Piledriver and 23 Mile Slough Survey Report 2016

Tanana Valley Watershed Association
October 6, 2016

Introduction

This report discloses the findings of the 2016 study undertook by the Tanana Valley Watershed Association (TVWA) on Piledriver Slough and 23 mile Slough. For this study, Piledriver Slough was dissected into upper and lower subdivisions for monitoring. Monitoring on Upper Piledriver Slough was done with the assistance of citizen student-scientist from Salcha School. Survey site results are discussed below.

Purpose

This ten-year study is within its third year pursuant to fulfillment of the Mitigation Measure 56 of the Service Transportation Board. The measure states, "*prior to construction of Salcha Alternative Segment 1, ARRC shall develop appropriate mitigation in consultation with ADF&G to prevent blockage of Piledriver and 23 Mile Sloughs by beaver dams (as a result of flushing flows caused by ARRC-proposed channel plugs). Mitigation may include monitoring conducted by ARRC at a frequency agreed to by ADF&G.*" The Piledriver Slough Mitigation Plan was created to assess impacts of the Northern Rail Extension Project-Phase 1.

Need

A levee was put into place to alleviate blockage to spring flow flushing from the Tanana River into the Piledriver Slough due to construction of the new rail extension. With the construction of the levee, concerns were raised about the potential alteration in flow-rate because of the lacking ability of natural flushing of debris or ice build-up by spring flows. Resulting concerns include ice and log jams and beaver dams impeding fish passage. This study was created to assess the risk that such obstructions pose to fish passage.

Objectives

The Alaska Department of Fish and Game (AKDFG) consults TVWA in action through a Memorandum of Agreement implementing fish monitoring within the Piledriver Slough located in the City of Salcha and the 23 Mile Slough. TVWA is charged to manage the Piledriver Slough Beaver Activity Survey program until to 2022, in which a final report will be submitted to AKDF&G and the Alaska Rail Road (AKRR). The report will compile results and conclusions drawn from outlined objectives and accomplishments achieved during the 10-year study.

Methodology

The ten-mile section of the Piledriver Slough was divided into two sections for managing monitoring based upon distance from the levee site to the Bailey Bridge. These sections were the *Upper Piledriver* and *Lower Piledriver.* Upper Piledriver surveying began from the levee site and ended at the Old Valdez Trail road crossing. This section was surveyed by TVWA staff with the assistance of citizen scientists from the Salcha Elementary. Lower Piledriver surveying began from the Old Valdez Trail road crossing ended at the Bailey Bridge, adjacent to Eielson Airforce Base. This section was surveyed by TVWA staff. Undivided, the 23 Mile Slough site was located and surveyed in its entirety off of Old Eielson Farm Road. All surveys took place late spring, summer, and late fall, which exact dates dependent on staff and school availability.

For the study of Upper Piledriver, TVWA trained volunteers and students who acted as citizen scientist through a presentation and science curriculum on water safety, fish, plant and invertebrate identification, fish handling, water quality, invasive species, aquatic invertebrates and habitat assessment. Each child was equipped with a tool kit containing supplies and safety for the field surveying. Algae and aquatic plant identification education curriculum was added in 2014. Fish factsheets, tracks sheets, and more complex habitat assessments were added in 2015. Compasses and magnifying boxes were added to the curriculum in 2016.

Equipment: Equipment used in the study by TVWA staff were a Garmin GPS 62s, PentaxWGIII SR Adventure Proof GPS Camera, GoPro videocamera, Android telephone camera for capturing photos and videos to be used for analysis and reporting. GPS units were used for marking identified dams and lodges as well as geo-referencing photos.

Water Quality Sampling: Adopt-a-Stream water quality sampling protocol was used to record water quality at each Upper Piledriver Site. This protocol is detailed below:

Step 1: Perform a Hanna meter pre-sampling check with tap water. Using the pH 4 and 1413 conductivity standards provided, test your meter's accuracy. Turn on your meter. Place a small amount of the pH 4 standard into plastic cup marked “pH4 check” (just enough to cover the sensor). Take a pH reading and record the result. It should fall between 3.8 and 4.2. Rinse the meter in tap water and shake it gently to remove excess water. Then, place a small amount of the 1413

conductivity standard into the plastic cup marked "conductivity check" and take a reading. Note the conductivity level. It should fall between 1342 and 1484. Rinse the meter again in tap water and shake it gently to remove excess water before replacing the cap. The standards are safe to pour down the drain with a little tap water. DO NOT pour them into the stream.

Step 2: Collect water sample: A few yards away (preferable downstream or down current) from your exact sampling site, rinse the plastic bucket three times with stream water. Then go to your site and, facing upstream, lower the bucket gently into the water, and fill it to a level about 2 inches from the lip of the bucket. If you are working in very shallow water, do not disturb the bottom while collecting the sample.

