Juvenile Chinook salmon (*Oncorhynchus tshawytscha*) in the Chena River corridor through Fairbanks, AK: using citizen scientists to build community stewardship.

RM #32-12

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Introduction

Summary:
Our project sampled juvenile fish at 14 sites along the lower Chena River weekly from 15 May to 1 October 2012. Overall 124 individuals assisted with data collection; however, the results and information about our project reached far beyond the citizen scientists because we presented our findings at several community outreach events. We estimate through our outreach efforts we talked to over 2,000 local residents and visitors about the importance of the Chena River as habitat for Chinook salmon. We caught 1,511 juvenile fish, of which 849 (56%) were Chinook salmon. Our objectives were to: 1) increase Fairbanks community's stewardship of the Chena River Chinook salmon population through communication, outreach, and education with social media and riverside events; and 2) collect length and relative abundance of Chinook salmon using citizen scientist volunteers.

Objectives:
The primary objective of this project is to increase the Fairbanks community's stewardship of the Chena River Chinook salmon population; more specifically, to build the public's awareness of outmigrating juveniles, juvenile salmonid use of the Lower Chena River's streambank habitats, the characteristics of streambanks that are beneficial to juvenile survival, and the individual and collective actions that can be taken to conserve, restore, and promote healthy streambanks in the Lower Chena River. We will: 1) engage citizen scientists in data collection, allowing us to complete a third year of sampling juvenile fish in the lower Chena River; 2) build community awareness of Chena River Chinook salmon with outreach and education while promoting other collaborative outreach in the Tanana Valley drainage significant to Chinook salmon populations; and 3) connect the community with nature in a relevant way, generating a stakeholder attitude toward the Chena River, resulting in untapped demographics of stewardship for local salmon resources.

Study Area: The Chena River is a tannic-stained, non-glaciated tributary of the Tanana River that originates 145 km east of Fairbanks, AK and flows 250 km to its confluence with the Tanana River southwest of Fairbanks. A major flood event occurred in August of 1967 which led to the construction of the Moose Creek Dam in 1979, 27 km east of Fairbanks. This flood control project divided the Chena River into upper and lower reaches. The dam allows water and fish to pass freely under floodgates at normal river stages, and a fishway allows fish passage if the floodgates are closed (Brase 2009). Therefore the impact of the dam on fish passage is thought to be minimal.

The Chena River supports one of the largest Chinook salmon (*Oncorhynchus tshawytscha*) populations in the Alaska portion of the Yukon River drainage, with an average adult return of over 6,000 fish from

2001-10 (JTC 2012). All documented Chinook salmon spawning that occurs in the Chena River occurs upriver from the Moose Creek Dam (Brase 2009). These fish support subsistence and commercial fisheries in the Yukon and Tanana rivers, and attract sport anglers in the Chena River near Fairbanks. Adult returns to the Chena River are monitored annually (JTC 2012), and characteristics, habitats, and behaviors of juveniles have been described in the upper Chena River (Gutierrez 2011). Other fish species present in the Chena River include chum salmon (*O. keta*), Arctic grayling (*Thymallus arcticus*), burbot (*Lota lota*), round whitefish (*Prosopium cylindraceum*), humpback whitefish (*Coregonus pidschian*), longnose sucker (*Catostomus catostomus*), slimy sculpin (*Cottus cognatus*), lake chub (*Couesius plumbeus*), Arctic lamprey (*Lethenteron camtschaticum*), Alaska blackfish (*Dallia pectoralis*), sheefish (*Stenodus leucichthys*), least cisco (*C. sardinella*), and northern pike (*Esox lucius*) (Seitz 2011).

