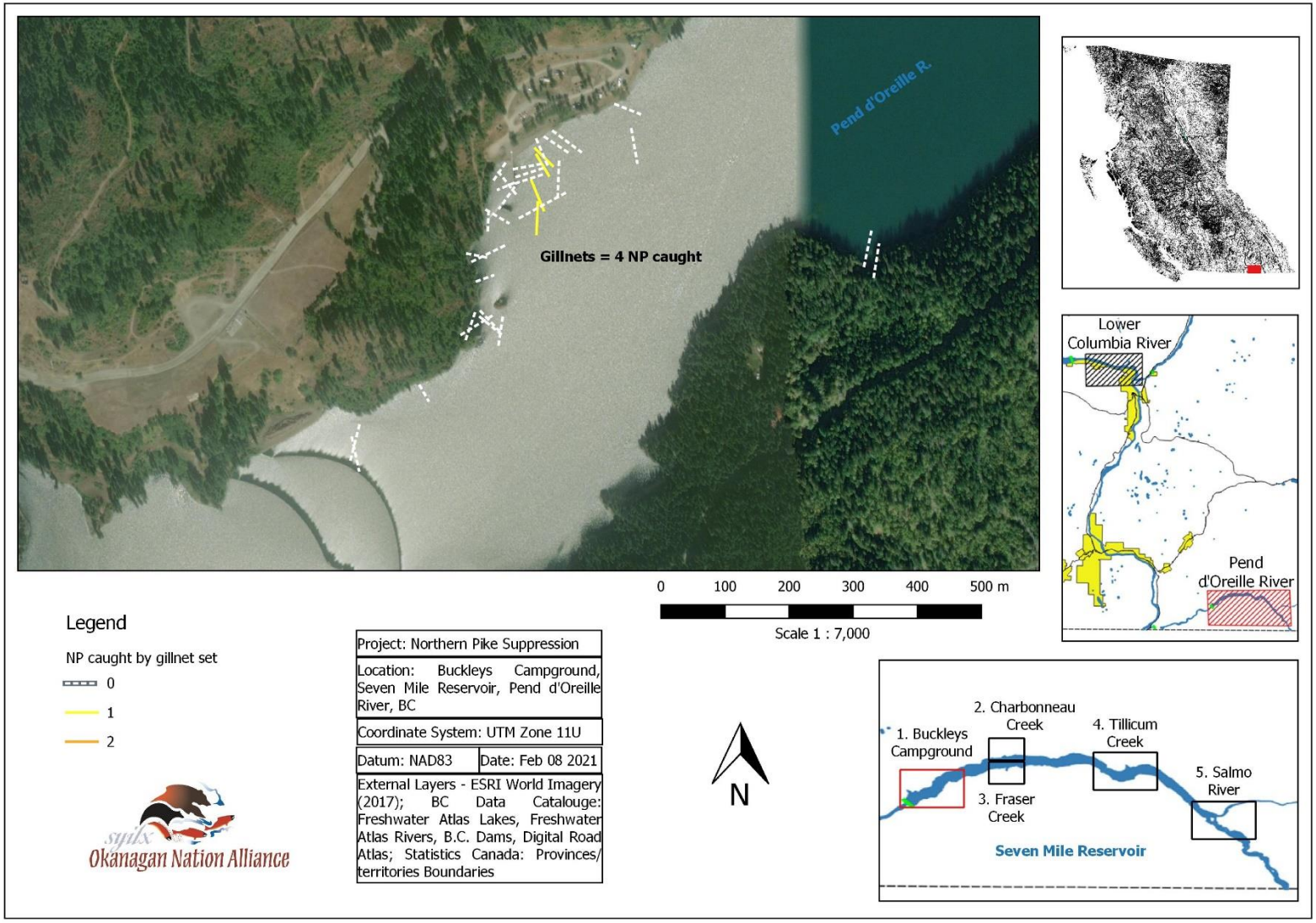

Figure 36. Buckley's Campground in the Seven Mile Reservoir (Pend d'Oreille River) depicting gillnet locations (short lines) differentiating between number of Northern Pike caught by gillnet between April 28 2020 and October 30 2020 where 0 = white hatched line, 1 = yellow line, 2 = orange line, with the total number of Northern Pike displayed.

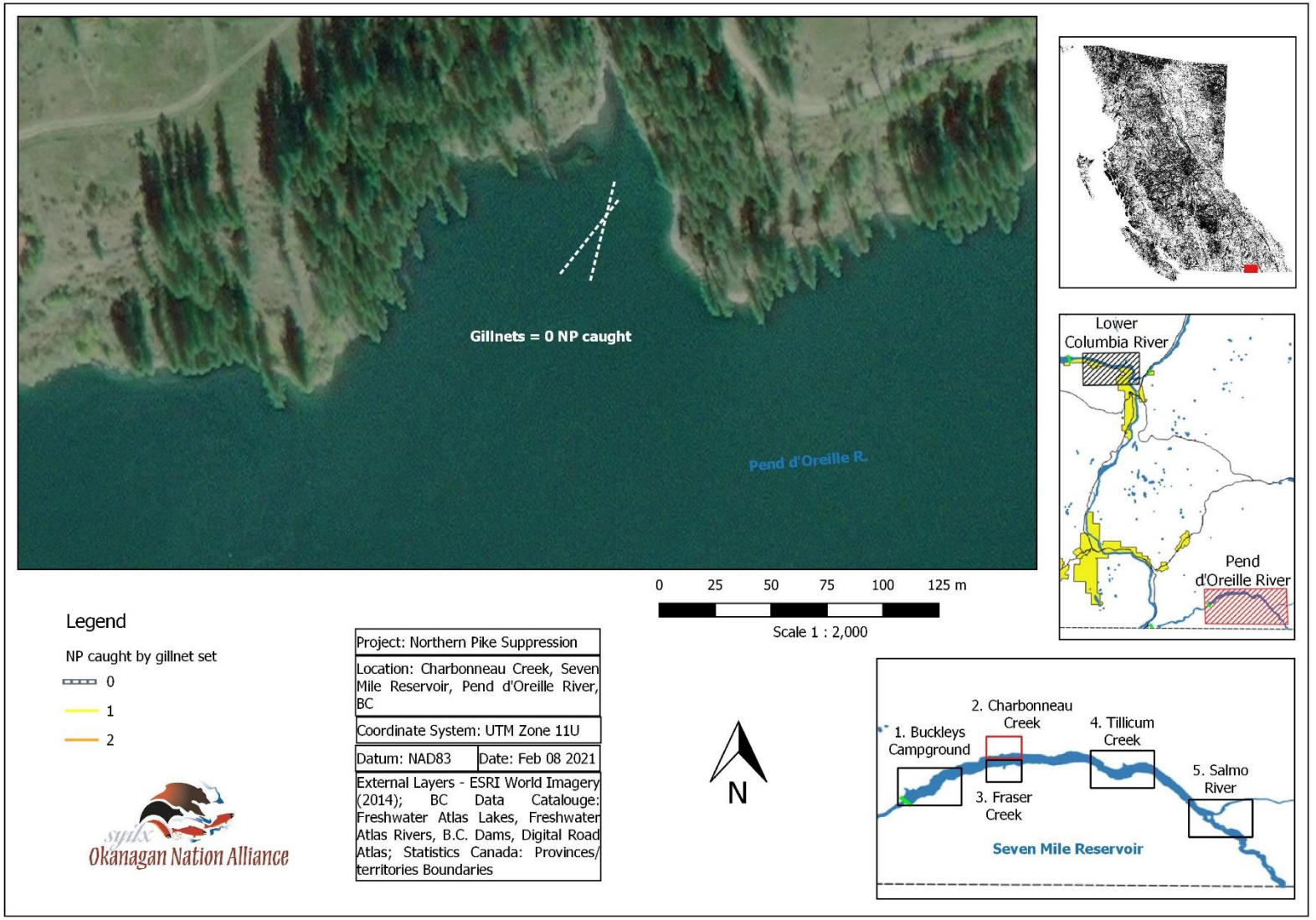

Figure 37. Charbonneau Creek in the Seven Mile Reservoir (Pend d'Oreille River) depicting gillnet locations (short lines) differentiating between number of Northern Pike caught by gillnet between April 28 2020 and October 30 2020 where 0 = white hatched line, 1 = yellow line, 2 = orange line, with the total number of Northern Pike displayed.

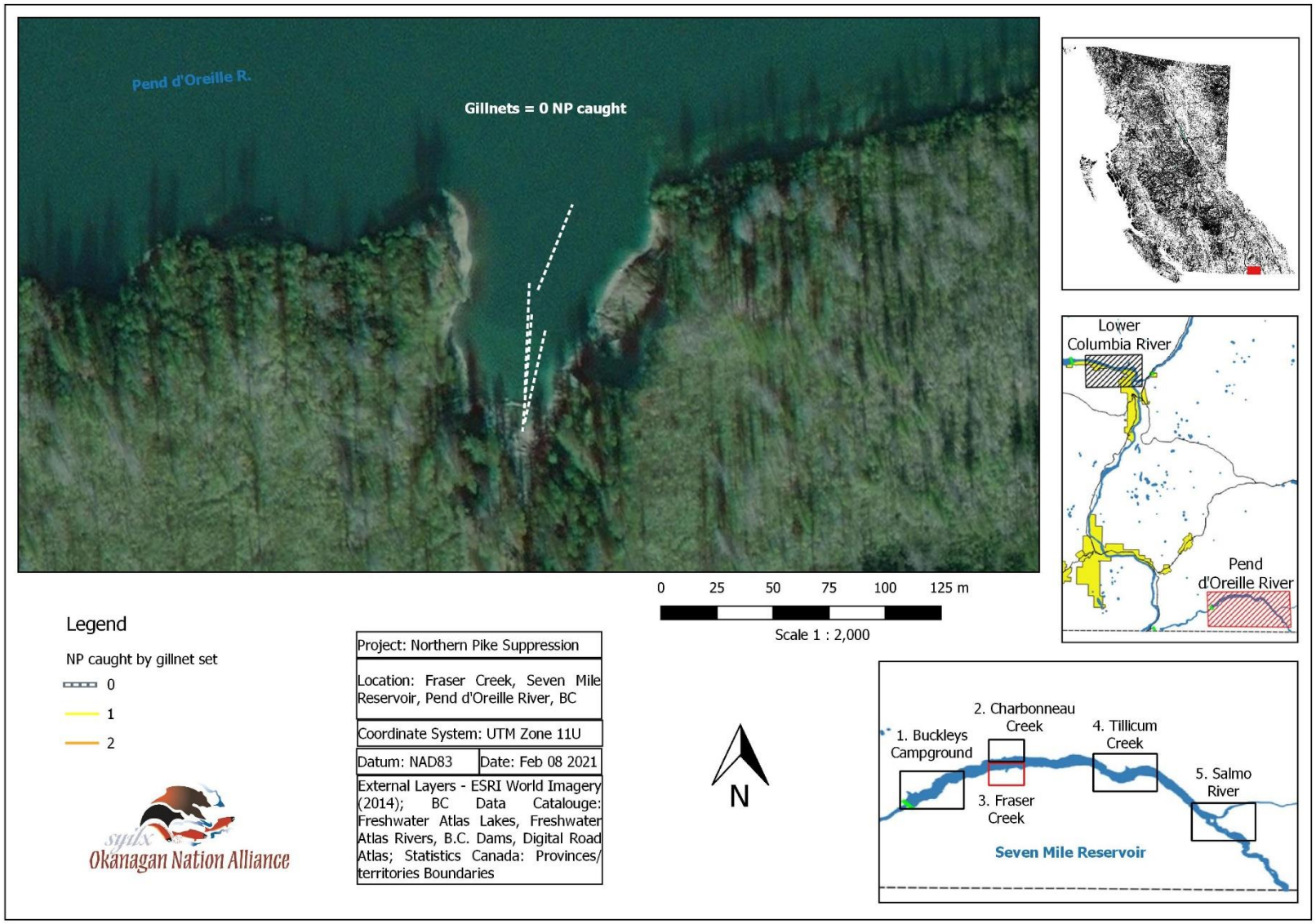

Figure 38. Fraser Creek in the Seven Mile Reservoir (Pend d'Oreille River) depicting gillnet locations (short lines) differentiating between number of Northern Pike caught by gillnet between April 28 2020 and October 30 2020 where 0 = white hatched line, 1 = yellow line, 2 = orange line, with the total number of Northern Pike displayed.

