U.S. Fish and Wildlife Service—Project Investigation Plan

For

Assessment and Classification of Mat-Su Fish Habitat—Juvenile Fish Distribution

A Project Funded Through the National Fish Habitat Program's

Matanuska-Susitna Basin Salmon Conservation Partnership

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Title:

Assessment and Classification of Mat-Su Fish Habitat—Juvenile Fish Distribution

Principal Investigator:

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Project Objective:

Evaluate and compare the relative importance of small upland clear water and lowland brown-water streams within the Susitna and Little Susitna River drainages for rearing and overwintering of anadromous Pacific Salmon.

Project Justification:

Information regarding the fish distribution among diverse stream types within the Mat-Su Borough is necessary to prioritize restoration efforts and to guide local, state, and federal regulatory actions and planning efforts in order to avoid future fish habitat losses. Urban and rural development within the Matanuska-Susitna Borough has resulted in the loss of fish habitat and as development continues, will potentially cause further losses. Direct and indirect habitat loss due to development includes removal or riparian vegetation, increases in surface water runoff, obstruction of fish passage, and the disruption of the interaction between terrestrial and aquatic ecosystems. Future regulatory decisions and local land use planning could inadvertently lead to additional habitat losses if decisions are made in the absence of information on the relationship between stream classification and fish distribution. Information on seasonal use of different stream systems can help focus fish passage and other restoration projects.

Multiple different stream types are present within the Susitna and Matanuska River drainages. These rivers could be classified as large glacial rivers, clear water rivers, low slope small and large wetland streams, and lake and stream complexes. These stream types differ in slope, hydrology, temperature and production. In addition, these stream systems likely provide support to different salmon life stages and respond differently to human disturbance. In 2007, through Salmon Conservation Partnership Support, we began to investigate differences among these stream types. Water temperature, channel physical characteristics, and basic water chemistry were collected within small upland streams, small wetland streams, large wetland streams, and lake dominated stream systems. There were significant differences in maximum water temperatures and cumulative degree days among small upland, wetland, and lake dominated systems, with no differences in these parameters between small and large wetland streams (Davis and Davis 2008). Small upland streams maximum daily temperatures never exceeded 15 C, while wetland streams exceeded 15 °C 20 to 50% of the time, and lake dominated streams exceeded 15 °C 75 to 90 % of the time. Water temperatures were strongly correlated with air temperatures demonstrating limiting buffering capacity and susceptibility to human induced watershed impacts. We also measured differences in specific conductivity among these stream types that may reflect differences in nutrient concentrations and productivity.

The ability to protect fish in cooperation with future development will require an extensive understanding of the stream characteristics that provide high fish productivity. Fresh water fish production is often limited by winter survival. Survival through the winter and the number of winters prior to smolt migration has been linked to the size and health of fish in the fall (Ebersole et al. 2006). Different stream types may provide advantages to rearing juvenile fish that can influence fitness and survival. Previous studies have shown that juvenile salmon will migrate to small streams and off channel habitats for rearing and overwintering (Bramblett et al. 2002). This may be particularly important for fish use associated with glacial rivers where juvenile fish have been shown to migrate long distances to find adequate rearing habitat (Murphy et al. 2002). The differences in water temperature and ameliorated flows during fall storms in small wetland streams may provide ideal wintering habitat for juvenile salmon within the Susitna River drainage. The objective of this study is to begin to look at the factors influencing the differential and seasonal juvenile salmon use of the different stream types within Southcentral Alaska. This project will focus on the use of small lowland wetland and small clear upland streams. These two stream types both support juvenile salmon rearing but differ widely in temperature, flow, sources of organic matter and many other physical and biotic characteristics.