Step 3: Measure pH and Conductivity with Hanna Meter*:* Turn on the meter. Hold it or clip it to the side of the bucket in the sample water for 5 minutes. Turn on the meter. Press SET/HOLD until it is in conductivity (µ) mode, wait 15 seconds, then record three (3) sequential readings for Conductivity at 15 second intervals. Press SET/HOLD until it is in pH mode and wait 15 seconds. Record three (3) pH readings at 15 second intervals. Finally, press SET/HOLD until it is in temperature mode and wait 15 seconds. Record three (3) water temperature readings at 15 second intervals. Turn the meter off. Put the cover back on the meter, making sure to moisten the pH sensor before doing so.

Step 4: Record the air temperature: Hang the air thermometer somewhere where it will not lean against any soled object and where it is protected as much as possible from direct wind and sunlight. The thermometer will take at least five minutes to equilibrate. It might take longer if it has to adjust for large changes in temperature. Recording the air temperature after you have completed the water quality sampling should ensure that the thermometer has had ample time to adjust.

Step 5: Perform the meter post-sampling check in office with tap water: Using the pH 10 and 1413 conductivity standards provided, test your meter's accuracy. Turn on your meter. Place a small amount of the pH 10 standard into plastic cup marked "pH10 check" (just enough to cover the sensor). Take a pH reading and record the result. It should fall between 9.8 and 10.2. Rinse the meter in tap water and shake it gently to remove excess water. Then, place a small amount of the 1413 conductivity standard into the plastic cup marked "conductivity check" and take a reading. Note the conductivity level. It should fall between 1342 and 1484. Rinse the meter again in tap water and shake it gently to remove excess water before replacing the cap. The standards are safe to pour down the drain with a little tap water. DO NOT pour them into the stream.

Fish Sampling: Chena Salmon sampling protocol was used for recording information on fish. Sampling procedures follow. Gee-type minnow traps (23 x 45 cm, 0.64 cm wire mesh, with 2.5 cm diameter openings) will be baited with salmon roe and set 5-10 mm apart for a 24-hour soak time (Swales, 1987). After the 24 hour soak, volunteers will identify and count all fish in the trap and, for each Chinook salmon and Arctic lamprey, will determine weight using water displacement and length using a Photarium viewing box (Duvall, WA, USA) to estimate the condition, or K factor (Weatherly and Rogers 1978). Fish will be released after identification and measurements are taken. Any incidental fish deaths will be labeled and brought to the USFWS laboratory in Fairbanks for further processing.

1. Set Traps:

- Place bait ball in the trap

- Put trap in suitable location length-wise to current. Slow moving water with in-stream cover is best but this may not be possible at all sites. Put traps in the slowest moving water available at your site because fish will get exhausted swimming against current
- Let your trap soak overnight and check on it 24 hours later
- Be as consistent as possible with length of soak -me!
- Get traps in deep enough water to cover the trap (deeper is better)
- Don't put traps in a high use area because they may get vandalized or stolen
- Make sure that traps are well-secured to something on the bank

2. Checking Traps

- Have all of your equipment ready before removing any traps from the water.
- Fill your counting and holding buckets half full of river water.
- Remove one of your traps from the water and gently pour fish into your counting buckets.
- Catch one fish at a time with the dip net and place it in the viewing box to identify it.
- Go to your guide. If the fish has an adipose fin, use the upper key. If it doesn't have an adipose fin,
  use the bottom key. Pictures & descriptions for each species are in the guide (with TVWA).
- Record length of first 10 fish you identify for each habitat type using length markings on viewing box or measuring tube.
- After identification, put fish into the holding bucket.
- After you are finished counting and identifying all of the fish from one trap gently pour the holding bucket into the river and start counting your next trap
- Record total numbers for each species on the datasheet if no fish are caught record that
- Complete one data sheet for both habitat types, try to keep neat, organized notes

3. Fish Handling Guidelines- Our goal is to minimize stress, limit handling, treat them with respect!

- Keep your hands wet at all times.
- Use bare hands, gloves can damage scales.
- Handle fish as little as possible.
- Only empty one trap into the counting bucket at a -me (to maximize oxygen content).
- If counting is taking a long -me you can try carefully changing out some of the water to maintain oxygen content and water temperature.
- Release fish in the same place where you caught them.