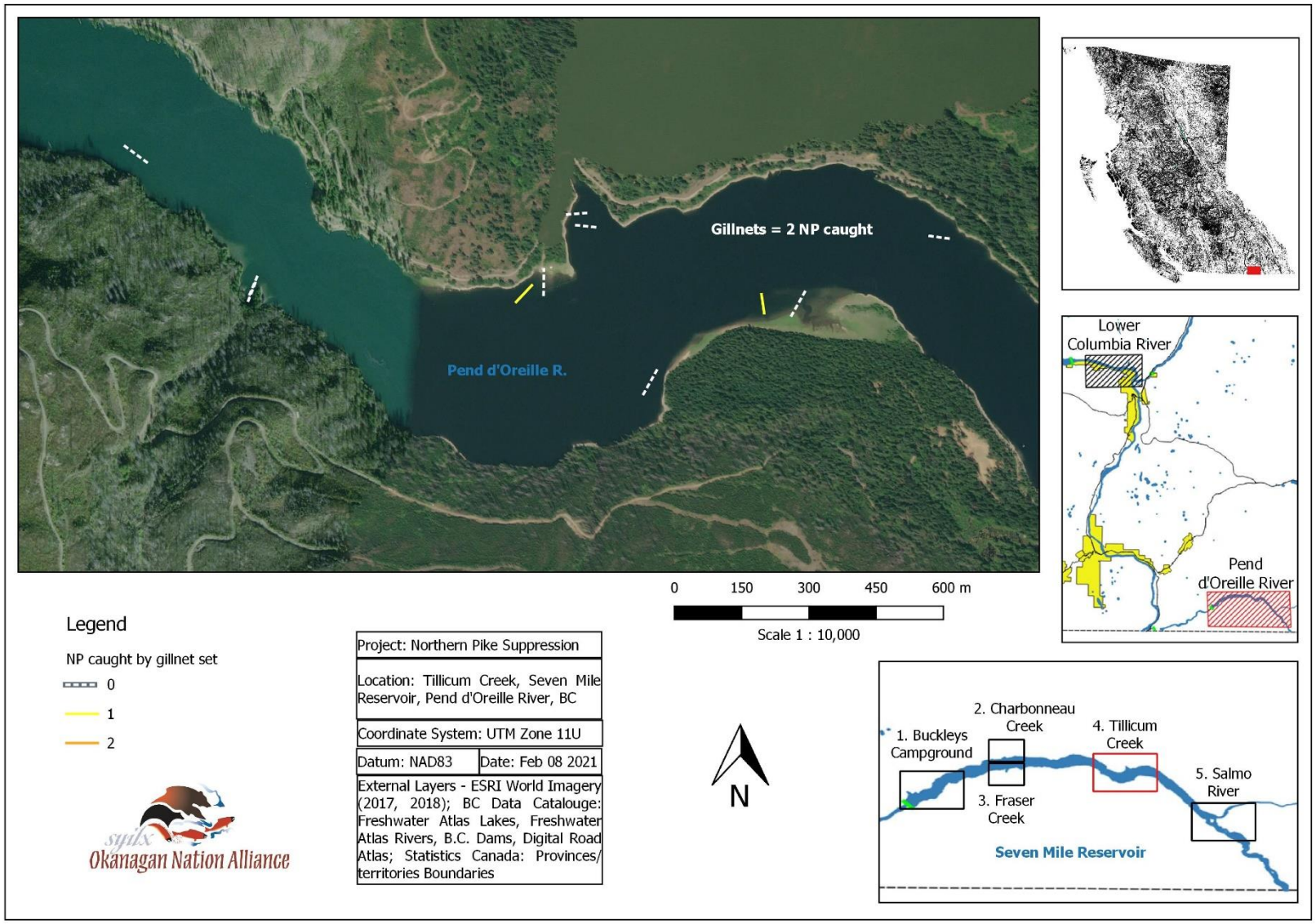

Figure 39. Tillicum Creek in the Seven Mile Reservoir (Pend d'Oreille River) depicting gillnet locations (short lines) differentiating between number of Northern Pike caught by gillnet between April 28 2020 and October 30 2020 where 0 = white hatched line, 1 = yellow line, 2 = orange line with the total number of Northern Pike displayed.

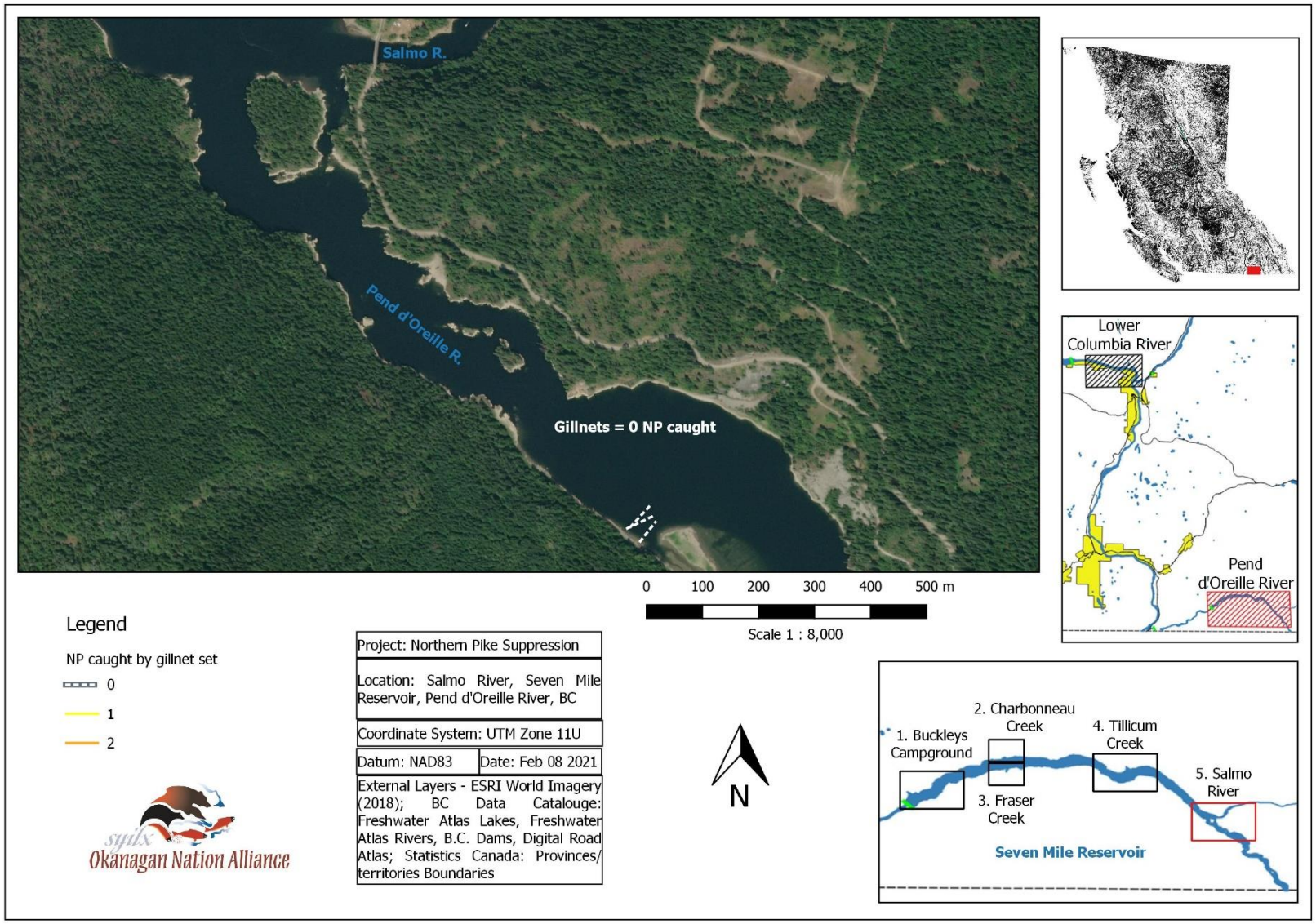

Figure 40. Salmo River in the Seven Mile Reservoir (Pend d'Oreille River) depicting gillnet locations (short lines) differentiating between number of Northern Pike caught by gillnet between April 28 2020 and October 30 2020 where 0 = white hatched line, 1 = yellow line, 2 = orange line with the total number of Northern Pike displayed.

Appendix C: Summary of Gillnet Effort by Season, Location, and Gillnet Type

Table 22. Summary of gillnet effort with total net-units, average net-units, count (# of sets) and total net hours by location and season, with resulting catch-per-unit-effort (CPUE) in Northern Pike (NP) per net-units, NP per net hours, and NP per 8 net-hours.

	Location	Total Net-Units	Average Net-Units	Count	Total NP	Total Net Hours	CPUE (# NP / Net-Units)	CPUE (NP / Net Hours)	CPUE (NP / 8 Net Hours)
Totals (Apr 28 - Oct 30)	**Pend d'Oreille River**	**45.82**	**0.42**	**109**	**6**	**1317.08**	**0.13**	**0.005**	**0.04**
	Columbia River	5.15	0.11	45	10	149.87	1.94	0.067	0.53
	lower Kootenay River	0.68	0.14	5	0	20.27	0.00	0.000	0.00
	Zuckerberg Pond	5.605	0.106	53	115	203.77	20.52	0.564	4.51
	Total Columbia River	**11.44**	**0.11**	**103**	**125**	**373.90**	**10.92**	**0.334**	**2.67**
	All Sites	57.26	0.27	212	131	1690.98	2.29	0.077	0.62
Spring (Apr 28 - Jun 30)	Pend d'Oreille River	43.15	0.48	90	6	1238.48	0.14	0.005	0.04
	Columbia River*	5.64	0.12	46	10	161.75	1.77	0.062	0.49
Summer (Jul 01 - Aug 19)	Zuckerberg Pond	0.51	0.13	4.00	16	17.80	31.14	0.899	7.19
Fall (Aug 20 - Oct 30)	**Pend d'Oreille River**	**2.67**	**0.14**	**19**	**0**	**78.60**	**0.00**	**0.000**	**0.00**
	Columbia River	0.15	0.05	3	0	6.35	0.00	0.000	0.00
	lower Kootenay River	0.05	0.05	1	0	2.03	0.00	0.000	0.00
	Zuckerberg Pond	5.09	0.10	49	99	185.97	19.45	0.532	4.26
	Total Columbia River	**5.29**	**0.10**	**53**	**99**	**194.35**	**18.70**	**0.509**	**4.08**
	All Sites	7.96	0.11	72	99	272.95	12.43	0.363	2.90

* Includes Columbia River and lower Kootenay River, but not Zuckerberg Pond.

Appendix D: Northern Pike Biological Data

Table 23. Northern Pike biological and sample information of individuals captured between April 28 and October 30 2020 including the Site ID, date of capture, method of capture (GN = gillnet; EF = backpack electrofishing; MT = minnow trap); designated Pike ID; fork length (mm), weight (g), sex (M = male; F= female; U = unknown), maturity, age (years; 0 = young-of-year), and stomach contents (LW = Lake Whitefish; PCC = Peamouth Chub; MW = Mountain Whitefish; RB = Rainbow Trout; CC = Sculpin sp.; SU = Sucker sp.; RSC = Redside Shiner; YP = Yellow Perch).