Several projects have focused on enumerating and understanding the biology of juvenile Chinook salmon in the Chena River near the Moose Creek Dam. For example, from 1981-83, the US Fish and Wildlife Service and US Army Corps of Engineers used an inclined plane trap to study salmon outmigration and found that the peak of outmigration occurred in the first 2 weeks of May but continued into June (Williamson 1984). Another study examined salmon abundance and mortality using inclined plane and rotary traps near the Dam and found that CPUE was highest during late May, yet there were several minor peaks in outmigration depending on the discharge rate of the Chena River (Peterson 1997). The duration and timing of these studies varied; however, sampling only occurred near the Moose Creek Dam between April and June. Our study included sites throughout the lower Chena River, and we sampled from May to October 2012.

Commercial and residential development has decreased the amount of available fish habitat throughout many parts of the lower Chena River. To determine if there were some sections of the lower river corridor where juvenile Chinook salmon were present throughout the summer, we divided the lower river into 3 sections (Fig 1): Above Downtown, Downtown, and Below Downtown and sampled sites from each section from 15 May to 1 October 2012. The Above Downtown section extended from the Moose Creek Dam to the Fort Wainwright Army Base and represented the section of the lower Chena River with the most intact fish habitat. For example, woody debris and overhanging riparian vegetation was available in most areas for this section. The Downtown section extended from the Steese Expressway Bridge to the University Avenue Bridge. This area was the most heavily commercially and residentially developed; therefore much of the riparian habitat had been altered or removed from this section. Additionally, in some parts of this section there were long stretches of the river where rip-rap or other bank stabilization methods had replaced riparian vegetation. The section Below Downtown extended from the Robert Mitchell Expressway Bridge to the confluence with the Tanana River. This area had an intermediate amount of fish habitat available; meaning there was more intact riparian vegetation and woody debris than what was present in the Downtown section, but there was still substantial development.

Figure 1. Map of the lower Chena River showing sampling locations included in the above downtown (green squares), downtown (orange circles) and below downtown (yellow triangles) sections.

Methods

Outreach Methods:

Citizen Scientists: We recruited and trained local families, homeschool groups, and landowners to be citizen scientists who would conduct the weekly sampling events. Each group adopted a single site to sample each week. We held a training event for volunteers before sampling started. To ensure citizen scientists collected uniform and accurate data, an employee from the US Fish and Wildlife Service or the Tanana Valley Watershed Association sampled with each group for a period of time ranging from several weeks to the entire summer, depending on the group.

Marketing and Events: We created a Chena Salmon Project logo for outreach materials and thank you gifts for our citizen scientists. Logoed items were an effective method to increase the long-term impact of our project through "brand recognition". We presented our project findings as well as Chinook salmon biology and lifecycle information at several community venues. One popular outreach tool we implemented was the "Salmon Wheel of Fun" which was a spinning wheel game with salmon and
Chena River quiz question categories; children especially were drawn in by the game.
Participants received logoed balloons as prizes which further advertised the project.

Sampling Methods:

Fish Sampling: The sampling sites selected for each section were determined by the availability of road access. The Above Downtown section had less development, meaning there were fewer river access points, resulting in long stretches of river between each sampling site. In the more developed areas, road and river access was more available resulting in sampling locations much closer to each other.

Four 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. Sampling events

occurred once per week per site between 16 May and 1 October 2012. Traps were placed in a variety of habitat types including cut banks, slough mouths, in woody debris, on rip-rap, and along gravel and silty beaches. All captured fish were identified to species. The fork length of the first 30 Chinook salmon 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.

An Alaska Department of Fish and Game (ADFG) Fish Resource Permit SF2012-148 was granted to the Tanana Valley Watershed Association (TVWA) for this project on 11 May 2012. Our final permit report was submitted to ADFG on 19 October 2012.

Water Quality and Habitat Sampling: Water quality (temperature, pH, and conductivity) was tested during each sampling event using a Hanna HI 98129 pH/EC/TDS/Temperature meter. Meter calibration was checked each week before and after testing using pH 4, pH10, and 1413µS standard solutions. To broaden the experience for the citizen scientists, habitat surveys based on the EPA Habitat Walk method were undertaken during the season to record changes in riparian habitat over time. Both the results documenting the Water Quality Assessments as well as the Habitat Walks can be found in the "2012 Annual Report of Adopt-a-Stream Program Activities for the Fairbanks Storm Water Advisory Committee" dated January 1, 2013 submitted to the City of Fairbanks by the Tanana Valley Watershed Association.

