

Deterring River Otters from the Makah Sockeye Weir: A Pilot Project



Total Cost: \$13,605.36

Rikki Manuel

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Makah Fisheries Management, Makah Tribe. 101 Resort Dr., Neah Bay, WA 98357

Executive Summary

The sockeye salmon (*Oncorhynchus nerka*) has been historically used by the Makah Nation for thousands of years. The Lake Ozette sockeye salmon is an evolutionary significant unit that is listed as a threatened species under the Endangered Species Act (ESA). A recovery plan has been written to identify threats and propose recovery measures for the Lake Ozette sockeye salmon. Of the threats identified, predation at the Ozette weir posed a significant concern because fish passage is constrained to a small area and otters target the compromised salmon. Otter predation on the sockeye salmon is frequent; and as salmon run size decrease, the level of impact on salmon populations increases. For this project, I plan to install acoustic deterrent devices (ADDs) at the Ozette weir to deter the river otters from using the Ozette weir to target the Lake Ozette sockeye salmon. The ADDs will repeatedly emit a high pitched chirping sound at 200-220 dB. The study design will have two treatments to compare for otter activity, when ADDs are active and when they are inactive. The videos will be recorded daily at the Ozette weir and will be watched to determine the total count of otters, seals, and fish passing through the weir each day. A comparison of the two treatments will be performed using a Student's T-test to see if the ADDs are successful in deterring otters and seals and see if the ADDs affect the salmon passing through the weir. The ADDs are expected to lessen the level of impact of otter predation at the Ozette weir to help the recovery of the Ozette sockeye salmon populations. This project is expected to start April 30th, 2011 and end August 31st, 2011. A manuscript reporting the results will be prepared by September 15th, 2011 and be available at www.makah.com/fisheries. The expected cost is \$13,605.36.

Introduction

The Ozette River and Lake Ozette are historical sockeye salmon (*Oncorhynchus nerka*) fishing sites that have been used by the Makah Nation for hundreds of years (NOAA 2009). Both sites are located within the usual and accustomed (U&A) grounds and stations for tribal fishing. Over time the Lake Ozette sockeye salmon run sizes have been decreasing; in recent years the Lake Ozette sockeye run sizes have decreased drastically (NOAA 2009). The sockeye salmon is an evolutionarily significant unit (ESU) exclusive only to the Ozette area. The Ozette sockeye salmon is listed as a threatened under the Endangered Species Act (NOAA 2009). The Lake Ozette sockeye salmon (ESU) is listed as a threatened species because it is in danger of becoming extinct.

A recovery plan was written to identify threats and propose recovery measures for the Lake Ozette sockeye salmon (NOAA 2009). The plan identified water quality, habitat conversion, and predation as limiting factors to Lake Ozette Sockeye recovery (Haggerty 2009). Logging and other activities have caused high water temperatures and high sediment concentrations in the water which affects survival and productivity rates of the Ozette sockeye salmon. Habitat conversion is a limiting factor also; the Ozette campground, facilities, and trailhead affect the floodplain and hydrological function of the Ozette Lake area. Also, predation is a key limiting factor; predation affects the sockeye populations and survival rates (Haggerty 2009).

At the Ozette River weir, predation is a significant concern because passage is constrained to a small passage which fish are forced to find and pass through. Predators, particularly otters, have been observed targeting the salmon passing the weir. In 2003 alone, a total of 31 events were observed of otters were attacking or predated on sockeye as they passed through the weir. Furthermore, past studies have shown that there is a high frequency of salmonid remains in river otter scat samples collected from the Lake Ozette area; after scat was analyzed, the frequency occurrence of salmonids in scat was 34.6% at the weir site (Scordino et al. 2010). This shows that otter predation on salmonids is very frequent; and as salmon run size decrease, the level of impact on salmon populations increases.

The recovery of Lake Ozette sockeye salmon would be aided by reducing the impacts of predators at the Ozette weir. This proposed project is a pilot project to see if acoustic deterrent devices (ADDs) will deter river otters from using the Ozette River salmon weir to target sockeye salmon. The device has proved effective at deterring seals, and sea lions at the Ballard Locks in Seattle and at fish farms and should work equally well in the Ozette River (Norberg et al 2000). An ADD is a device that emits a high pitched chirping sound repeatedly at 200-220 decibels.