#	Site ID	Date	Method	Pike ID	Length (mm)	Weight (g)	Sex	Maturity	Age	Stomach Contents	Comments
1	GN_PDO_03_2	4/29/2020	GN	NP_2020_PDO_001	667	2637	M	Pre-spawning	3	- LW (318mm, 463g)	
2	GN_PDO_14_1	5/1/2020	GN	NP_2020_PDO_002	1001	10376	F	Pre-spawning	5	- Empty	- Egg in sac (1707g)
3	GN_PDO_17_1	5/5/2020	GN	NP_2020_PDO_003	1062	12150	F	Pre-spawning	5	- Empty	- Eggs in sac (1888g)
4	GN_PDO_24_1	5/6/2020	GN	NP_2020_PDO_004	926	8860	F	Pre-spawning	4	- Empty	- Parasites in intestines - Eggs in sac (1447g)
5	GN_PDO_25_3	5/8/2020	GN	NP_2020_PDO_005	933	6540	F	Pre-spawning	4	- Empty	- Gravid, eggs in sac (623g)
6	GN_PDO_29_1	5/20/2020	GN	NP_2020_PDO_006	979	8530	F	Spawning	4	- Empty	- Gravid, eggs free from sac - Leech on left jaw - Parasites in intestines
7	GN_LCR_01_1	6/9/2020	GN	NP_2020_LCR_007	975	7590	F	Spent	6	- Fish vertebrae and scales	- Spawned out - Very few intestinal parasites
8	GN_LCR_07_1	6/11/2020	GN	NP_2020_LCR_008	742	3523	F	Spent	3	- PCC (261mm, 190g)	- Spawned out - Intestinal parasites
9	GN_LCR_07_1	6/11/2020	GN	NP_2020_LCR_009	699	2883	M	Spawning	2	- Fish vertebrae - Ramshorn snails	- Spawned out - Intestinal parasites
10	GN_LCR_08_1	6/11/2020	GN	NP_2020_LCR_010	651	2661	M	Spent	2	- MW (very degraded)	- Spawning - Very few intestinal parasites
11	GN_LCR_08_1	6/11/2020	GN	NP_2020_LCR_011	957	8230	M	Spent	7	- MW (215mm, 99g) - PCC	- Spawned out - Live tapeworm in stomach / intestines - Wound near vent

#	Site ID	Date	Method	Pike ID	Length (mm)	Weight (g)	Sex	Maturity	Age	Stomach Contents	Comments
12	GN_LCR_05_1	6/11/2020	GN	NP_2020_LCR_012	836	4617	F	Spent	5	- RB	- Spawned out - Intestinal parasites - Acoustic tag (54269-1240791)
13	GN_LCR_13_1	6/12/2020	GN	NP_2020_LCR_013	782	3743	M	Spent	3	- MW (248mm, 197g)	- Spawned out - Very few intestinal parasites
14	GN_LCR_28_1	6/27/2020	GN	NP_2020_LCR_014	351	376	U	Undefined	1	- Empty	- Intestinal parasites
15	GN_LCR_29_1	6/27/2020	GN	NP_2020_LCR_015	395	504	U	Undefined	1	- 3 unidentifiable fish (possibly CC and SU)	
16	EF_LCR_05	7/22/2020	EF	NP_2020_LCR_016	117	11	U	Immature	0	- Empty	
17	EF_LCR_05	7/22/2020	EF	NP_2020_LCR_017	85	4	U	Immature	0	- Unidentifiable fish vertebrae, scales, and bones	- Intestinal parasites
18	EF_LCR_05	7/22/2020	EF	NP_2020_LCR_018	108	9	U	Immature	0	- SU (~290mm)	- Intestines full of digested food, hard to identify intestinal parasites
19	EF_LCR_05	7/22/2020	EF	NP_2020_LCR_019	79	3	U	Immature	0	- Unidentifiable fish vertebrae and fins	
20	EF_LCR_06	7/22/2020	EF	NP_2020_LCR_020	115	11	U	Immature	0	- Empty	
21	EF_LCR_06	7/22/2020	EF	NP_2020_LCR_021	115	13	U	Immature	0	- 1 CC - 1 grasshopper	
22	EF_LCR_06	7/22/2020	EF	NP_2020_LCR_022	94	6	U	Immature	0	- 1 CC - 1 SU	
23	EF_LCR_06	7/22/2020	EF	NP_2020_LCR_023	114	12	U	Immature	0	- 1 unidentifiable fish	
24	EF_LCR_06	7/22/2020	EF	NP_2020_LCR_024	82	4	U	Immature	0	- Grasshoppers and inverts - 2 unidentifiable fish vertebrae	- Injured but still gilling, found in ~40 cm on water, dip netted
25	EF_LCR_06	7/22/2020	EF	NP_2020_LCR_025	122	14	U	Immature	0	- Empty	

#	Site ID	Date	Method	Pike ID	Length (mm)	Weight (g)	Sex	Maturity	Age	Stomach Contents	Comments
26	EF_LCR_09	7/23/2020	EF	NP_2020_LCR_026	113	10	U	Immature	0	- 2 RB - 2 unidentifiable fish	
27	EF_LCR_09	7/23/2020	EF	NP_2020_LCR_027	100	7	U	Immature	0	- 1 CC (62mm)	
28	MT_LCR_02_1	7/24/2020	MT	NP_2020_LCR_028	110	10	U	Immature	0	- 1 CC (30mm)	
29	GN_LCR_33_1	6/28/2020	GN	NP_2020_LCR_029	372	430	U	Undefined	1	- 1 grasshopper and 2 inverts	
30	GN_LCR_37_1	8/18/2020	GN	NP_2020_LCR_030	558	1473	U	Undefined	2	- 2 CC (27mm)	
31	GN_LCR_37_1	8/18/2020	GN	NP_2020_LCR_031	589	1959	U	Undefined	2	- 3 unidentifiable fish	
32	GN_LCR_37_1	8/18/2020	GN	NP_2020_LCR_032	498	1170	U	Undefined	2	- 2 CC - 1 unidentifiable fish	
33	GN_LCR_39_1	8/18/2020	GN	NP_2020_LCR_033	180	41	U	Immature	0	- Empty	
34	GN_LCR_38_1	8/18/2020	GN	NP_2020_LCR_034	200	55	U	Immature	0	- 1 RB (50mm +, head missing)	
35	GN_LCR_38_1	8/18/2020	GN	NP_2020_LCR_035	195	62	U	Immature	0	- 1 leech - 6 aquatic sow bugs	
36	GN_LCR_38_1	8/18/2020	GN	NP_2020_LCR_036	195	60	U	Immature	0	- 1 CC (75mm)	
37	GN_LCR_38_1	8/18/2020	GN	NP_2020_LCR_037	135	23	U	Immature	0	- 1 RSC (~75mm)	
38	GN_LCR_40_1	8/18/2020	GN	NP_2020_LCR_038	528	1331	F	Undefined	2	- 1 YP - 1 wasp	
39	GN_LCR_40_1	8/18/2020	GN	NP_2020_LCR_039	190	60	U	Immature	0	- 5 grasshopper / crickets - 1 aquatic sow bug	
40	GN_LCR_40_1	8/18/2020	GN	NP_2020_LCR_040	172	40	U	Immature	0	- 1 CC (25mm +) - Unidentifiable fish fins	
41	GN_LCR_40_1	8/18/2020	GN	NP_2020_LCR_041	204	67	U	Immature	0	- 1 CC (36mm +)	
42	GN_LCR_40_1	8/18/2020	GN	NP_2020_LCR_042	183	43	U	Immature	0	- 1 RB - 2 CC	
43	GN_LCR_40_1	8/18/2020	GN	NP_2020_LCR_043	170	37	U	Immature	0	- 1 SU (122mm) - 1 CC	
44	GN_LCR_40_1	8/18/2020	GN	NP_2020_LCR_044	188	57	U	Immature	0	- 7 grasshoppers	
45	GN_LCR_40_1	8/18/2020	GN	NP_2020_LCR_045	166	39	U	Immature	0	- 1 CC (77mm +) - 1 YP	

#	Site ID	Date	Method	Pike ID	Length (mm)	Weight (g)	Sex	Maturity	Age	Stomach Contents	Comments
46	GN_LCR_41_1	8/20/2020	GN	NP_2020_LCR_046	171	36	U	Immature	0	- 3 grasshoppers	
47	GN_LCR_41_1	8/20/2020	GN	NP_2020_LCR_047	200	64	U	Immature	0	- 2 CC (32mm)	
48	GN_LCR_41_1	8/20/2020	GN	NP_2020_LCR_048	194	56	U	Immature	0	- Unidentifiable fish	
49	GN_LCR_42_1	8/20/2020	GN	NP_2020_LCR_049	174	39	U	Immature	0	- Empty	
50	GN_LCR_42_1	8/20/2020	GN	NP_2020_LCR_050	175	42	U	Immature	0	- CC (63mm +)	
51	GN_LCR_42_1	8/20/2020	GN	NP_2020_LCR_051	165	34	U	Immature	0	- 1 CC (39mm) - 2 YP	
52	GN_LCR_42_1	8/20/2020	GN	NP_2020_LCR_052	166	31	U	Immature	0	- Unidentifiable fish	
53	GN_LCR_42_1	8/20/2020	GN	NP_2020_LCR_053	205	69	U	Immature	0	- 1 grasshopper / cricket	
54	GN_LCR_42_1	8/20/2020	GN	NP_2020_LCR_054	178	44	U	Immature	0	- 2 YP (41mm +)	
55	GN_LCR_42_1	8/20/2020	GN	NP_2020_LCR_055	221	94	U	Immature	0	- 1 CC - 2 unidentifiable fish	
56	GN_LCR_42_1	8/20/2020	GN	NP_2020_LCR_056	355	350	U	Undefined	1	- Empty	
57	GN_LCR_43_1	8/20/2020	GN	NP_2020_LCR_057	180	40	U	Immature	0	- Empty	
58	GN_LCR_43_1	8/20/2020	GN	NP_2020_LCR_058	210	79	U	Immature	0	- Empty	
59	GN_LCR_43_1	8/20/2020	GN	NP_2020_LCR_059	171	42	U	Immature	0	- Various inverts	
60	GN_LCR_43_1	8/20/2020	GN	NP_2020_LCR_060	173	35	U	Immature	0	- 1 CC - 1 YP	
61	GN_LCR_43_1	8/20/2020	GN	NP_2020_LCR_061	167	36	U	Immature	0	- 1 CC - Several aquatic sow bugs / flies	
62	GN_LCR_43_1	8/20/2020	GN	NP_2020_LCR_062	176	39	U	Immature	0	- 2 YP (39mm +)	
63	GN_LCR_43_1	8/20/2020	GN	NP_2020_LCR_063	181	47	U	Immature	0	- 1 SU (110mm +)	
64	GN_LCR_44_1	8/20/2020	GN	NP_2020_LCR_064	190	49	U	Immature	0	- 1 SU - 1 YP	
65	GN_LCR_46_1	8/21/2020	GN	NP_2020_LCR_065	190	49	U	Immature	0	- 1 YP	
66	GN_LCR_46_1	8/21/2020	GN	NP_2020_LCR_066	164	29	U	Immature	0	- 1 RSC (65mm +)	
67	GN_LCR_46_1	8/21/2020	GN	NP_2020_LCR_067	159	29	U	Immature	0	- Empty	
68	GN_LCR_47_1	8/21/2020	GN	NP_2020_LCR_068	181	46	U	Immature	0	- 1 YP (95mm)	
69	GN_LCR_47_1	8/21/2020	GN	NP_2020_LCR_069	182	40	U	Immature	0	- Unidentifiable fish	
70	GN_LCR_47_1	8/21/2020	GN	NP_2020_LCR_070	184	42	U	Immature	0	- Empty	
71	GN_LCR_48_1	8/21/2020	GN	NP_2020_LCR_071	195	65	U	Immature	0	- Empty	
72	GN_LCR_49_1	8/21/2020	GN	NP_2020_LCR_072	224	93	U	Immature	0	- 1 YP	

#	Site ID	Date	Method	Pike ID	Length (mm)	Weight (g)	Sex	Maturity	Age	Stomach Contents	Comments
73	GN_LCR_49_1	8/21/2020	GN	NP_2020_LCR_073	190	63	U	Immature	0	- Unidentifiable fish	
74	GN_LCR_49_1	8/21/2020	GN	NP_2020_LCR_074	174	46	U	Immature	0	- Unidentifiable fish	
75	GN_LCR_49_1	8/21/2020	GN	NP_2020_LCR_075	181	44	U	Immature	0	- 2 unidentifiable fish	
76	GN_LCR_49_1	8/21/2020	GN	NP_2020_LCR_076	220	95	U	Immature	0	- Insects	
77	GN_LCR_51_1	8/24/2020	GN	NP_2020_LCR_077	210	80	U	Immature	0	- Empty	- Injuries on side
78	GN_LCR_51_1	8/24/2020	GN	NP_2020_LCR_078	160	26	U	Immature	0	- Empty	
79	GN_LCR_51_1	8/24/2020	GN	NP_2020_LCR_079	175	48	U	Immature	0	- Empty	
80	GN_LCR_51_1	8/24/2020	GN	NP_2020_LCR_080	180	40	U	Immature	0	- Empty	
81	GN_LCR_52_1	8/24/2020	GN	NP_2020_LCR_081	210	67	U	Immature	0	- 1 YP	
82	GN_LCR_52_1	8/24/2020	GN	NP_2020_LCR_082	185	42	U	Immature	0	- Empty	
83	GN_LCR_52_1	8/24/2020	GN	NP_2020_LCR_083	87	43	U	Immature	0	- 1 unidentifiable fish	
84	GN_LCR_52_1	8/24/2020	GN	NP_2020_LCR_084	193	46	U	Immature	0	- 1 unidentifiable fish	
85	GN_LCR_52_1	8/24/2020	GN	NP_2020_LCR_085	157	27	U	Immature	0	- 2 CC - 1 unidentifiable fish	
86	GN_LCR_52_1	8/24/2020	GN	NP_2020_LCR_086	166	29	U	Immature	0	- Empty	
87	GN_LCR_52_1	8/24/2020	GN	NP_2020_LCR_087	176	45	U	Immature	0	- RSC (73mm +) - 1 unidentifiable fish	
88	GN_LCR_52_1	8/24/2020	GN	NP_2020_LCR_088	170	38	U	Immature	0	- Empty	
89	GN_LCR_54_1	8/24/2020	GN	NP_2020_LCR_089	200	53	U	Immature	0	- 1 unidentifiable fish	
90	GN_LCR_56_1	8/26/2020	GN	NP_2020_LCR_090	185	40	U	Immature	0	- Empty	
91	GN_LCR_56_1	8/26/2020	GN	NP_2020_LCR_091	190	46	U	Immature	0	- 2 RB (75mm +) - 1 unidentifiable	
92	GN_LCR_56_1	8/26/2020	GN	NP_2020_LCR_092	145	21	U	Immature	0	- 3 unidentifiable fish	
93	GN_LCR_58_1	8/26/2020	GN	NP_2020_LCR_093	170	34	U	Immature	0	- 1 unidentifiable fish	
94	GN_LCR_58_1	8/26/2020	GN	NP_2020_LCR_094	174	38	U	Immature	0	- 1 SU (95mm +)	
95	GN_LCR_58_1	8/26/2020	GN	NP_2020_LCR_095	167	33	U	Immature	0	- 1 unidentifiable fish	
96	GN_LCR_60_1	8/27/2020	GN	NP_2020_LCR_096	215	65	U	Immature	0	- Empty	