Results and Discussion

Outreach:

Citizen scientists sampled an average of 13 sites per week for 19 weeks during summer of 2012 for an estimated 494 hours spent setting and checking traps. We found that the citizen scientist approach to sampling was successful. Citizen scientists collected reliable data and were very careful when handling fish. It would not have been possible to sample so many sites each week without citizen scientists. In addition to the citizen scientists, we had the opportunity to involve two University of Alaska groups: the Upward Bound Program and the Watershed Management class, in the sampling project. A total of 124 people (77 youths, 47 adults) helped with fish sampling from 15 May to 1 October 2012.

After the citizen scientists demonstrated proficiency in identifying and handling juvenile fish, they were allowed to sample by themselves. This process worked very well in most cases, however one of the few challenges we experienced was that there were occasionally weeks when sampling was not possible for some groups. These circumstances lead to some weeks where some sites were not sampled. We would recommend that if this project were continued, it would be best to have an employee present to sample each week. This would ensure that all sites would be sampled each week regardless of the citizen scientist availability, while at the same time allowing the citizen scientists the opportunity to help as much as their schedule allowed. Throughout the summer there were 247 sampling events and 19 missed sampling events. Each river section had at least three sites sampled per week and each site was sampled an average of 17.6 times. We canceled sampling for the week of 27 May 2012 because of unsafe high water conditions.

We presented information about the Chena River, Chinook salmon and the salmon lifecycle at 12 local events (Table 1). The event with the largest number of people that were exposed to the Chena River Salmon project was the Golden Days Parade; however our most successful event was the Midnight Sun Solstice Festival because the crowd was extremely diverse and the booth format allowed us to interact for an extended period of time with interested individuals. We shared our space with the Soil and Water Conservation District's Invasive Weed booth for this festival which increased the number of festival-

goers that visited our booth and learned about the Chena Salmon project.

Table 1. Outreach event attendance, dates of event and the estimated number of participants that we interacted with.

Event Name	Date(s)	Estimated number of outreach recipients
Chena Salmon Project Training	4/28	33
Chena Riverwalk Festival	6/9	85
Midnight Sun Solstice Festival	6/24	600
Downtown Monday Market	7/25, 8/13,8/27, 9/24	180
Farmer's Market	6/27	75
UAF Upward Bound	6/19, 6/21	34
Golden Days Parade	7/22	1,000
UAF Watershed Management Class	9/17	6

Sampling:

We caught a total of 1,511 fish, of which 849 (56%) were juvenile Chinook salmon. We also caught slimy sculpin (38%), lake chub, burbot, longnose suckers, blackfish and Arctic lamprey (less than 5% each) (Table 2). The number of Chinook salmon increased dramatically in week 9 (July 15) and remained high for the duration of the project (Fig 2), especially in the Above Downtown corridor (Fig 3). This increase was almost exclusively due to the high number of fish caught near the Moose Creek Dam; the two Dam sites accounted for 92% of the total Chinook salmon that were caught throughout the course of this project. Interestingly, in May and June, Chinook salmon were caught in small numbers at most sites throughout the lower Chena River but not at the Moose Creek Dam. However, by mid-July Chinook salmon were more abundant at the Moose Creek Dam than any other sampling site and this trend continued for the remainder of the summer. While length measurements were recorded for every Chinook salmon, the only sites with sufficient numbers of Chinook salmon to examine the change in length over time were at the Moose Creek Dam (Fig 4). There was considerable variation in size each week; however length tended to increase over time.

Table 2 Species caught at each sampling site during the 2012 Chena River juvenile Chinook salmon project, Fairbanks, Alaska.