Beaver Survey: Beaver dams and lodges were surveyed visually by foot on Upper Piledriver Slough and by canoe on Lower Piledriver. Beaver dams were defined as dams built by beavers to provide ponds as protection against predators such as coyotes, wolves, and bears, and to provide easy access to food during winter. Beaver lodges were defined as dwellings constructed on the side of the stream that do not impeded passage. All dams and lodges were photographed, GPS locations were recorded, sites were described. Dams were measured for height, diameter of logs and width of passage. Dams were categorized based on activity by beavers (active, inactive) and type of dwelling (primary dam, secondary dam, lodge). Active was defined as dams or lodges that exhibited signs of recent activity including fresh chews, moved materials, feed piles, tracks, beaver slides, or beaver presence ect. Inactive dams and lodges were defined as places which did not exhibit the signs of use identified in the "active" definition. Primary dam was considered the largest dam in a ½ mile area that displayed the most use. Secondary dam was determined as a smaller dam.

Follow Up:

All equipment was inventoried, cleaned, and serviced before and after the surveying season. Fish data reports were sent to the Alaska Dept of Fish and Game, in compliance with our permit requirement.

Study Survey Results

TVWA staff held discussions with Salcha head teacher to discuss updates to the program including map and compass curriculum and magnifying containers for invertebrates. We took feedback from the teachers and discussed future ideas for the partnership and curriculum. The Piledriver project maintained strong community involvement throughout the study duration: 10 members of the Salcha Elementary School staff, 15 community and parent volunteers, 74 children attending Salcha Elementary School, 1 TVWA staff, 2 contractors, 3 volunteers, the Department of Fish and Game, and the U.S. Department of Fish and Wildlife.

The study had a total of twenty-eight survey sites. Eight survey sites (with 2 traps each) on the Upper Piledriver were within the periods of May 12-13, June 8-9 and August 18-19. This Upper Piledriver was monitored with the assistance of the Salcha Elementary School through the citizen scientist collaboration. Sixteen sites (with one trap each) were surveyed on Lower Piledriver by TVWA field technicians and volunteers on May 13-14, June 7-8, and August 18-19. Undivided, 23 Mile Slough had four survey locations that took place on May 12-13 and June 7-8 by TVWA field technicians and volunteers. TVWA staff included Jenna Hertz and Audra Ashby. Volunteers included David Jonas, Heather Mirczak, Barb Hertz and Steve Hertz.

In 2015, TVWA staff began recording qualitative data after each float and continued this practice in 2016.

In 2016 TVWA contacted Trent Sutton, a professor at UAF who teaches a freshwater fisheries techniques course and conducts yearly sampling on Piledriver Slough. We were able to obtain the data from his sampling project and share it with the Salcha Elementary students.

Fish: AKF&G issued TVWA a Fish Resource Permit for the study (See Appendix A). Surveying took place post-permit issuance. Data collection recorded fish species identified, relative size, and location assisted by equipment (minnow traps, viewer, bucket, and identification book). The compilation of fish parameters was reported to AKRR as the *Fish Collection Report* (See Appendix B). Fish monitoring was conducted at 28 sites with a total of XXX caught-and-release fish recorded.

Beaver: Beaver dams were categorized based on whether or not it was actively used by beavers, which simply were active or inactive. Secondary categorization was based on dwelling type of dam, which consisted of primary dam, secondary dam and lodge. Dam activity and dwelling type was recorded as well as coordinates.

Discussion of Study Outcomes & Activities

Successful implementation of the Piledriver Sough Project 2016 provided survey data recording and community buy-in through community-based learning as citizen-scientist volunteers ranging from

youth or adults. TVWA featured the Piledriver project at several outreach events including Earth Day on April 22, Midnight Sun Festival on June 19th. Piledriver curriculum was used at other TVWA water sampling events such as those used with the Adopt a Stream trainings for the kid's kits. A display provided information to the public that outlined the full scope of the Piledriver Project and highlighted the Salcha Elementary School children's stewardship accomplishments. A Piledriver curriculum was catered to the project to enhance TVWA's Adopt-A-Stream program and participant education. An anticipated increase in project citizen participation and long-term monitoring education for 2017 and onward are expected from these outreach events.

Hydrology Monitor

The initial Hydrology monitoring report was already sent to AKRR – TVWA collected more data, which is still being analyzed and a full report will be turned in before December 30, 2016.

Appendix A: Fish Resource Permit: Fish Resource Permit

STATE OF ALASKA
DEPARTMENT OF FISH AND GAME
333 Raspberry Road
ANCHORAGE, ALASKA 99518

Permit No. **SF2016-148**

Expires: **10/1/2016**

FISH RESOURCE PERMIT
(For Scientific/Collection Purposes)

This permit authorizes: **Jenna Hertz**
(whose signature is required on page 2 for permit validation)

Of

Tanana Valley Watershed Association
516 Second Avenue, Suite 412, Fairbanks, AK 99701
(248) 568-0345 jenna.tvwa@gmail.com

to conduct the following activities from **May 1, 2016** to **October 1, 2016** in accordance with AS 16.05.930 and AS 16.05.340(b).