#	Site ID	Date	Method	Pike ID	Length (mm)	Weight (g)	Sex	Maturity	Age	Stomach Contents	Comments
97	GN_LCR_60_1	8/27/2020	GN	NP_2020_LCR_097	206	65	U	Immature	0	- 2 YP (47mm)	
98	GN_LCR_60_1	8/27/2020	GN	NP_2020_LCR_098	234	71	U	Immature	0	- 1 RSC (51mm) - 1 unidentifiable fish	
99	GN_LCR_60_1	8/27/2020	GN	NP_2020_LCR_099	195	60	U	Immature	0	- 1 YP	
100	GN_LCR_60_1	8/27/2020	GN	NP_2020_LCR_100	208	80	U	Immature	0	- 1 unidentifiable fish	
101	GN_LCR_60_1	8/27/2020	GN	NP_2020_LCR_101	194	49	U	Immature	0	- 1 CC - 2 YP	
102	GN_LCR_60_1	8/27/2020	GN	NP_2020_LCR_102	170	34	U	Immature	0	- 1 CC - 1 YP - Inverts (1 mayfly, 1 aquatic sow bug, 1 grasshopper / cricket)	
103	GN_LCR_60_1	8/27/2020	GN	NP_2020_LCR_103	185	44	U	Immature	0	- 10 aquatic invertebrates (including aquatic sow bugs) - 1 unidentifiable fish	
104	GN_LCR_61_1	8/27/2020	GN	NP_2020_LCR_104	240	138	U	Immature	0	- 1 YP - 3 aquatic sow bugs	
105	GN_LCR_61_1	8/27/2020	GN	NP_2020_LCR_105	165	40	U	Immature	0	- 2 unidentifiable fish - 1 grasshopper - 1 mayfly	
106	GN_LCR_62_1	8/27/2020	GN	NP_2020_LCR_106	207	74	U	Immature	0	- 1 insect	
107	GN_LCR_62_1	8/27/2020	GN	NP_2020_LCR_107	221	94	U	Immature	0	- 1 unidentifiable fish	
108	GN_LCR_62_1	8/27/2020	GN	NP_2020_LCR_108	184	41	U	Immature	0	- Empty	
109	GN_LCR_62_1	8/27/2020	GN	NP_2020_LCR_109	175	41	U	Immature	0	- 2 insects	
110	GN_LCR_62_1	8/27/2020	GN	NP_2020_LCR_110	199	60	U	Immature	0	- 1 unidentifiable fish	
111	GN_LCR_62_1	8/27/2020	GN	NP_2020_LCR_111	224	83	U	Immature	0	- 1 YP	
112	GN_LCR_63_1	8/27/2020	GN	NP_2020_LCR_112	190	46	U	Immature	0	- 1 YP	

#	Site ID	Date	Method	Pike ID	Length (mm)	Weight (g)	Sex	Maturity	Age	Stomach Contents	Comments
113	GN_LCR_63_1	8/27/2020	GN	NP_2020_LCR_113	174	31	U	Immature	0	- Empty	
114	GN_LCR_63_1	8/27/2020	GN	NP_2020_LCR_114	184	39	U	Immature	0	- 1 CC (106mm)	
115	GN_LCR_63_1	8/27/2020	GN	NP_2020_LCR_115	189	52	U	Immature	0	- Empty	
116	GN_LCR_63_1	8/27/2020	GN	NP_2020_LCR_116	175	35	U	Immature	0	- 2 YP	
117	GN_LCR_63_1	8/27/2020	GN	NP_2020_LCR_117	210	70	U	Immature	0	- 2 YP	
118	GN_LCR_63_1	8/27/2020	GN	NP_2020_LCR_118	184	54	U	Immature	0	- 1 unidentifiable fish	
119	GN_LCR_67_1	9/23/2020	GN	NP_2020_LCR_119	220	73	U	Immature	0	- 1 unidentifiable fish	
120	GN_LCR_67_1	9/23/2020	GN	NP_2020_LCR_120	260	140	U	Immature	0	- Empty	
121	GN_LCR_67_1	9/23/2020	GN	NP_2020_LCR_121	215	71	U	Immature	0	- 1 unidentifiable fish	
122	GN_LCR_67_1	9/23/2020	GN	NP_2020_LCR_122	233	87	U	Immature	0	- Empty	
123	GN_LCR_67_1	9/23/2020	GN	NP_2020_LCR_123	212	67	U	Immature	0	- Empty	
124	GN_LCR_67_1	9/23/2020	GN	NP_2020_LCR_124	230	101	U	Immature	0	- Empty	
125	GN_LCR_67_1	9/23/2020	GN	NP_2020_LCR_125	250	116	U	Immature	0	- Empty	
126	GN_LCR_67_1	9/23/2020	GN	NP_2020_LCR_126	209	70	U	Immature	0	- Empty	
127	GN_LCR_68_1	9/23/2020	GN	NP_2020_LCR_127	273	155	U	Immature	0	- 1 YP	
128	GN_LCR_70_1	9/23/2020	GN	NP_2020_LCR_128	242	100	U	Immature	0	- 1 YP	
129	GN_LCR_70_1	9/23/2020	GN	NP_2020_LCR_129	222	90	U	Immature	0	- 2 YP	
130	GN_LCR_70_1	9/23/2020	GN	NP_2020_LCR_130	252	113	U	Immature	0	- 3 YP	
131	GN_LCR_70_1	9/23/2020	GN	NP_2020_LCR_131	208	80	U	Immature	0	- 1 YP	
132	GN_LCR_70_1	9/23/2020	GN	NP_2020_LCR_132	205	76	U	Immature	0	- Stomach contents not analyzed	
133	GN_LCR_70_1	9/23/2020	GN	NP_2020_LCR_133	197	73	U	Immature	0	- Stomach contents not analyzed	
134	GN_LCR_70_1	9/23/2020	GN	NP_2020_LCR_134	224	85	U	Immature	0	- Stomach contents not analyzed	
135	GN_LCR_70_1	9/23/2020	GN	NP_2020_LCR_135	219	79	U	Immature	0	- Stomach contents not analyzed	
136	GN_LCR_70_1	9/23/2020	GN	NP_2020_LCR_136	199	58	U	Immature	0	- Stomach contents not analyzed	

#	Site ID	Date	Method	Pike ID	Length (mm)	Weight (g)	Sex	Maturity	Age	Stomach Contents	Comments
137	GN_LCR_72_1	9/23/2020	GN	NP_2020_LCR_137	220	109	U	Immature	0	- Stomach contents not analyzed	
138	GN_LCR_72_1	9/23/2020	GN	NP_2020_LCR_138	222	114	U	Immature	0	- Stomach contents not analyzed	
139	GN_LCR_75_1	10/13/2020	GN	NP_2020_LCR_139	263	129	U	Immature	0	- Stomach contents not analyzed	
140	GN_LCR_75_1	10/13/2020	GN	NP_2020_LCR_140	214	70	U	Immature	0	- Stomach contents not analyzed	
141	GN_LCR_75_1	10/13/2020	GN	NP_2020_LCR_141	242	112	U	Immature	0	- Stomach contents not analyzed	
142	GN_LCR_79_1	10/20/2020	GN	NP_2020_LCR_142	280	147	U	Immature	0	- 1 YP	- Intestinal parasites present
143	GN_LCR_81_1	10/20/2020	GN	NP_2020_LCR_143	275	153	U	Immature	0	- 1 unidentifiable	
144	GN_LCR_82_1	10/20/2020	GN	NP_2020_LCR_144	252	139	U	Immature	0	- 1 CC - 1 aquatic invertebrate	

Appendix E: Bycatch Data

Table 24. Bycatch by method in the Columbia River Mainstem and lower Kootenay River, and Zuckerberg Pond.

Location	Sample Type	Species	Scientific Name	Status	Total Number
Lower Columbia River Mainstem + Lower Kootenay River	Light Trap	No Bycatch Caught			
	Minnow Trap	No Bycatch Caught			
	Backpack Electrofishing	Sucker (General)	*Catostomidae* sp.	Native	1
		Yellow Perch	*Perca flavescens*	Non-native	2
	Gillnetting	Lake Whitefish	*Coregonus clupeaformis*	Non-native	103
		Sucker sp.	*Catostomidae* sp	Native	51
		Mountain Whitefish	*Prosopium williamsoni*	Native	75
		Northern Pikeminnow	*Ptychocheilus oregonensis*	Native	21
		Peamouth Chub	*Mylocheilus caurinus*	Native	2
		Rainbow Trout	*Oncorhynchus mykiss*	Native	13
		Walleye	*Sander vitreus*	Non-native	7
		White Sturgeon	*Acipenser transmontanus*	Native	15
Zuckerberg Pond	Fyke Net	No Bycatch Caught			
	Minnow Trap	No Bycatch Caught			
	Light Trap	Redside Shiner	*Richardsonius balteatus*	Native	1
	Backpack Electrofishing	Northern Pikeminnow	*Ptychocheilus oregonensis*	Native	1
		Redside Shiner	*Richardsonius balteatus*	Native	14
		Sculpin (General)	*Cottoidea sp.*	Native	1
		Tench	*Tinca tinca*	Non-native	4
		Yellow Perch	*Perca flavescens*	Non-native	1
	Gillnetting	Sucker sp.	*Catostomidae* sp.	Native	11
		Yellow Perch	*Perca flavescens*	Non-native	394

Table 25. Bycatch by method in the Pend d'Oreille River (Seven Mile Reservoir).

Location	Sample Type	Species	Scientific Name	Status	Total Number
Seven Mile Reservoir	Angling	Bull Trout	*Salvelinus confluentus*	Native	1
	Gillnetting	Brook Trout	*Salvelinus fontinalis*	Non-native	2
		Brown Trout	*Salmo trutta*	Non-native	7
		Bull Trout	*Salvelinus confluentus*	Native	8
		Bullhead/catfish	*Ictaluridae sp.*	Non-native	1
		Cutthroat Trout	*Oncorhynchus clarkii*	Native	3
		Lake Trout	*Salvelinus namaycush*	Non-native	27
		Lake Whitefish	*Coregonus clupeaformis*	Native	4
		Sucker sp.	*Catostomidae* sp.	Native	192
		Northern Pikeminnow	*Ptychocheilus oregonensis*	Native	88
		Peamouth Chub	*Mylocheilus caurinus*	Native	20
		Rainbow Trout	*Oncorhynchus mykiss*	Native	31
		Smallmouth Bass	*Micropterus dolomieu*	Non-native	13
		Tench	*Tinca tinca*	Non-native	3
		Walleye	*Sander vitreus*	Non-native	80
		Yellow Perch	*Perca flavescens*	Non-native	7

Table 26. Bycatch by species at a given site including the number of individuals captured (#) in the site with the minimum and maximum fork lengths (mm) and weights (g); location (LCR = lower Columbia River; LKR = lower Kootenay River; PDO = Pend d'Oreille River; ZP = Zuckerberg Pond) method and date of capture are also included. Blank space indicates data were not collected.