Prior to writing this proposal, I surveyed 20 people while they were using the Ozette area for recreational activities. The purpose of this survey was to see if installing ADDs would affect people's Ozette experience and recreational activities, and if so, whether or not they would be okay with the ADDs being installed. The survey questions and responses are as listed:

1. Would a loud continuous noise near the trailhead affect your experience at Ozette? (The proposed Acoustic Deterrent Device transmits at 218 dB.)
 - a. 75% replied that the ADDs would affect their Ozette experience, 25% replied the ADDs wouldn't affect their Ozette experience.
2. Would you be willing to have loud noises interrupt your Ozette experience if it meant helping the sockeye salmon?
 - a. 45% replied that they would put up with the ADDs to help the salmon. 45% replied that they wouldn't put up with the ADDs even if it meant helping the salmon. 10% replied that they would maybe put up the ADDs if it meant helping the salmon.

Methods

Site Description

Lake Ozette is located on the northern Olympic peninsula of Washington State. The Ozette River drains Lake Ozette and runs 7 km. to the Pacific Ocean. The fish counting weir is located near the mouth of Ozette Lake, and is used to count returning adult sockeye salmon. This information is then used by Makah Fisheries Management to monitor effectiveness of recovery efforts or impacts of detrimental activities in watershed.

The fish counting weir located at the Ozette River is a wide V-shape that extends across the width of the river. The weir consists of a large metal triangular viewing chamber, and many thin metal pipes held in place by six large wooden tripods. The sockeye salmon pass through the triangular, metal viewing chamber and located in this viewing chamber is a water resistant camera used to record video of salmon passage.

The ADDs will be installed 15 yards away from the Ozette weir; in about 1 ft. of water. The projectors will be placed in the center of the Ozette River, parallel to the weir. The ADDs will have a directional projection as opposed to an omni-directional projection. Figure 1 shows the location of the ADDs at the weir site, and the direction they will be projecting in. The projection will be pointed towards the viewing chamber in the weir; this will deter the otters and prevent them from targeting the salmon exiting the viewing chamber. This figuration is designed for maximum deterrence at the weir.