Purpose: To examine fish presence and abundance in the target locations in fulfillment of Mitigation Measure 56 of the Service Transportation Board.

Location: Piledriver slough (334-40-11000-2490-3315), 23 mile slough (334-40-11000-2490-3315-4010)

Species: Local species

Method of Capture: Minnow trap

Final Disposition: Any number of fish may be captured, identified, and quickly released alive during each sampling event.
≤50 individuals each of Alaskan brook lamprey, Arctic lamprey, and Chinook salmon at each sample location may also be measured before release.
≤2 individuals of each unknown species may be killed and saved for later identification.
All unintended mortalities must be recorded and may either be returned to capture site waters or provided to the U.S. Fish & Wildlife Service as vouchers.

COLLECTION REPORT DUE November 1, 2016 and RESEARCH REPORT DUE April 30, 2017; see **Stipulations #2** and **#3** for more information. Data from such reports are considered public information. Reports must be submitted to the Alaska Department of Fish and Game, Division of Sport Fish-HQ, 333 Raspberry Rd, Anchorage, AK 99518, attention: Scott Ayers (267-2517; dfg.dsf.permitcoordinator@alaska.gov). A report is required whether or not collecting activities were undertaken.

GENERAL CONDITIONS, EXCEPTIONS, AND RESTRICTIONS

1. This permit must be carried by person(s) specified during approved activities who shall show it on request to persons authorized to enforce Alaska's fish and game laws. This permit is nontransferable and will be revoked or renewal denied by the Commissioner of Fish and Game if the permittee violates any of its conditions, exceptions, or restrictions. No redelegation of authority may be allowed under this permit unless specifically noted.
2. No specimens taken under authority hereof may be sold, bartered, or consumed. All specimens must be deposited in a public museum or a public scientific or educational institution unless otherwise stated herein. Subpermittees shall not retain possession of live animals or other specimens.
3. The permittee shall keep records of all activities conducted under authority of this permit, available for inspection at all reasonable hours upon request of any authorized state enforcement officer.
4. Permits will not be renewed until detailed reports, as specified in the Stipulations section, have been received by the department.
5. UNLESS SPECIFICALLY STATED HEREIN, this permit does not authorize the exportation of specimens or the taking of specimens outside of existing regulations.

Scott D. Ayers
Permit Coordinator
Division of Sport Fish

Sheila A Cameron for
Director
Division of Sport Fish

April 20, 2016
Date

Authorized Personnel: The following persons may perform collecting activities under terms of this permit:

Audra Ashby, Jewelz Barker, Annie Keep Barnes, Ed Barnes, Tori Brannan, Royce Conlon, Christy Everett, Jenna Hertz, David Jonas, Ben Kennedy, Bryn McElroy, Laura Minski, Ian Olson, Gale Vick, Dave Welborn

Employees and volunteers under the direct supervision of, and in the presence of, one of the authorized personnel listed above may participate in collecting activities under terms of this permit.

Permit Stipulations:

1) **Klaus Wuttig** (459-7344; klaus.wuttig@alaska.gov), the Tanana River Area Management Biologist (AMB), must be contacted for final authorization **prior** to you engaging in any collecting activities. *The time/date of this contact must be included in your collections report (using the "data submission form" furnished by ADF&G).* AMBs have the right to specify methods for collecting, as well as limiting the collections of any species by number, time, and location.
2) **A report of collecting activities, referencing this fish resource permit, must be submitted within 30 days after the expiration of this permit.** The report (using a data submission form furnished by ADF&G), shall include all species, numbers, dates, locations of collection (datum/GPS coordinates in the decimal degrees format (dd.ddddd)), and disposition, and if applicable, sex, age, and breeding condition, and lengths and weights of fish handled. It must also include the date/time the local biologist was contacted for final authorization to carry out collecting activities.
3) **A report of research activities, referencing this fish resource permit, must be submitted within 6 months after the expiration of this permit.** This report should present the research conducted in a format similar to a scientific paper including the following: introduction (objective of the study plan and hypothesis), methods, and results. The report is intended to show that the specimens were used in a scientific method, and allows for the evaluation of potential cumulative effects from multiple projects in the same area. A report is required whether or not collecting activities were undertaken.
4) An instance of >10% unintended collecting mortality requires sampling at a site to cease and the AMB contacted.
5) Each piece of unattended sampling gear must be: 1) labeled with the permittee's name, telephone number, and permit number, 2) properly secured to ensure retrieval, 3) placed in a location where they will not be easily noticed (e.g. under cut banks, in pools away from roads or trails), 4) allowed to soak no more than twenty-four hours at a time, 5) located with GPS coordinates, and 6) accounted for and removed at the conclusion of sampling.
6) Salmon eggs used as bait in traps must either be sterilized commercial eggs or, if raw, disinfected prior to use. A 10-minute soak in 1/100 Betadyne solution or some other iodophor disinfectant is adequate. Commercial eggs must be placed into a container that does not allow the fish to consume them (e.g., film canister with holes punched in it or a perforated plastic bag).
7) Gloves, boots, and collecting gear should be disinfected between streams to reduce the potential of pathogen transmission. A wash/rinse in 1/100 Betadyne solution is adequate. Felt or absorbent soles on waders and wading boots are prohibited.
8) If new anadromous fish species *or* previously undocumented life stages of anadromous fish are found in permitted streams, rivers, and lakes, the permit holder will work closely with ADF&G to see that information is included in the database for the *Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes*. Anadromous fish include *Oncorhynchus spp*., Arctic char, Dolly Varden, sheefish, smelts, lamprey, whitefish, and sturgeon. Please direct questions to **J Johnson** (907-267-2337; j.johnson@alaska.gov).
9) Contact **Tammy Davis** with the ADF&G Invasive Species Program (907-465-6183 or 1-877-INVASIV), and the nearest AMB (**Stipulation #1**) within 24 hours should you find any species suspected to be a **non-native species** during your sampling. If possible the organism should be killed, preserved by freezing or placing into 90% alcohol, and taken to the nearest ADF&G office. Please take a photo of the organism, as well as a photo of the organism in the environment in which it was observed, and note the location with a GPS or by describing it on a map with landmarks.
10) A copy of this permit, including any amendments, must be made available at all field collection sites and project sites for inspection upon request by a representative of the department or a law enforcement officer.
11) Issuance of this permit does not absolve the permittee from securing any other required state, federal, or local permits, including securing permissions to trespass on controlled lands.
12) Failure to comply with the conditions of this permit will result in the loss of future permitting privileges.
13) PERMIT VALIDATION requires permittee's signature agreeing to abide by permit conditions before beginning collecting activities:

Bryn M. McElroy

Signature of Permittee

ecc: Klaus Wuttig, Division of Sport Fish, Fairbanks
Brandy Baker, Division of Sport Fish, Delta Junction
Bonnie Borba, Division of Commercial Fisheries, Fairbanks
Audra Brase, Division of Habitat, Fairbanks
Michelle Morris, Commercial Fisheries Permit Coordinator, Juneau
Colonel Bear, Alaska Wildlife Troopers
Captain Leath, Alaska Wildlife Troopers Northern Detachment
Lieutenant Rodgers, Alaska Wildlife Troopers, Fairbanks

Appendix B: Fish Collection Report: Fish Collection Report

Summary

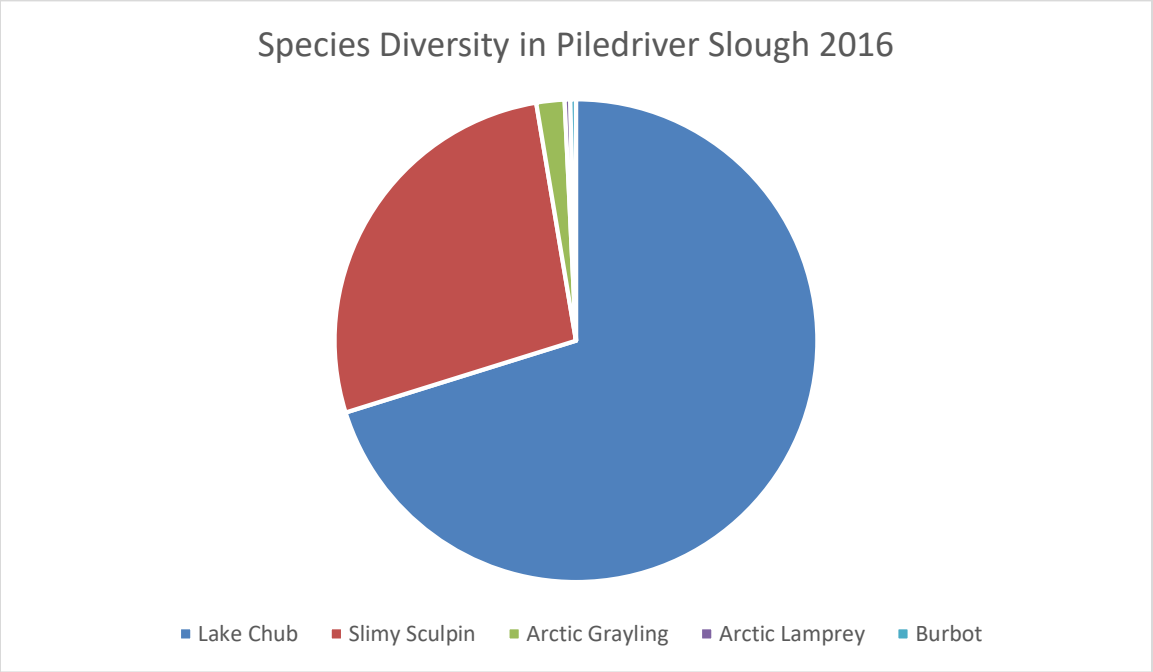
In 2016 252 fish were caught, identified and released in Piledriver and 23 Mile Sloughs. Of these, 53 were caught on Upper Piledriver with the Salcha Elementary students and 45 on Lower Piledriver, and 154 on 23 Mile Slough.