Location	Site	Sample Type	Date Pull	Species	#	Length Min (mm)	Length Max (mm)	Weight Min (g)	Weight Max (g)
LCR	GN_LCR_01_1	Gillnet	06/09/20	Lake Whitefish	3	372	455		
LCR	GN_LCR_02_1	Gillnet	06/09/20	Lake Whitefish	9	396	472		
LCR	GN_LCR_03_1	Gillnet	06/09/20	Lake Whitefish	6	400	463		
LCR	GN_LCR_04_1	Gillnet	06/09/20	Lake Whitefish	7	395	454		
LCR	GN_LCR_05_1	Gillnet	06/11/20	Lake Whitefish	3	388	415		
LCR	GN_LCR_07_1	Gillnet	06/11/20	Lake Whitefish	4	397	414		
LCR	GN_LCR_07_2	Gillnet	06/11/20	Lake Whitefish	4	415	452		
LCR	GN_LCR_08_1	Gillnet	06/11/20	Lake whitefish	5	412	440		
LCR	GN_LCR_08_2	Gillnet	06/11/20	Lake Whitefish	3	411	425		
LCR	GN_LCR_09_1	Gillnet	06/12/20	Lake Whitefish	5	397	415		
LCR	GN_LCR_10_1	Gillnet	06/12/20	Lake Whitefish	3	412	412		
LCR	GN_LCR_13_1	Gillnet	06/12/20	Lake Whitefish	1	415	415		
LCR	GN_LCR_14_1	Gillnet	06/12/20	Lake Whitefish	1	443	443		
LCR	GN_LCR_15_1	Gillnet	06/15/20	Lake Whitefish	3	395	423		
LCR	GN_LCR_15_2	Gillnet	06/15/20	Lake Whitefish	1	412	412		
LCR	GN_LCR_16_1	Gillnet	06/15/20	Lake Whitefish	1	405	405		
LCR	GN_LCR_17_1	Gillnet	06/15/20	Lake Whitefish	3	393	419		
LCR	GN_LCR_17_2	Gillnet	06/15/20	Lake Whitefish	2	408	430		
LCR	GN_LCR_19_1	Gillnet	06/15/20	Lake Whitefish	2	406	417		
LCR	GN_LCR_19_2	Gillnet	06/15/20	Lake whitefish	3	382	414		
LCR	GN_LCR_26_1	Gillnet	06/27/20	Lake Whitefish	3				
LCR	GN_LCR_28_1	Gillnet	06/27/20	Lake Whitefish	1				
LCR	GN_LCR_35_1	Gillnet	06/28/20	Lake Whitefish	1				
LCR	GN_LCR_07_1	Gillnet	06/11/20	Largescale Sucker	1	376	376		
LCR	GN_LCR_08_1	Gillnet	06/11/20	Largescale Sucker	1	412	412		
LCR	GN_LCR_15_2	Gillnet	06/15/20	Largescale Sucker	1	365	365		
LCR	GN_LCR_17_2	Gillnet	06/15/20	Largescale Sucker	1	387	387		
LCR	GN_LCR_21_1	Gillnet	06/18/20	Largescale Sucker	1	371	371		
LCR	GN_LCR_22_1	Gillnet	06/18/20	Largescale Sucker	1	441	441		
LCR	GN_LCR_29_1	Gillnet	06/27/20	Largescale Sucker	4				
LCR	GN_LCR_32_1	Gillnet	06/28/20	Largescale Sucker	5				
LCR	GN_LCR_33_1	Gillnet	06/28/20	Largescale Sucker	1				
LCR	GN_LCR_34_1	Gillnet	06/28/20	Largescale Sucker	6				
LCR	GN_LCR_01_1	Gillnet	06/09/20	Longnose Sucker	1	376	376		
LCR	GN_LCR_02_1	Gillnet	06/09/20	Longnose Sucker	1	451	451		
LCR	GN_LCR_03_1	Gillnet	06/09/20	Longnose Sucker	1	384	384		
LCR	GN_LCR_09_1	Gillnet	06/12/20	Longnose Sucker	1				
LCR	GN_LCR_12_1	Gillnet	06/12/20	Longnose Sucker	5	436	463		
LCR	GN_LCR_17_2	Gillnet	06/15/20	Longnose Sucker	1	409	409		
LCR	GN_LCR_18_1	Gillnet	06/15/20	Longnose Sucker	1	444	444		
LCR	GN_LCR_19_1	Gillnet	06/15/20	Longnose Sucker	1				
LCR	GN_LCR_22_1	Gillnet	06/18/20	Longnose Sucker	2	379	436		
LCR	GN_LKR_03_1	Gillnet	06/18/20	Longnose Sucker	3	346	426		
LCR	GN_LCR_28_1	Gillnet	06/27/20	Longnose Sucker	1				
LCR	GN_LCR_02_1	Gillnet	06/09/20	Mountain Whitefish	3	306	436	401	1108
LCR	GN_LCR_03_1	Gillnet	06/09/20	Mountain Whitefish	1	337	337	568	568
LCR	GN_LCR_05_1	Gillnet	06/11/20	Mountain Whitefish	1	400	400		
LCR	GN_LCR_07_1	Gillnet	06/11/20	Mountain Whitefish	2	322	396	459	605
LCR	GN_LCR_08_1	Gillnet	06/11/20	Mountain Whitefish	6	240	361	184	552
LCR	GN_LCR_08_2	Gillnet	06/11/20	Mountain Whitefish	2	344	406	532	809
LCR	GN_LCR_09_1	Gillnet	06/12/20	Mountain Whitefish	5	195	304	84	321
LCR	GN_LCR_10_1	Gillnet	06/12/20	Mountain Whitefish	2	261	326	210	485
LCR	GN_LCR_15_1	Gillnet	06/15/20	Mountain Whitefish	4	264	360	239	685
LCR	GN_LCR_15_2	Gillnet	06/15/20	Mountain Whitefish	1	312	312	404	404
LCR	GN_LCR_16_1	Gillnet	06/15/20	Mountain Whitefish	7	254	372	228	649
LCR	GN_LCR_16_1	Gillnet	06/15/20	Mountain Whitefish	1	326	326		
LCR	GN_LCR_17_1	Gillnet	06/15/20	Mountain Whitefish	4	239	361	164	630
LCR	GN_LCR_17_2	Gillnet	06/15/20	Mountain Whitefish	2	330	376		
LCR	GN_LCR_18_1	Gillnet	06/15/20	Mountain Whitefish	3	261	342	222	512
LCR	GN_LCR_19_1	Gillnet	06/15/20	Mountain Whitefish	3	257	418	219	872
LCR	GN_LCR_19_2	Gillnet	06/15/20	Mountain Whitefish	2	266	325	250	378
LCR	GN_LCR_21_1	Gillnet	06/18/20	Mountain Whitefish	3	253	434	206	1150

Location	Site	Sample Type	Date Pull	Species	#	Length Min (mm)	Length Max (mm)	Weight Min (g)	Weight Max (g)
LCR	GN_LCR_22_1	Gillnet	06/18/20	Mountain Whitefish	1	368	368		
LCR	GN_LCR_23_1	Gillnet	06/18/20	Mountain Whitefish	2	251	350	203	531
LCR	GN_LCR_28_1	Gillnet	06/27/20	Mountain Whitefish	2				
LCR	GN_LCR_29_1	Gillnet	06/27/20	Mountain Whitefish	2				
LCR	GN_LCR_30_1	Gillnet	06/27/20	Mountain Whitefish	1				
LCR	GN_LCR_32_1	Gillnet	06/28/20	Mountain Whitefish	4	260	284		
LCR	GN_LCR_35_1	Gillnet	06/28/20	Mountain Whitefish	4	373	386		
LCR	GN_LCR_35_1	Gillnet	06/28/20	Mountain Whitefish	1	215	215		
LCR	GN_LCR_36_1	Gillnet	06/28/20	Mountain Whitefish	6	330	419		
LCR	GN_LCR_01_1	Gillnet	06/09/20	Northern Pikeminnow	2	325	364		
LCR	GN_LCR_07_2	Gillnet	06/11/20	Northern Pikeminnow	1	402	402		
LCR	GN_LCR_13_1	Gillnet	06/12/20	Northern Pikeminnow	2	443	443		
LCR	GN_LCR_65_1	Gillnet	09/22/20	Northern Pikeminnow	1	140	140		
LCR	GN_LCR_05_1	Gillnet	06/11/20	Peamouth Chub	1	265	265		
LCR	GN_LCR_13_1	Gillnet	06/12/20	Peamouth Chub	1	237	237		
LCR	GN_LCR_08_2	Gillnet	06/11/20	Rainbow Trout	2	311	395	320	692
LCR	GN_LCR_09_1	Gillnet	06/12/20	Rainbow Trout	1	396	396	717	717
LCR	GN_LCR_10_1	Gillnet	06/12/20	Rainbow Trout	2	357	403	498	716
LCR	GN_LCR_14_1	Gillnet	06/12/20	Rainbow Trout	1	425	425	803	803
LCR	GN_LCR_15_1	Gillnet	06/15/20	Rainbow Trout	1	397	397	675	675
LCR	GN_LCR_17_1	Gillnet	06/15/20	Rainbow Trout	1	314	314	347	347
LCR	GN_LCR_26_1	Gillnet	06/27/20	Rainbow Trout	1				
LCR	GN_LCR_29_1	Gillnet	06/27/20	Rainbow Trout	1				
LCR	GN_LCR_32_1	Gillnet	06/28/20	Rainbow Trout	2	356	414		
LCR	EF_LCR_07	Backpack Electrofishing	07/23/20	Sucker (General)	1	101	101		
LCR	GN_LCR_03_1	Gillnet	06/09/20	Walleye	1	436	436	969	969
LCR	GN_LCR_15_1	Gillnet	06/15/20	Walleye	1	385	385	562	562
LCR	GN_LCR_29_1	Gillnet	06/27/20	Walleye	1				
LCR	GN_LCR_35_1	Gillnet	06/28/20	Walleye	1	451	451		
LCR	GN_LCR_01_1	Gillnet	06/09/20	White Sturgeon	3				
LCR	GN_LCR_02_1	Gillnet	06/09/20	White Sturgeon	1				
LCR	GN_LCR_04_1	Gillnet	06/09/20	White Sturgeon	1				
LCR	GN_LCR_08_2	Gillnet	06/11/20	White Sturgeon	1				
LCR	GN_LCR_15_1	Gillnet	06/15/20	White Sturgeon	3				
LCR	GN_LCR_15_2	Gillnet	06/15/20	White Sturgeon	1				
LCR	GN_LCR_16_1	Gillnet	06/15/20	White Sturgeon	1				
LCR	GN_LCR_19_2	Gillnet	06/15/20	White Sturgeon	2				
LCR	GN_LCR_23_1	Gillnet	06/18/20	White Sturgeon	1				
LCR	GN_LCR_29_1	Gillnet	06/27/20	White Sturgeon	1				
LCR	EF_LCR_08	Backpack Electrofishing	07/23/20	Yellow Perch	2	78	80		
LCR	GN_LKR_01_1	Gillnet	06/11/20	Lake Whitefish	16	419	460		
LCR	GN_LKR_02_1	Gillnet	06/11/20	Lake Whitefish	11				
LKR	GN_LKR_03_1	Gillnet	06/18/20	Lake Whitefish	1				
LKR	GN_LKR_04_1	Gillnet	06/27/20	Lake Whitefish	1				
LKR	GN_LKR_01_1	Gillnet	06/11/20	Largescale Sucker	1	396	396		
LKR	GN_LKR_02_1	Gillnet	06/11/20	Largescale Sucker	2				
LKR	GN_LKR_04_1	Gillnet	06/27/20	Largescale Sucker	1				
LKR	GN_LKR_01_1	Gillnet	06/11/20	Longnose Sucker	7	392	437		
LKR	GN_LKR_01_1	Gillnet	06/11/20	Northern Pikeminnow	1	337	337		
LKR	GN_LKR_04_1	Gillnet	06/27/20	Northern Pikeminnow	14				
LKR	GN_LKR_02_1	Gillnet	06/11/20	Rainbow Trout	1				
LKR	GN_LKR_04_1	Gillnet	06/27/20	Walleye	3	379	425	488	851
PDO	GN_PDO_10_1	Gillnet	04/30/20	Brook Trout	1				
PDO	GN_PDO_19_3	Gillnet	05/06/20	Brook Trout	1	330	330	449	449
PDO	GN_PDO_10_1	Gillnet	04/30/20	Brown Trout	1	481	481	1326	1326
PDO	GN_PDO_14_1	Gillnet	05/01/20	Brown Trout	1	415	415	806	806
PDO	GN_PDO_18_4	Gillnet	05/06/20	Brown Trout	1	414	414	723	723
PDO	GN_PDO_20_1	Gillnet	05/05/20	Brown Trout	1	430	430	732	732
PDO	GN_PDO_23_1	Gillnet	05/05/20	Brown Trout	1	380	380	571	571
PDO	GN_PDO_31_2	Gillnet	05/20/20	Brown Trout	1	412	412	904	904
PDO	GN_PDO_33_1	Gillnet	05/20/20	Brown Trout	1	419	419	774	774
PDO	GN_PDO_03_1	Gillnet	04/28/20	Bull Trout	1	286	286	284	284
PDO	GN_PDO_06_3	Gillnet	04/30/20	Bull Trout	1	416	416	675	675
PDO	GN_PDO_08_1	Gillnet	04/29/20	Bull Trout	1	357	469		
PDO	GN_PDO_09_2	Gillnet	04/30/20	Bull Trout	1	415	415	771	771
PDO	GN_PDO_34_2	Gillnet	05/21/20	Bull Trout	1	407	407	682	682
PDO	GN_PDO_38_1	Gillnet	10/28/20	Bull Trout	1	440	440		
PDO	GN_PDO_42_1	Gillnet	10/29/20	Bull Trout	1	475	475		