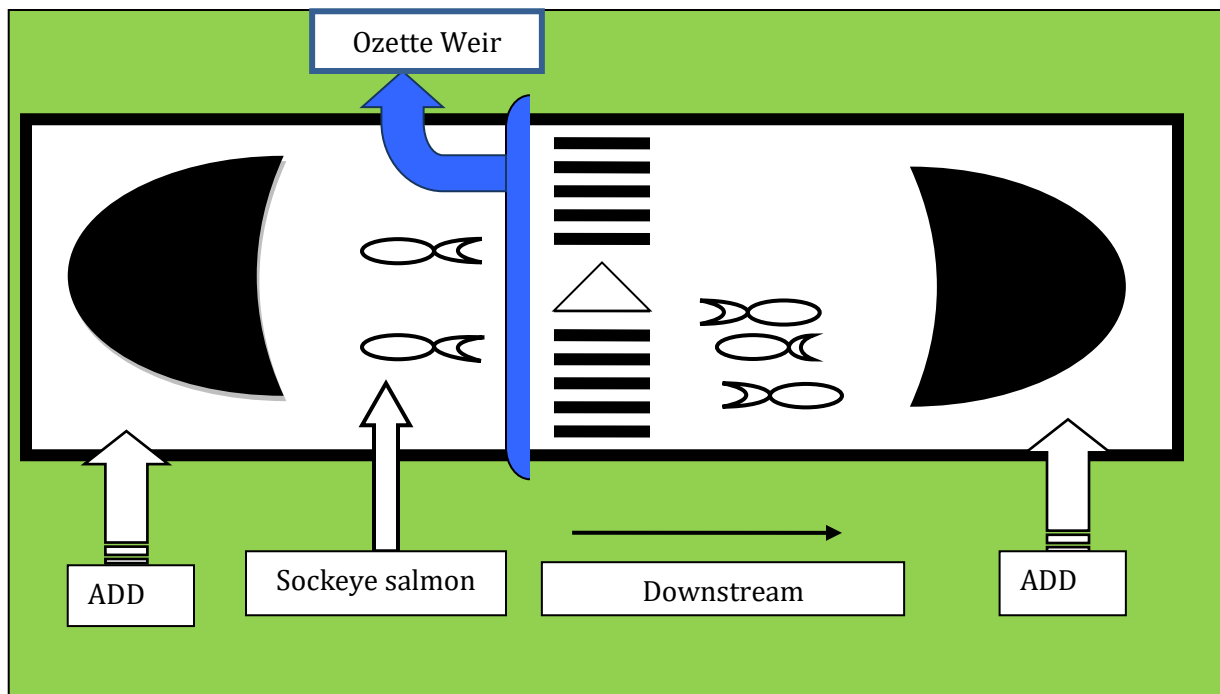


Figure 1: Proposed ADD locations at the Ozette weir

Data Collection

The video camera located in the viewing chamber of the weir will record the video necessary for data collection; the camera will be on 24 hours a day and 7 days a week. The data will be divided into two categories: upstream counts, and downstream counts. The total salmon counts, otter counts, and seal counts will be recorded and summed daily.

The acoustic deterrent devices will not remain active throughout the duration of the study. There will be ten ten-day sampling periods, starting April 30th, 2011 and ending August 8, 2011. The

ADDs will be active for 5 ten-day sampling periods and inactive for 5 ten-day sampling periods. This is to improve the validity of the results by expanding the sampling periods over the length of the salmon escapement period to ensure solid data and results. Figure 2 shows salmon escapement for the years: 2004, 2005, 2006, and 2007. As shown, salmon counts vary from week to week. By making the sampling period ten days, the data collected should not be affected by the varying salmon counts throughout the duration of the project.

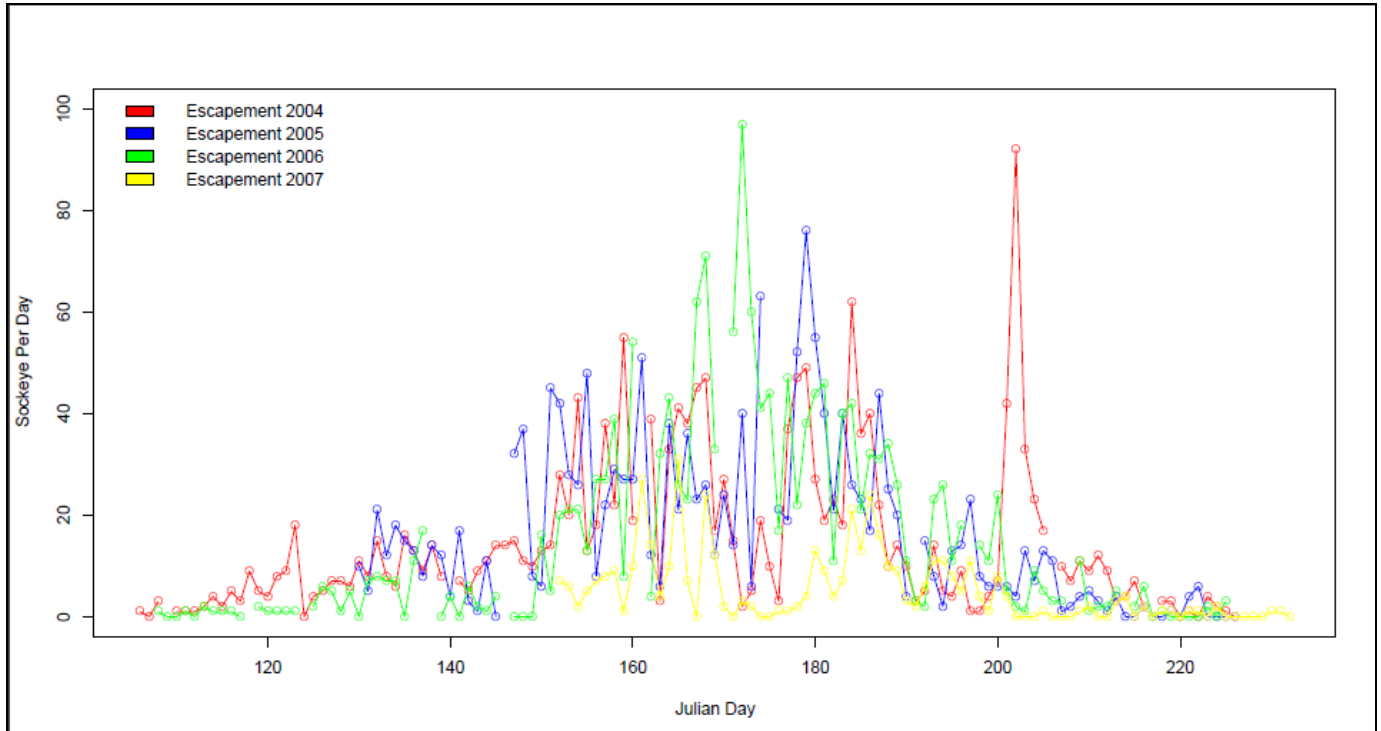


Figure 2- Counts of sockeye salmon passing through the Ozette River weir for 2004-07; starting April 30-August 8.