Place	Total Fish Caught	Slimy Sculpin	Lake Chub	Burbot	Arctic Grayling	Arctic Lamprey		Days Sampled	# traps set
Upper Piledriver	53	11	38	1	3	0		May 12-13, June 8-9, Aug 18-19	16
Lower Piledriver	45	42	2	0	0	1		May 13-14, June 7-8, Aug 18-19	16
23-Mile Slough	154	7	146	0	1	0		May 12-13, June 7-8	4

Equipment Used

Gee-type minnow traps (23 x 45 cm, 0.64 cm bar mesh, with 2.5 cm diameter opening) were baited with disinfected salmon roe and set for 24 hours for each sampling event. Traps were placed in a variety of habitat types including cut banks, slough mouths, in woody debris, and on either side of beaver dams. All captured fish were identified to species. The fork length of the fish identified at each site each week was measured using the ruler on a medium Photarium viewing box (Duvall, WA). Fish were released after identification and measurement.

Species Diversity



The most commonly caught fish this year was the lake chub (186 fish). We caught the majority of the lake chub on upper piledriver section and 23 mile slough in June when water levels were low, temperatures were warm, and these fish may have been spawning. The second most commonly caught fish was the slimy sculpin (72). In past years, the Slimy Sculpin has been the most commonly caught fish in each year of sampling on Piledriver slough. Arctic Grayling were caught, mostly on upper piledriver slough as well (5 fish).

The lake chub (Couesius plumbeus) belongs to the largest freshwater fish family, the minnows (Cyprinidae). They are a small fish, with adults averaging from 5-10 cm long. The lake chub is found in all types of freshwater bodies (lakes and streams), but in Alaska it has been found more often in silty waters. It tends to prefer shallow water, although it will move to deeper water during hot weather. The lake chub is usually abundant wherever it is found. Young lake chubs feed primarily on zooplankton. Older lake chubs feed on terrestrial and aquatic insects, but also feed on algae, occasionally small fishes, and have been known to scavenge on decaying fish.[1] This makes sense as our surveys of Piledriver's aquatic invertebrates have found the habitat to be host an extensive array of aquatic insects and we have observed increasing amounts of algae in the past years. We additionally believe that we encountered the Lake Chub during their spawning period, which is known to occur between spring and early summer. This would account, in part, for their abundance although lake chub prefer spawning areas with shallow water and rocky or gravelly bottoms.

TVWA field staff observed large numbers of grayling, ranging in size from 2-16 inches traveling in schools, mostly heading upstream during each sampling event in 2016. TVWA staff also noted large numbers of spawing chum salmon in the slough during the August 18-19 sampling on Lower Piledriver slough.

[1] "Lake Chub" Alaska Dept. of Fish and Game Wildlife Notebook Series, Kelly Mansfield, 2004

Number of Fish Caught

In 2016 we caught 252 fish. In 2015 the total catch was 373 fish, in 2014 the total catch was 58, 2013 saw 24 fish and in 2012 101 fish were captured. This is due largely to the abundance of Lake Chub that were captured in June of 2016 in 23 mile slough. There is not yet enough data to determine a significant trend in fish numbers.