Location	Site	Sample Type	Date Pull	Species	#	Length Min (mm)	Length Max (mm)	Weigh t Min (g)	Weigh t Max (g)
PDO	GN_PDO_54_1	Gillnet	10/30/20	Bull Trout	1	441	441		
PDO	AN	Angling	05/05/20	Bull Trout	1				
PDO	GN_PDO_26_1	Gillnet	05/07/20	Bullhead/catfish	1	312	312	444	444
PDO	GN_PDO_17_3	Gillnet	05/06/20	Cutthroat Trout	1	285	285	237	237
PDO	GN_PDO_29_1	Gillnet	05/20/20	Cutthroat Trout	1	309	309	398	398
PDO	GN_PDO_29_2	Gillnet	05/20/20	Cutthroat Trout	1	302	302	303	303
PDO	GN_PDO_01_2	Gillnet	04/29/20	Lake Trout	2	430	460	842	1014
PDO	GN_PDO_03_1	Gillnet	04/28/20	Lake Trout	1	377	377	543	543
PDO	GN_PDO_03_4	Gillnet	04/30/20	Lake Trout	1	415	415	699	699
PDO	GN_PDO_04_1	Gillnet	04/28/20	Lake Trout	1	418	418	709	709
PDO	GN_PDO_04_2	Gillnet	04/29/20	Lake Trout	1	435	435	833	833
PDO	GN_PDO_05_2	Gillnet	04/29/20	Lake Trout	3	427	441	803	863
PDO	GN_PDO_06_3	Gillnet	04/30/20	Lake Trout	1	473	473	1031	1031
PDO	GN_PDO_08_2	Gillnet	04/30/20	Lake Trout	1	397	397	600	600
PDO	GN_PDO_13_1	Gillnet	05/01/20	Lake Trout	2	444	474	913	972
PDO	GN_PDO_16_1	Gillnet	05/05/20	Lake trout	1	388	388	550	550
PDO	GN_PDO_17_1	Gillnet	05/05/20	Lake trout	1	428	428	695	695
PDO	GN_PDO_20_1	Gillnet	05/05/20	Lake Trout	1	443	443	876	876
PDO	GN_PDO_22_1	Gillnet	05/05/20	Lake Trout	1	487	487	1180	1180
PDO	GN_PDO_22_2	Gillnet	05/06/20	Lake Trout	1	409	409	694	694
PDO	GN_PDO_22_4	Gillnet	05/07/20	Lake Trout	1	399	399	617	617
PDO	GN_PDO_24_1	Gillnet	05/06/20	Lake Trout	1	437	437	878	878
PDO	GN_PDO_25_3	Gillnet	05/08/20	Lake Trout	1	385	385	603	603
PDO	GN_PDO_27_2	Gillnet	05/08/20	Lake Trout	1	446	446	923	923
PDO	GN_PDO_28_3	Gillnet	05/21/20	Lake Trout	1	439	439	813	813
PDO	GN_PDO_33_2	Gillnet	05/21/20	Lake Trout	2	455	469	844	992
PDO	GN_PDO_34_2	Gillnet	05/21/20	Lake Trout	2	415	476	643	961
PDO	GN_PDO_21_1	Gillnet	05/05/20	Lake Whitefish	1	367	367		
PDO	GN_PDO_24_1	Gillnet	05/06/20	Lake whitefish	1	342	342		
PDO	GN_PDO_25_3	Gillnet	05/08/20	Lake whitefish	1	359	359		
PDO	GN_PDO_26_1	Gillnet	05/07/20	Lake Whitefish	1	346	346		
PDO	GN_PDO_01_2	Gillnet	04/29/20	Largescale Sucker	4	387	410		
PDO	GN_PDO_01_3	Gillnet	04/30/20	Largescale Sucker	3	399	410		
PDO	GN_PDO_01_4	Gillnet	04/30/20	Largescale Sucker	1	415	415		
PDO	GN_PDO_02_2	Gillnet	04/29/20	Largescale Sucker	1	470	470		
PDO	GN_PDO_03_1	Gillnet	04/28/20	Largescale Sucker	1	418	418		
PDO	GN_PDO_03_2	Gillnet	04/29/20	Largescale Sucker	3	360	414		
PDO	GN_PDO_03_3	Gillnet	04/30/20	Largescale Sucker	2	405	436		
PDO	GN_PDO_03_4	Gillnet	04/30/20	Largescale Sucker	1	444	444		
PDO	GN_PDO_04_3	Gillnet	04/30/20	Largescale Sucker	2	378	398		
PDO	GN_PDO_05_1	Gillnet	04/28/20	Largescale Sucker	2	366	408		
PDO	GN_PDO_05_2	Gillnet	04/29/20	Largescale Sucker	6	377	421		
PDO	GN_PDO_06_1	Gillnet	04/28/20	Largescale Sucker	3	339	404		
PDO	GN_PDO_06_2	Gillnet	04/29/20	Largescale Sucker	3	372	410		
PDO	GN_PDO_06_3	Gillnet	04/30/20	Largescale Sucker	1	401	401		
PDO	GN_PDO_08_1	Gillnet	04/29/20	Largescale Sucker	7	380	442		
PDO	GN_PDO_08_2	Gillnet	04/30/20	Largescale Sucker	5	345	403		
PDO	GN_PDO_09_1	Gillnet	04/30/20	Largescale Sucker	3	370	442		
PDO	GN_PDO_10_1	Gillnet	04/30/20	Largescale Sucker	2	391	470		
PDO	GN_PDO_10_2	Gillnet	05/01/20	Largescale Sucker	5	389	432		
PDO	GN_PDO_11_1	Gillnet	04/30/20	Largescale Sucker	3	405	423		
PDO	GN_PDO_11_2	Gillnet	05/01/20	Largescale Sucker	9	350	476		
PDO	GN_PDO_12_1	Gillnet	05/01/20	Largescale Sucker	13	355	431		
PDO	GN_PDO_13_1	Gillnet	05/01/20	Largescale Sucker	1	354	354		
PDO	GN_PDO_14_1	Gillnet	05/01/20	Largescale Sucker	2	380	435		
PDO	GN_PDO_15_1	Gillnet	05/01/20	Largescale Sucker	2	388	402		
PDO	GN_PDO_16_1	Gillnet	05/05/20	Largescale Sucker	6	378	440		
PDO	GN_PDO_17_1	Gillnet	05/05/20	Largescale Sucker	4	413	441		
PDO	GN_PDO_17_3	Gillnet	05/06/20	Largescale Sucker	2				
PDO	GN_PDO_17_7	Gillnet	05/08/20	Largescale Sucker	1				
PDO	GN_PDO_18_1	Gillnet	05/05/20	Largescale Sucker	2	397	445		
PDO	GN_PDO_18_5	Gillnet	05/07/20	Largescale Sucker	1				
PDO	GN_PDO_19_1	Gillnet	05/05/20	Largescale Sucker	1	389	389		
PDO	GN_PDO_19_3	Gillnet	05/06/20	Largescale Sucker	1				
PDO	GN_PDO_20_1	Gillnet	05/05/20	Largescale Sucker	4	409	456		
PDO	GN_PDO_21_1	Gillnet	05/05/20	Largescale Sucker	10	345	467		
PDO	GN_PDO_22_1	Gillnet	05/05/20	Largescale Sucker	1				
PDO	GN_PDO_22_4	Gillnet	05/07/20	Largescale Sucker	5				

Location	Site	Sample Type	Date Pull	Species	#	Length Min (mm)	Length Max (mm)	Weigh t Min (g)	Weigh t Max (g)
PDO	GN_PDO_23_2	Gillnet	05/06/20	Largescale Sucker	5				
PDO	GN_PDO_24_1	Gillnet	05/06/20	Largescale sucker	5				
PDO	GN_PDO_24_2	Gillnet	05/06/20	Largescale Sucker	1				
PDO	GN_PDO_24_3	Gillnet	05/07/20	Largescale Sucker	2				
PDO	GN_PDO_24_4	Gillnet	05/07/20	Largescale Sucker	2				
PDO	GN_PDO_24_5	Gillnet	05/08/20	Largescale Sucker	5				
PDO	GN_PDO_25_1	Gillnet	05/07/20	Largescale Sucker	3				
PDO	GN_PDO_25_3	Gillnet	05/08/20	Largescale Sucker	1				
PDO	GN_PDO_26_1	Gillnet	05/07/20	Largescale Sucker	2				
PDO	GN_PDO_27_1	Gillnet	05/07/20	Largescale Sucker	5				
PDO	GN_PDO_27_2	Gillnet	05/08/20	Largescale Sucker	5				
PDO	GN_PDO_28_1	Gillnet	05/20/20	Largescale Sucker	5				
PDO	GN_PDO_28_3	Gillnet	05/21/20	Largescale Sucker	3				
PDO	GN_PDO_29_1	Gillnet	05/20/20	Largescale Sucker	2				
PDO	GN_PDO_29_2	Gillnet	05/20/20	Largescale Sucker	1				
PDO	GN_PDO_29_3	Gillnet	05/21/20	Largescale Sucker	2				
PDO	GN_PDO_31_1	Gillnet	05/20/20	Largescale Sucker	1				
PDO	GN_PDO_31_3	Gillnet	05/21/20	Largescale Sucker	4				
PDO	GN_PDO_32_2	Gillnet	05/20/20	Largescale Sucker	1				
PDO	GN_PDO_32_3	Gillnet	05/21/20	Largescale Sucker	2				
PDO	GN_PDO_33_1	Gillnet	05/20/20	Largescale Sucker	2				
PDO	GN_PDO_33_2	Gillnet	05/21/20	Largescale Sucker	6				
PDO	GN_PDO_34_2	Gillnet	05/21/20	Largescale Sucker	1				
PDO	GN_PDO_35_1	Gillnet	05/20/20	Largescale Sucker	1				
PDO	GN_PDO_18_1	Gillnet	05/05/20	Longnose Sucker	1	308	308		
PDO	GN_PDO_25_3	Gillnet	05/08/20	Longnose Sucker	1				
PDO	GN_PDO_02_2	Gillnet	04/29/20	Northern Pikeminnow	2	470	470		
PDO	GN_PDO_03_2	Gillnet	04/29/20	Northern Pikeminnow	1	460	460		
PDO	GN_PDO_03_3	Gillnet	04/30/20	Northern Pikeminnow	4	354	530		
PDO	GN_PDO_04_2	Gillnet	04/29/20	Northern Pikeminnow	1	364	364		
PDO	GN_PDO_04_3	Gillnet	04/30/20	Northern Pikeminnow	2	327	360		
PDO	GN_PDO_05_2	Gillnet	04/29/20	Northern Pikeminnow	5	330	425		
PDO	GN_PDO_06_3	Gillnet	04/30/20	Northern Pikeminnow	1	318	318		
PDO	GN_PDO_08_1	Gillnet	04/29/20	Northern Pikeminnow	1	444	444		
PDO	GN_PDO_08_2	Gillnet	04/30/20	Northern Pikeminnow	2	370	438		
PDO	GN_PDO_11_1	Gillnet	04/30/20	Northern Pikeminnow	1	441	441		
PDO	GN_PDO_12_1	Gillnet	05/01/20	Northern Pikeminnow	4	394	439		
PDO	GN_PDO_13_1	Gillnet	05/01/20	Northern Pikeminnow	4	371	436		
PDO	GN_PDO_14_1	Gillnet	05/01/20	Northern Pikeminnow	1	515	515		
PDO	GN_PDO_16_1	Gillnet	05/05/20	Northern Pikeminnow	3	338	385		
PDO	GN_PDO_17_1	Gillnet	05/05/20	Northern Pikeminnow	2	365	433		
PDO	GN_PDO_17_3	Gillnet	05/06/20	Northern Pikeminnow	2				
PDO	GN_PDO_18_3	Gillnet	05/06/20	Northern Pikeminnow	2				
PDO	GN_PDO_18_5	Gillnet	05/07/20	Northern Pikeminnow	1				
PDO	GN_PDO_19_1	Gillnet	05/05/20	Northern Pikeminnow	1	391	391		
PDO	GN_PDO_21_1	Gillnet	05/05/20	Northern Pikeminnow	3	363	464		
PDO	GN_PDO_22_2	Gillnet	05/06/20	Northern Pikeminnow	1				
PDO	GN_PDO_23_2	Gillnet	05/06/20	Northern Pikeminnow	5				
PDO	GN_PDO_24_4	Gillnet	05/07/20	Northern Pikeminnow	1				
PDO	GN_PDO_24_5	Gillnet	05/08/20	Northern Pikeminnow	1				
PDO	GN_PDO_25_1	Gillnet	05/07/20	Northern Pikeminnow	1				
PDO	GN_PDO_25_3	Gillnet	05/08/20	Northern Pikeminnow	1				
PDO	GN_PDO_26_1	Gillnet	05/07/20	Northern Pikeminnow	7				
PDO	GN_PDO_27_2	Gillnet	05/08/20	Northern Pikeminnow	5				
PDO	GN_PDO_28_1	Gillnet	05/20/20	Northern Pikeminnow	1				
PDO	GN_PDO_33_1	Gillnet	05/20/20	Northern Pikeminnow	1				
PDO	GN_PDO_33_2	Gillnet	05/21/20	Northern Pikeminnow	4				
PDO	GN_PDO_34_2	Gillnet	05/21/20	Northern Pikeminnow	1				
PDO	GN_PDO_35_2	Gillnet	05/21/20	Northern Pikeminnow	16				
PDO	GN_PDO_06_3	Gillnet	04/30/20	Peamouth Chub	1	361	361		
PDO	GN_PDO_12_1	Gillnet	05/01/20	Peamouth Chub	2	354	357		
PDO	GN_PDO_15_1	Gillnet	05/01/20	Peamouth Chub	1	347	347		
PDO	GN_PDO_21_1	Gillnet	05/05/20	Peamouth Chub	1	346	346		
PDO	GN_PDO_23_2	Gillnet	05/06/20	Peamouth Chub	1	346	346		
PDO	GN_PDO_24_1	Gillnet	05/06/20	Peamouth Chub	1	355	355		
PDO	GN_PDO_24_5	Gillnet	05/08/20	Peamouth Chub	1				
PDO	GN_PDO_25_1	Gillnet	05/07/20	Peamouth Chub	3	336	348		
PDO	GN_PDO_25_3	Gillnet	05/08/20	Peamouth Chub	1				