Site Name	Chinook salmon	Slimy sculpin	Lake chub	Arctic lamprey	Burbot	Alaska Blackfish	Longnose Sucker
Moose Creek Dam A	x	x		x	x		
Moose Creek Dam B	x	x		x			
Nordale	x	x	x				
FTWW Housing	x	x					
Chena Cove	x	x					
Noyes Park	x	x			x		x
Quality	x	x			x		
Carlson Center	x	x			x		
Peger		x					
Chena Rec	x	x					
Parks Hwy	x	x	x			x	x
Pikes	x	x	x				
Pump House	x	x	x				
Boat Shop	x	x	x		x		

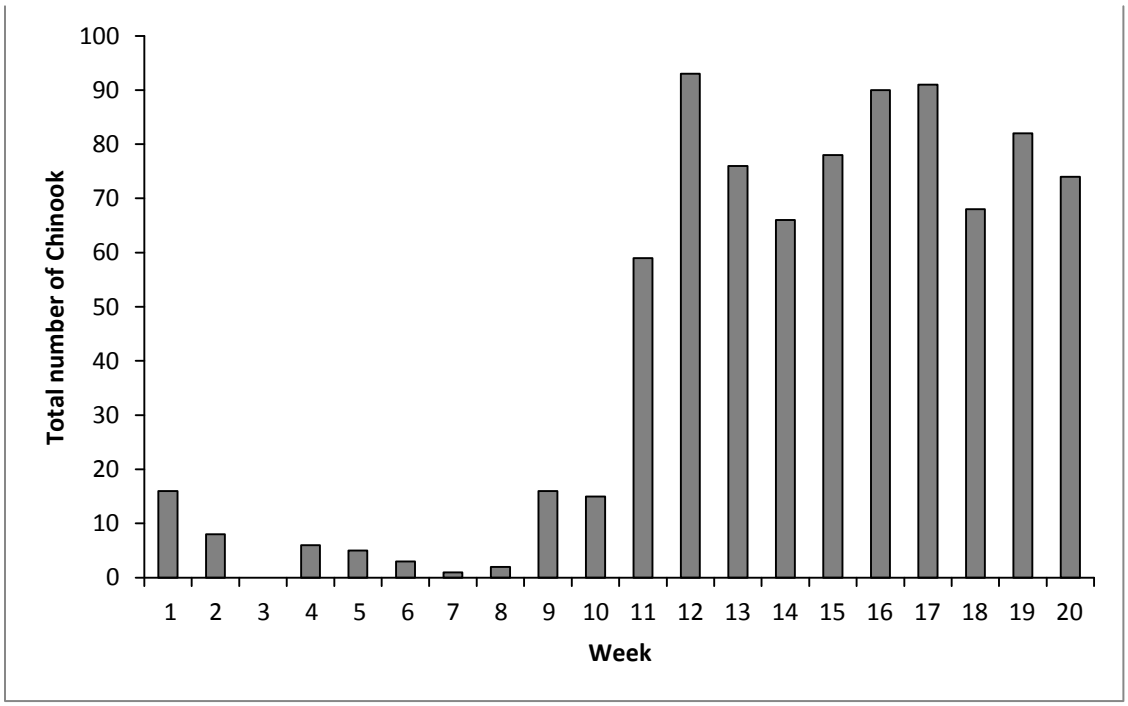

Figure 2. Total number of Chinook salmon caught per week of project.