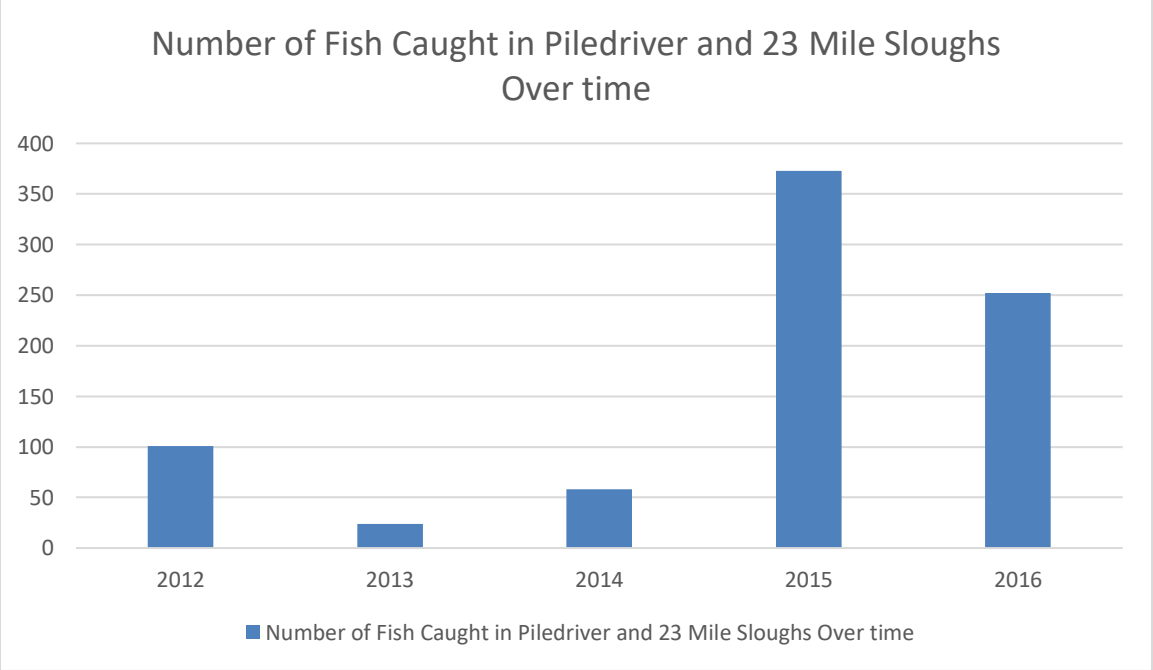


Figure 2: Number of Juvenile Fish Caught in Piledriver and 23 Mile Slough Annually

Sampling Sites

Whenever possible – TVWA chooses to use the same sampling sites as the previous years. Sometimes, flooding or other environmental factors make use move the sites a few feet. We use GPS coordinates to mark and then return to the same sites. The sites used in 2016 were, for the most part, consistent with those used in 2015.

Table 2: Piledriver Slough site locations with Salcha School.

Upper Piledriver Sites 2016

1	Culverts- Downstream	64.60180	-147.09177
2	Culverts- Upstream	64.60175	-147.09187
3	Annie's Yard	64.60035	-147.0912
4	Ingrid	64.59650	-147.08459
5	4-wheeler trail	64.59391	-147.08321
6	Xantheus Bridge	64.59293	-147.07361
7	Posted Braided	64.58728	-147.06952
8	Dam	64.58630	-147.06807

Table 3: Piledriver Slough site locations with TVWA staff and volunteers.

Lower Piledriver Sites 2016

1	tied to willows just past culvert across from houses on River R	64.84387	147.71843
2	on island just past houses, river L	64.60297	147.08966
3	mealt frame river L	64.60259	147.0863
4	upstreamof cabin and camper, river L	64.60233	147.08534
5	donwstream of cabin/camper river R after old dam	64.60301	147.08369
6	downstream of giant old dam river R	64.60333	147.08543
7	upstream of second bridge dam River L	64.60429	147.08809
8	downstream in middle of bridge dam	64.60429	147.08809
9	upstream of 3rd dam bride river R by drift log	64.60547	147.08676
10	downstream of 3rd dam bridge by river R	64.60547	147.08676
11	On stick with pink flagging across from old lodge	64.60766	147.08507
12	Tied to dead snag in pool river L	64.60837	147.08905
13	set to stake out of beach,slough widens and path flows right	64.61089	147.09007
14	on green twig upstream of gral island with cut spruce log, river L	64.61154	147.08916
15	in deep area between 2 shallow rocky ripples, river R	64.61420	147.08896
16	just past rocky ripplesbefore deep pool, river R	64.61451	147.08911
17	at left V of river on left for before yellow tag on tree river R	64.62028	147.0909
18	on right of Y after big log jam, river L	64.62366	147.08734

Appendix C: Beaver Report

Piledriver Slough Beaver Activity Survey Report 2016

Tanana Valley Watershed Association
October 1, 2016

The Piledriver slough mitigation plan monitors changes to the Piledriver slough that may be caused by beaver activity. Due to construction of the new rail extension, a levee was put in place that blocks flushing flows into the Piledriver Slough from the Tanana River. The flow-rate changes may cause ice and log jams that would hinder fish passage. Beaver dams may no longer be knocked out by flushing spring flows and could cause further fish passage issues. Beavers are a natural part of the local environment and can help or hinder the other wildlife in the area. In the case of Piledriver Slough monitoring will be conducted to evaluate the beaver dams and determine if they need to be removed to aid fish passage through the slough.