Location	Site	Sample Type	Date Pull	Species	#	Length Min (mm)	Length Max (mm)	Weigh t Min (g)	Weigh t Max (g)
PDO	GN_PDO_26_1	Gillnet	05/07/20	Peamouth Chub	2	329	343		
PDO	GN_PDO_28_1	Gillnet	05/20/20	Peamouth Chub	1	361	361		
PDO	GN_PDO_28_3	Gillnet	05/21/20	Peamouth Chub	1				
PDO	GN_PDO_29_1	Gillnet	05/20/20	Peamouth Chub	1	327	327		
PDO	GN_PDO_34_2	Gillnet	05/21/20	Peamouth Chub	1				
PDO	GN_PDO_35_1	Gillnet	05/20/20	Peamouth Chub	1				
PDO	GN_PDO_35_2	Gillnet	05/21/20	Peamouth Chub	1				
PDO	GN_PDO_03_2	Gillnet	04/29/20	Rainbow Trout	1	351	351	454	454
PDO	GN_PDO_03_3	Gillnet	04/30/20	Rainbow Trout	1	231	231	142	142
PDO	GN_PDO_04_2	Gillnet	04/29/20	Rainbow Trout	1	338	338	421	421
PDO	GN_PDO_09_1	Gillnet	04/30/20	Rainbow Trout	2	290	303	286	310
PDO	GN_PDO_11_2	Gillnet	05/01/20	Rainbow Trout	2	394	414	723	736
PDO	GN_PDO_17_1	Gillnet	05/05/20	Rainbow Trout	3	336	410	450	790
PDO	GN_PDO_17_4	Gillnet	05/06/20	Rainbow Trout	1	383	383	605	605
PDO	GN_PDO_17_7	Gillnet	05/08/20	Rainbow Trout	3	287	326	269	391
PDO	GN_PDO_18_3	Gillnet	05/06/20	Rainbow Trout	1	412	412	742	742
PDO	GN_PDO_18_4	Gillnet	05/06/20	Rainbow Trout	1	396	396	684	684
PDO	GN_PDO_18_6	Gillnet	05/07/20	Rainbow Trout	1	387	387	699	699
PDO	GN_PDO_21_1	Gillnet	05/05/20	Rainbow Trout	1	406	406	771	771
PDO	GN_PDO_24_3	Gillnet	05/07/20	Rainbow Trout	1				
PDO	GN_PDO_24_5	Gillnet	05/08/20	Rainbow Trout	1	263	263	153	153
PDO	GN_PDO_25_1	Gillnet	05/07/20	Rainbow Trout	1	247	247	163	163
PDO	GN_PDO_29_2	Gillnet	05/20/20	Rainbow Trout	3	277	338	273	450
PDO	GN_PDO_29_3	Gillnet	05/21/20	Rainbow Trout	4	285	371	256	623
PDO	GN_PDO_33_2	Gillnet	05/21/20	Rainbow Trout	1	334	334	424	424
PDO	GN_PDO_44_1	Gillnet	10/29/20	Rainbow Trout	1	445	445		
PDO	GN_PDO_48_1	Gillnet	10/30/20	Rainbow Trout	1	357	357		
PDO	GN_PDO_04_3	Gillnet	04/30/20	Smallmouth Bass	2	231	274	185	335
PDO	GN_PDO_05_2	Gillnet	04/29/20	Smallmouth Bass	1	273	273	285	285
PDO	GN_PDO_11_1	Gillnet	04/30/20	Smallmouth Bass	1	340	340	617	617
PDO	GN_PDO_11_2	Gillnet	05/01/20	Smallmouth Bass	2	286	300	385	402
PDO	GN_PDO_12_1	Gillnet	05/01/20	Smallmouth Bass	1	261	261	217	217
PDO	GN_PDO_23_2	Gillnet	05/06/20	Smallmouth Bass	1	251	251	204	204
PDO	GN_PDO_24_5	Gillnet	05/08/20	Smallmouth Bass	1	301	301	409	409
PDO	GN_PDO_28_3	Gillnet	05/21/20	Smallmouth Bass	1	384	384	713	713
PDO	GN_PDO_29_3	Gillnet	05/21/20	Smallmouth Bass	1	259	259	240	240
PDO	GN_PDO_32_3	Gillnet	05/21/20	Smallmouth Bass	2	275	286	302	335
PDO	GN_PDO_04_2	Gillnet	04/29/20	Tench	1	315	315	518	518
PDO	GN_PDO_22_2	Gillnet	05/06/20	Tench	1	355	355	799	799
PDO	GN_PDO_34_2	Gillnet	05/21/20	Tench	1				
PDO	GN_PDO_01_1	Gillnet	04/28/20	Walleye	1	454	454	1030	1030
PDO	GN_PDO_01_2	Gillnet	04/29/20	Walleye	3	321	405	356	700
PDO	GN_PDO_01_3	Gillnet	04/30/20	Walleye	2	311	394	338	702
PDO	GN_PDO_02_2	Gillnet	04/29/20	Walleye	1	312	312	354	354
PDO	GN_PDO_03_2	Gillnet	04/29/20	Walleye	3	330	395	394	694
PDO	GN_PDO_04_3	Gillnet	04/30/20	Walleye	1	313	313	349	349
PDO	GN_PDO_05_2	Gillnet	04/29/20	Walleye	7	382	485	605	1222
PDO	GN_PDO_08_2	Gillnet	04/30/20	Walleye	1	382	382		
PDO	GN_PDO_09_1	Gillnet	04/30/20	Walleye	1	471	471	1143	1143
PDO	GN_PDO_10_2	Gillnet	05/01/20	Walleye	1	485	485	1132	1132
PDO	GN_PDO_11_2	Gillnet	05/01/20	Walleye	1	375	375	568	568
PDO	GN_PDO_12_1	Gillnet	05/01/20	Walleye	5	372	445	504	1009
PDO	GN_PDO_14_1	Gillnet	05/01/20	Walleye	1	383	383	701	701
PDO	GN_PDO_15_1	Gillnet	05/01/20	Walleye	2	375	419		
PDO	GN_PDO_16_1	Gillnet	05/05/20	Walleye	2	304	322	283	366
PDO	GN_PDO_17_1	Gillnet	05/05/20	Walleye	2	300	483	309	1186
PDO	GN_PDO_17_3	Gillnet	05/06/20	Walleye	1	324	324	368	368
PDO	GN_PDO_17_5	Gillnet	05/07/20	Walleye	1	318	318	324	324
PDO	GN_PDO_17_7	Gillnet	05/08/20	Walleye	1	494	494	1347	1347
PDO	GN_PDO_18_1	Gillnet	05/05/20	Walleye	2	320	454	309	1167
PDO	GN_PDO_18_3	Gillnet	05/06/20	Walleye	3	292	489	268	1179
PDO	GN_PDO_19_3	Gillnet	05/06/20	Walleye	1	311	311	301	301
PDO	GN_PDO_21_1	Gillnet	05/05/20	Walleye	4	305	448	285	1060
PDO	GN_PDO_22_2	Gillnet	05/06/20	Walleye	1	305	305	327	327
PDO	GN_PDO_23_2	Gillnet	05/06/20	Walleye	4	358	508		
PDO	GN_PDO_24_1	Gillnet	05/06/20	Walleye	2	434	446	830	957
PDO	GN_PDO_24_5	Gillnet	05/08/20	Walleye	2	376	395	588	607
PDO	GN_PDO_26_1	Gillnet	05/07/20	Walleye	3	262	460	155	1094