Data Analysis

For data analysis, the response variables (daily: otter count, sockeye count, seal count) will be compared from when the ADDs are active versus inactive. A student's t-test will be used to determine if otters per day, salmon per day and seals per day are statistically different for sampling periods with ADD on versus time periods with ADD off. There will be 5 ten-day sampling periods when the ADDs are active and 5 ten-day sampling periods when the ADDs are inactive. The study design results in 50 days when the ADDs are active and 50 days when the ADDs are inactive; giving a large sample size for t-tests. Afterwards, the gathered information and data will be presented in a scientific manuscript.

Anticipated Results

The anticipated results are a dramatic decrease in otter usage of the weir. After ADD installation, the ADDs will deter the otters and prevent them from preying on the salmon exiting the weir. Towards the end of the project some individual otters may habituate to the ADDs and continue to preying on the salmon exiting the weir, although level of impact will be greatly lessened and the salmon populations should not be impacted as much by predation at the Ozette weir. All in all, the ADDs are expected to lessen the level of impact of otter predation and save the sockeye salmon. Results of this work will be presented in a scientific manuscript that will be available at www.makah.com/fisheries.

Literature Cited

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- Scordino, J.J., S. Reimer, and P.J Gearin. 2010. Food habits of river otters (*Lutra canadensis*) in Lake Ozette and the Ozette River 1998-2003. Contract Report to North Pacific Coast Marine Committee. Available at Makah Fisheries Management P.O Box 115, Neah Bay, WA 98357.

Time Table

There will be ten ten-day sampling periods. The ADDs will be active for five ten-day sampling periods and inactive for five ten-day sampling periods. The dates are as follows:

April 30, 2011-May 10, 2011: OFF

May 10, 2011- May 20, 2011: ON

May 20, 2011- May 30, 2011: OFF

May 30, 2011- June 9, 2011: ON

June 9, 2011- June 19, 2011: OFF

June 19, 2011- June 29, 2011: ON

June 29, 2011- July 9, 2011: OFF

July 9, 2011- July 19, 2011: ON

July 19, 2011- July 29, 2011: OFF

July 29, 2011- August 8, 2011: ON

August 8, 2011- August 31, 2011: The data analysis and the write up will be performed.

The ADDs will be active for 50 days throughout the duration of this project and inactive for 50 days throughout the duration of this project.

Budget

Salary	\$5,300.40
Fringe	\$1,431.11
Travel	\$1,515.00
Supplies	\$1,950.00
Indirect	\$3,408.85
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Total	\$13,605.36

Figure 3

Salaries and Wages:

One technician will be employed part time under this grant. The project technician will earn \$12.62 and hour. The technician will have 440 hours of pay over the course of the project.

Travel:

Travel covers the miles needed to access the acoustic deterrent device by car. This project area is accessible by road at one location. Therefore, it will be required to drive long distances to access the project area. Travel expenses were estimated for 40 trips throughout the duration of this project. Car travel rates are the accepted government reimbursement rate for car travel. To access the project area by car, it requires a 37.5 mile drive, 75 miles roundtrip. Car mileage throughout the duration of this project is estimated at 3000 miles. The accepted government reimbursement rate is \$0.505/mile.

Supplies:

Expenses for supplies fall into three categories: public awareness, field gear, and ADD repair. Field gear will cover gear needed to keep the technicians safe, and power cords necessary to power the operation. ADD repair will cover the expenses needed to repair the ADD's and prepare them for operation, this will cost is estimated at \$1,500.00 dollars. Expenses for public awareness will cover the materials needed for the installation of an awareness plaque. This plaque will inform the public about the acoustic deterrent devices and why they are installed at the Ozette weir.

Indirect Costs:

The indirect rate is 34.4%.