The ten mile section of Piledriver from the levee site to the Bailey Bridge was monitored in two sections: "Upper Piledriver" from the levee site to the Old Valdez Trail road crossing and "Lower Piledriver" from the Old Valdez Trail road crossing to the Bailey Bridge adjacent to Eielson Airforce Base. Piledriver Slough was monitored on May 13-14, June 7-8, and August 18-19 2016. Identification of dam, and lodges were marked with GPS Locations. Pictures and videos were taken for further comparison and review. Beaver dam activity was classified as active or inactive and labeled as a dam, secondary dam and lodge.

No sign of active beavers was observed anywhere on Piledriver slough in the summer of 2016. Since no active beaver activity was noted, TVWA recommends no action be taken to remove dams or lodges. All dams or lodges surveyed appeared to be old, abandoned or inactive.

None blocked passage of fish. The water levels in May and June were average and August these levels should have been adequate to facilitate fish passage.

Dam Reference:

Site 1: LB151- Man-made bridge found in 2015 at this site was not found in 2016. 64.60296, 147.0882

Site 2: LB152- Old dam with woody debris buildup. This is an old dam that has naturally built up sediment and woody debris so that it ranges from 1-2 feet in height. Not a concern because passage also varies between 2-4 feet. 64.60339, 147.08543

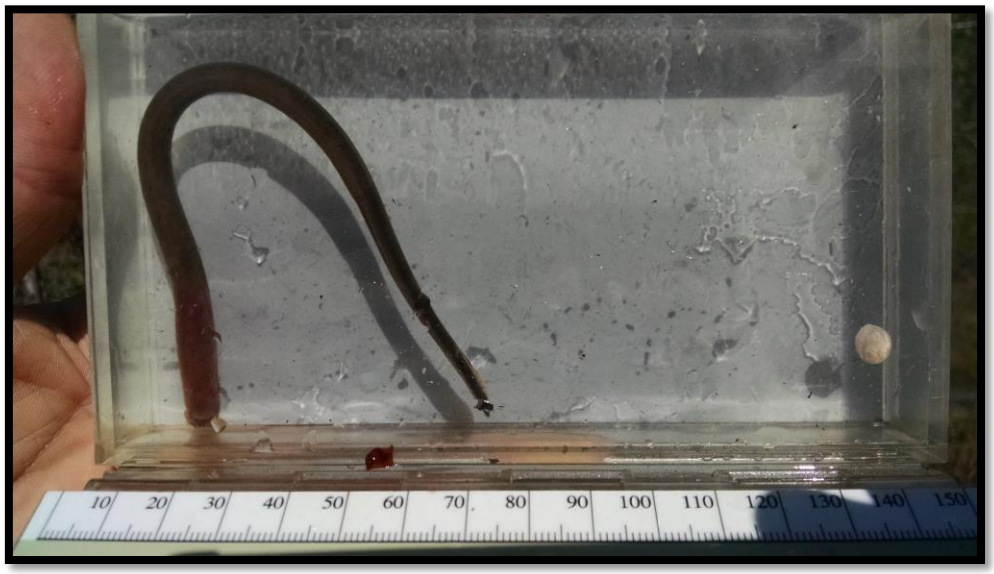
Site 3: LB153- Short dam. Height ranged from 6in to 1 foot, passage ranged from 2.5-5 feet. Made of smaller diameter logs, not a concern for fish passage in 2015. 64.60551, 147.08684

Appendix D: Photos

David Jonas walks canoe through shallow water in May 2016 Lower Piledriver sampling.

Fish Species

Arctic lamprey caught in Lower Piledriver Slough in May 2016.



Arctic Lamprey caught on Lower Piledriver Slough site 16 in May 2016.

Slimy Sculpin caught on the Upper Piledriver in May, 2016.

Water Quality Testing

Salcha elementary students use World Water Quality kits to identify pH level in Piledriver Slough.

Salcha students measure pH.

Habitat Exploration

Salcha elementary students explore Piledriver Slough.

Salcha students and teachers work together to identify invertebrates.

Fish Exploration

TVWA's Jenna Hertz instructs Salcha students on fish measurement.

Salcha student explore fish habitat.

Exploring the Algae Bloom

Salcha students search for algae and invertebrates.

Algae in Piledriver Slough, May 2016

Setting Fish Traps

Trap stepped on by a moose, May 2016 Lower Piledriver.

TVWA's David Jonas sets a trap on Lower Piledriver Slough, May 2016.

Spawning Salmon

Salmon Spawning in Lower Piledriver, during August 2016 sampling trip.

Volunteer Barb Hertz kayaks by a spawned salmon in August 2016.

Spawning salmon below Heather Mirczak in August 2016 sampling on Lower Piledriver Slough.