Location	Site	Sample Type	Date Pull	Species	#	Length Min (mm)	Length Max (mm)	Weigh t Min (g)	Weigh t Max (g)
PDO	GN_PDO_27_2	Gillnet	05/08/20	Walleye	2	298	401	273	764
PDO	GN_PDO_28_1	Gillnet	05/20/20	Walleye	3				
PDO	GN_PDO_28_1	Gillnet	05/20/20	Walleye	3	413	492	752	1231
PDO	GN_PDO_28_3	Gillnet	05/21/20	Walleye	3	401	509	630	1493
PDO	GN_PDO_29_3	Gillnet	05/21/20	Walleye	5	318	512	313	1558
PDO	GN_PDO_30_1	Gillnet	05/20/20	Walleye	2	396	414	587	648
PDO	GN_PDO_31_1	Gillnet	05/20/20	Walleye	1	439	439	859	859
PDO	GN_PDO_35_2	Gillnet	05/21/20	Walleye	2	365	479	499	1188
PDO	GN_PDO_05_2	Gillnet	04/29/20	Yellow Perch	1	190	190	92	92
PDO	GN_PDO_06_3	Gillnet	04/30/20	Yellow Perch	1	195	195		
PDO	GN_PDO_16_1	Gillnet	05/05/20	Yellow Perch	1	256	256	317	317
PDO	GN_PDO_17_1	Gillnet	05/05/20	Yellow Perch	1				
PDO	GN_PDO_17_7	Gillnet	05/08/20	Yellow Perch	1	195	195	94	94
PDO	GN_PDO_21_1	Gillnet	05/05/20	Yellow Perch	1	181	181	73	73
PDO	GN_PDO_23_2	Gillnet	05/06/20	Yellow Perch	1	184	184	75	75
ZP	GN_LCR_42_1	Gillnet	08/20/20	Longnose Sucker	3	115	124		
ZP	GN_LCR_46_1	Gillnet	08/21/20	Longnose Sucker	1	121	121		
ZP	GN_LCR_51_1	Gillnet	08/24/20	Longnose Sucker	1	122	122		
ZP	EF_LCR_05	Backpack Electrofishing	07/22/20	Northern Pikeminnow	1	125	125		
ZP	EF_LCR_04	Backpack Electrofishing	07/22/20	Redside Shiner	14	10	27		
ZP	LT_LCR_02_1	Light Trap	07/23/20	Redside Shiner	1				
ZP	EF_LCR_05	Backpack Electrofishing	07/22/20	Sculpin (General)	1	35	35		
ZP	GN_LCR_58_1	Gillnet	08/26/20	Sucker (General)	5	123	128		
ZP	GN_LCR_62_1	Gillnet	08/27/20	Sucker (General)	1	138	138		
ZP	EF_LCR_05	Backpack Electrofishing	07/22/20	Tench	3	52	55		
ZP	EF_LCR_06	Backpack Electrofishing	07/22/20	Tench	1	530	530		
ZP	GN_LCR_38_1	Gillnet	08/18/20	Yellow Perch	24	98	150		
ZP	GN_LCR_39_1	Gillnet	08/18/20	Yellow Perch	1	215	215		
ZP	GN_LCR_40_1	Gillnet	08/18/20	Yellow Perch	21	104	165		
ZP	GN_LCR_41_1	Gillnet	08/20/20	Yellow Perch	8	98	113		
ZP	GN_LCR_42_1	Gillnet	08/20/20	Yellow Perch	39	102	153		
ZP	GN_LCR_43_1	Gillnet	08/20/20	Yellow Perch	24	104	151		
ZP	GN_LCR_44_1	Gillnet	08/20/20	Yellow Perch	14	101	124		
ZP	GN_LCR_46_1	Gillnet	08/21/20	Yellow Perch	6	101	144		
ZP	GN_LCR_47_1	Gillnet	08/21/20	Yellow Perch	10	99	145		
ZP	GN_LCR_48_1	Gillnet	08/21/20	Yellow Perch	7	97	120		
ZP	GN_LCR_49_1	Gillnet	08/21/20	Yellow Perch	4	100	110		
ZP	GN_LCR_51_1	Gillnet	08/24/20	Yellow Perch	6	90	110		
ZP	GN_LCR_52_1	Gillnet	08/24/20	Yellow Perch	7	105	145		
ZP	GN_LCR_53_1	Gillnet	08/24/20	Yellow Perch	20	95	167		
ZP	GN_LCR_56_1	Gillnet	08/26/20	Yellow Perch	1	108	108		
ZP	GN_LCR_57_1	Gillnet	08/26/20	Yellow Perch	13	97	114		
ZP	GN_LCR_58_1	Gillnet	08/26/20	Yellow Perch	30	103	133		
ZP	GN_LCR_59_1	Gillnet	08/26/20	Yellow Perch	2	115	125		
ZP	GN_LCR_60_1	Gillnet	08/27/20	Yellow Perch	3	96	105		
ZP	GN_LCR_61_1	Gillnet	08/27/20	Yellow Perch	6	114	134		
ZP	GN_LCR_62_1	Gillnet	08/27/20	Yellow Perch	36	104	188		
ZP	GN_LCR_63_1	Gillnet	08/27/20	Yellow Perch	9	107	138		
ZP	GN_LCR_67_1	Gillnet	09/23/20	Yellow Perch	33	105	140		
ZP	GN_LCR_68_1	Gillnet	09/23/20	Yellow Perch	2	176	186	80	92
ZP	GN_LCR_70_1	Gillnet	09/23/20	Yellow Perch	27	94	125	16	28
ZP	GN_LCR_71_1	Gillnet	09/23/20	Yellow Perch	6	102	180		
ZP	GN_LCR_72_1	Gillnet	10/13/20	Yellow Perch	6	109	111		
ZP	GN_LCR_73_1	Gillnet	10/13/20	Yellow Perch	1	180	180		
ZP	GN_LCR_81_1	Gillnet	10/20/20	Yellow Perch	1	218	218	142	142
ZP	GN_LCR_82_1	Gillnet	10/20/20	Yellow Perch	2	106	106		
ZP	GN_LCR_87_1	Gillnet	10/21/20	Yellow Perch	2	108	108		
ZP	GN_LCR_89_1	Gillnet	10/22/20	Yellow Perch	1	219	219		
ZP	GN_LCR_90_1	Gillnet	10/22/20	Yellow Perch	12	105	120		
ZP	GN_LCR_91_1	Gillnet	10/22/20	Yellow Perch	1	220	220		
ZP	GN_LCR_92_1	Gillnet	10/22/20	Yellow Perch	9	116	209		
ZP	EF_LCR_11	Backpack Electrofishing	08/18/20	Yellow Perch	1	92	92		

Appendix F: White Sturgeon PIT Tag Information

Table 27. White Sturgeon capture data including date of capture, location (UTM Zone 11U), and PIT tag number when recorded.

#	Date	Easting	Northing	PIT Tag Number	Comments
1	6/09/20	450228	5464311	985121002975663	Added 2nd "1" (recorded on datasheet as 98512002975663)
2	6/09/20	450228	5464311	985121013514392	
3	6/09/20	450228	5464311	985121006366328	
4	6/09/20	449786	5464415	985121012179664	
5	6/09/20	446248	5465726	-	Got off net before scan
6	6/11/20	448784	5464754	985120019139000	
7	6/15/20	448771	5464761	985121012672908	
8	6/15/20	448771	5464761	985120030498824	
9	6/15/20	448771	5464761	-	Got off net before scan
10	6/15/20	448771	5464761	-	Got off net before scan
11	6/15/20	449618	5464514	-	Got off net before scan
12	6/15/20	450309	5464265	985121012131276	
13	6/15/20	450309	5464265	-	Got off net before scan
14	6/18/20	450145	5464560	-	Got off net before scan
15	6/27/20	449807	5464396	98516100006437	One number short

Appendix G: Summary of Northern Pike Suppression Efforts 2014-2020

Table 28. Gillnet effort, catch-per-unit-effort (CPUE), and the number of Northern Pike (NP) removed by location (LCR = lower Columbia River; PDO = Pend d'Oreille River; XL = Christina Lake) in the Canadian Columbia Basin between 2014 – 2020 with respective sources.

Year	Location	Effort (hr)	NP Removed	CPUE (NP/hr)	Sources
2014	LCR	475	133	0.19	Baxter 2016
2015	LCR	659	116	0.20	Baxter 2016
2016	LCR	407	39	0.13	Baxter and Doutaz 2017
	PDO*	130.1	0	-	Doutaz 2019
2017	LCR	676	35	0.05	Baxter and Lawrence 2018
	PDO*	61.88	43	-	Doutaz 2019
2018	LCR	525.3	22	0.04	Wood 2019
	PDO	308.4	15	0.05	
	LCR	11.2	0	0.00	ONA 2019
	PDO	36.6	0	0.00	
2019	LCR	357.8	34	0.10	ONA 2020
	PDO	625.7	10	0.02	
	XL	41.3	0	0.00	
2020	LCR	373.9	125	0.33	Present
	PDO	1,317.1	6	0.005	

* Doutaz (2019) describes the capture of 43 Northern Pike in the Pend d'Oreille Reservoir between 2016 and 2017, but specific location data and captures by year are not available.

Table 29. Boat electrofishing effort, catch-per-unit-effort (CPUE), and the number of Northern Pike (NP) removed (specific to Northern Pike suppression programs) by location (LCR = lower Columbia River; PDO = Pend d'Oreille River; XL = Christina Lake) in the Canadian Columbia Basin between 2015 – 2020 with respective sources.

Year	Location	Effort (s)	NP Removed	CPUE (NP/hr)	Source
2015	No Sampling Conducted				
2016	No Sampling Conducted				
2017	No Sampling Conducted				
2018	LCR	19,867	5	0.91	Wood 2019
	LCR	3,032	0	0.00	ONA 2019
2019	LCR	832	0	0.00	ONA 2020
	PDO	10,714	0	0.00	
	XL	3,594	0	0.00	
2020	No Sampling Conducted				

Table 30. Backpack electrofishing effort, catch-per-unit-effort (CPUE), and the number of Northern Pike (NP) removed by location (LCR = Columbia River) in the Canadian Columbia Basin between 2015 – 2020 with respective sources.

Year	Location	Effort (s)	NP Removed	CPUE (NP/hour)	Source
2015	LCR	1,734	0	0.00	Golder 2015
2016	No Sampling Conducted				
2017	No Sampling Conducted				
2018	No Sampling Conducted				
2019	No Sampling Conducted				
2020	LCR	7,428	12	5.82	Present

Table 31. Fyke net effort, catch-per-unit-effort (CPUE), and the number of Northern Pike (NP) removed by location (LCR = Columbia River) in the Canadian Columbia Basin between 2015 – 2020 with respective sources.

Year	Location	Effort (hr)	NP Removed	CPUE (NP/hr)	Source
2015			No Sampling Conducted		
2016	LCR	1,625	1	<0.001	ONA 2016
2017			No Sampling Conducted		
2018			No Sampling Conducted		
2019			No Sampling Conducted		
2020	LCR	21.52	0	0.00	Present

Table 32. Angling effort (by suppression crews), catch-per-unit-effort (CPUE), and the number of Northern Pike (NP) removed (specific to Northern Pike suppression programs) by location (LCR = lower Columbia River; PDO = Pend d'Oreille River) in the Canadian Columbia Basin between 2015 – 2020 with respective sources.

Year	Location	Effort (hr)	NP Removed	CPUE (NP/hr)	Source
2015			No Sampling Conducted		
2016			No Sampling Conducted		
2017			No Sampling Conducted		
2018	LCR	24	0	0.00	Wood 2019
	PDO	7.5	0	0.00	
2019	LCR	12	1	0.08	ONA 2020
	PDO	15	0	0.00	
2020	PDO	3	0	0.00	Present

Table 33. Minnow Trap effort, catch-per-unit-effort (CPUE), and the number of Northern Pike (NP) removed by location (LCR = Columbia River) in the Canadian Columbia Basin between 2015 – 2020 with respective sources.

Year	Location	Effort (hr)	NP Removed	CPUE (NP/hr)	Source
2015	LCR	74.4	0	0.00	Golder 2015
2016			No Sampling Conducted		
2017			No Sampling Conducted		
2018			No Sampling Conducted		
2019			No Sampling Conducted		
2020	LCR	277.6	1	0.004	Present

Table 34. Seine net effort, catch-per-unit-effort (CPUE), and the number of Northern Pike (NP) removed by location (LCR = Columbia River) in the Canadian Columbia Basin between 2015 – 2020 with respective sources.

Year	Location	Effort (m)	NP Removed	CPUE (NP/m)	Source
2015			No Sampling Conducted		
2016	LCR	300	0	0.00	ONA 2016
2017			No Sampling Conducted		
2018			No Sampling Conducted		
2019	LCR	60	0	0.00	ONA 2020
2020			No Sampling Conducted		

Table 35. Light trap effort, catch-per-unit-effort (CPUE), and the number of Northern Pike (NP) removed by location (LCR = Columbia River) in the Canadian Columbia Basin between 2015 – 2020 with respective sources.

Year	Location	Effort (hr)	NP Removed	CPUE (NP/hr)	Source
2015	LCR	136.2	0	0.00	Golder 2015
2016			No Sampling Conducted		
2017			No Sampling Conducted		
2018			No Sampling Conducted		
2019			No Sampling Conducted		
2020	LCR	48.0	0	0.00	Present

Table 36. Dip net effort, catch-per-unit-effort (CPUE), and the number of Northern Pike (NP) removed by location (LCR = Columbia River) in the Canadian Columbia Basin between 2015 – 2020 with respective sources.

Year	Location	Effort (m)	NP Removed	CPUE (NP/m)	Source
2015	LCR	460	0	0.00	Golder 2015

Table 37. Plankton tow effort, catch-per-unit-effort (CPUE), and the number of Northern Pike (NP) removed by location (LCR = Columbia River) in the Canadian Columbia Basin between 2015 – 2020 with respective sources.

Year	Location	Effort (s)	NP Removed	CPUE (NP/hr)	Source
2015	LCR	840	0	0.00	Golder 2015