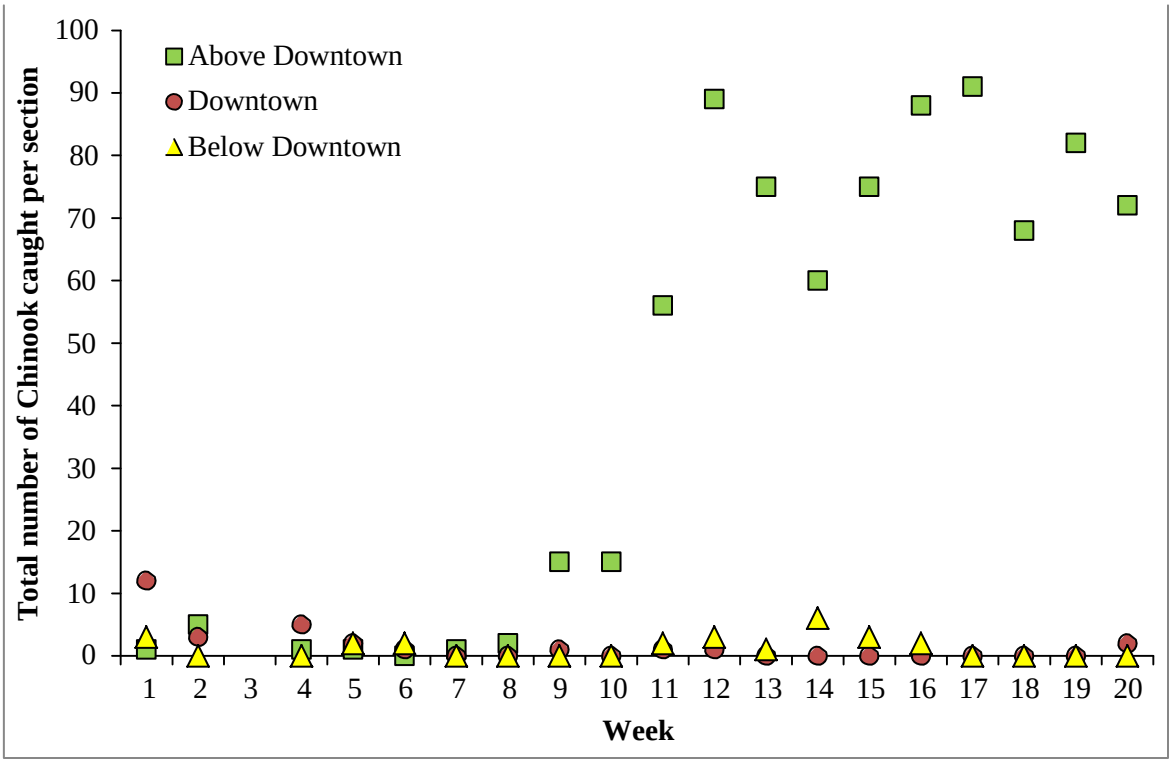

Figure 3. Total number of Chinook salmon caught per section per week.

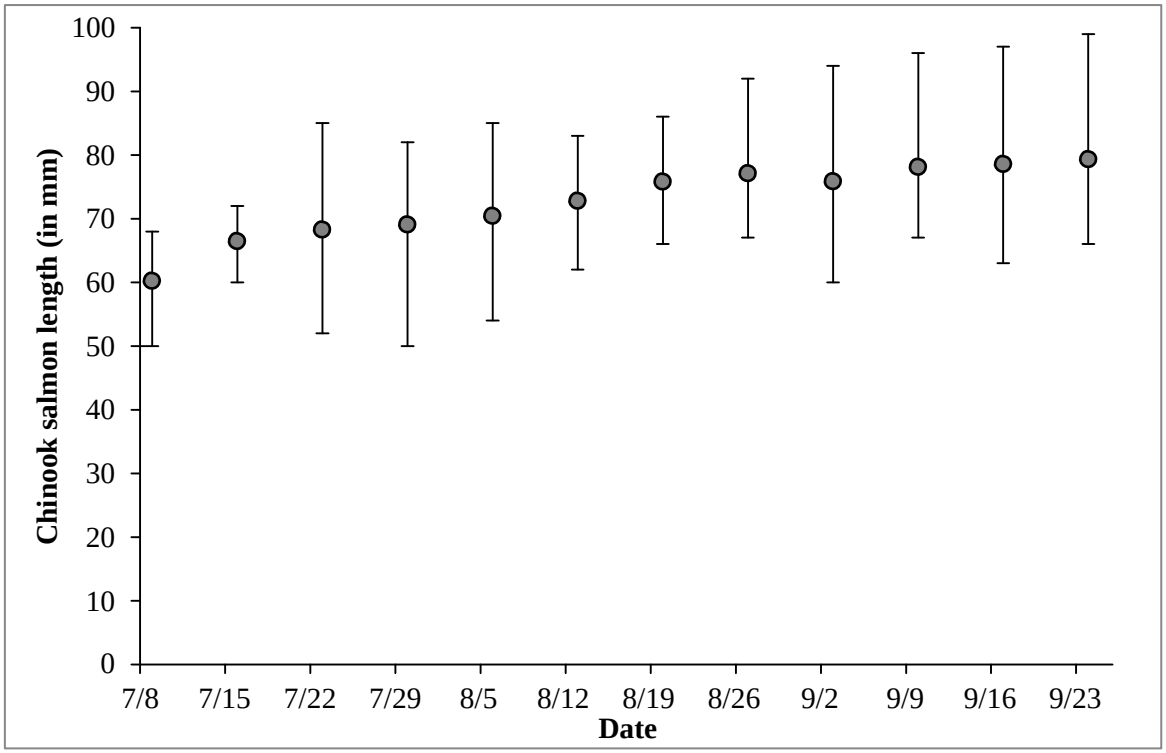

Figure 4 Average Chinook salmon length measurements from the Moose Creek Dam sites. Error bars indicate the maximum and minimum sizes while the symbols indicate the mean length of Chinook salmon measured for that week.

Conclusions

The most important outcome of this project is that over 2,000 local residents and visitors to the Fairbanks area learned about salmon habitat, the Chena River, and the salmon lifecycle. Of these, 77 youths and 47 adults learned how to identify, measure, and handle juvenile fish. We caught a total of 1,511 fish, 849 of which were Chinook salmon. The Moose Creek Dam sites accounted for 92% of the Chinook salmon we caught during the project. An average of 13 sites were sampled per week for 19 weeks, making this the most thorough survey of juvenile fish in the lower Chena River that has been done to our knowledge. The citizen scientist approach to sampling allowed local residents and especially youth to become engaged in stewardship of the Chena River, many cleaned up trash around their site each week and some reported talking to local landowners near their site about the project and the Chena River. We are excited about the ripple effect that this project has had in our community and feel that continued public outreach and engagement about Chinook salmon is an important step to inspiring future stewardship values in the Fairbanks community.

Acknowledgements

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Appendices:

Appendix A. – Data submitted to Alaska Department of Fish & Game: Fish Resource Permit SF2012-148 (Nutter/TVWA-Chena River-local fish)

References

Brase, A.L.J. 2009. Sport fishery management plan for Chinook salmon in the Chena and Salcha Rivers. Alaska Department of Fish and Game, Fishery Management Report No. 09-11

Gutierrez, L. 2011. Terrestrial invertebrate prey for juvenile Chinook salmon: abundance and environmental controls in an interior Alaska River. M.S. Thesis. University of Alaska Fairbanks, Alaska

The United States and Canada Yukon River Joint Technical Committee (JTC). 2012. Yukon River salmon 2011 season summary and 2012 season outlook. Alaska Department of Fish and Game, Regional Information Report No. 3A12-01

Peterson, B.D. 1997 Estimation of abundance and mortality of emigrating chum salmon and Chinook salmon in the Chena River, Alaska. M.S. Thesis. University of Alaska Fairbanks, Alaska

Seitz, A.C., K. Moerlein, M.D. Evans, A.E. Rosenberger. 2011. Ecology of fishes in a high-latitude, turbid river with implications for the impacts of hydrokinetic devices. Review of Fish Biology and Fisheries 22: 481-496

Williamson, D. 1984. Chena River salmon outmigration studies, 1981-1983. U.S. Fish and Wildlife Service Northern Alaska Ecological Services Report