Project Procedures:

Sampling would be conducted in four upland and four wetland streams. In order to build upon previous data collection, sampling sites would be located on streams where water temperatures were collected previously. Sampling would be conducted in the spring (1st of June), mid summer (1st of August), and fall (late September). Small wetland sampling locations would include sites on Wiggle Creek (near the Talkeetna River) Trapper Creek (near the Susitna River) Queer Creek (near Rabideau Creek)), and Gate Creek (below Petersville Road). Small upland sampling streams would include the two tributaries to Iron Creek (just upstream from the Willer-Kash Road), Buddy Creek (AKA Sawyer Creek) (near Anaconda Avenue), and Deception Creek (upstream from Willow-Fishook Road).

Juvenile salmon would be sampled to determine relative catch rate (catch/trap/hr), length, weight, and age distribution. These measures of the fish community would be used to evaluate differences between two different stream types: small upland streams, and small wetland streams. Fish sampling would be conducted using baited minnow traps. Traps would be baited with commercial salmon roe. Traps would be placed in slow velocity areas under cover provided by woody debris or stream banks. A minimum of 10 minnow traps would be used, and the traps would be fished for 24 hours. Ten traps will be used to reduce the variability in catch/trap/hour data; however, at one of the four sites we will use 20 traps to see if we obtain differences in resulting catch data. Traps will be soaked for 24 hour to maximize catch but minimize the chance of fish mortality. Previous sampling using baited minnow traps has shown that fish move in an out of the traps. Comparison of trapping conducted for 48 hours with the traps checked every 2 hours showed that maximum catch rates were obtained after 24 hours (Whitesel 1959). In 2007 we found that total catch and catch/hour increased when trapping increased from 1 to 24 hours. Fish from each trap would be identified to species, measured, and weighed in the field. Relative fish abundance would be evaluated from catch rate for each species and age class. The frequency distribution of fork lengths of all fish captured within each site would be used to determine the age classes present. Fitness would be based upon fish weight/length for each age class. We would use two-sample parametric or non-parametric statistical tests to compare dependent variables between small wetland and small upland streams. Dependent variables would include catch/trap/hr data, fitness (weight/length), and change in fitness from fall to spring for each age class of coho and Chinook salmon.

We would continue to monitor water temperature at 16 stream locations in small wetland, large wetland, small upland, and lake and stream systems using the remaining 2007 funding and the additional stream sites used for fish sampling (Deception Creek, Buddy Creek, and Gate Creek). Temperature logger deployment and maintenance would follow protocol developed by Cook Inlet Keeper, through U.S. Fish and Wildlife Service support. Temperature loggers (Onset Pro V2) would be programmed to record water temperature every fifteen minutes. The loggers would be placed within a well mixed stream section avoiding areas of obvious upwelling or tributary influence or direct solar radiation, and secured to bank vegetation using plastic-coated cable. Data loggers would be downloaded in mid summer and removed prior to freeze-up. Upon logger placement, downloading, and removal, stream water temperature and dissolved oxygen will be measured using a YSI 550 meter and probe, water samples will be collected and returned to the laboratory for basic chemical measures of specific conductance, pH, and turbidity. Discharge would be measured upon logger placement and removal. Regional air temperatures will be obtained from the National Weather Service web site (http://www.ncdc.noaa.gov/oa/ncdc.html) for the Talkeetna and Palmer Airports. Temperature data from each logger would be used to obtain daily mean, maximum and minimum values. Cumulative degree days (sum of mean values above 0°C) would be determined. Regression relationships would be calculated between maximum air temperatures and maximum and mean stream temperatures to obtain regression slopes (Davis and Davis 2008). Stream water temperatures would be compared with Alaska Water Quality Standards and published anadromous fish temperature tolerance values.

Schedule:

Task 1. Spring Fish Sampling and Temperature Logger Placement. May 25 to June 5, 2008. Water temperature loggers will be checked for accuracy and deployed at 16 stream locations per established methods. Stream water samples will be collected from each site and returned to the laboratory for chemical analyses. Stream discharge will be measured at each site. A minimum of 10 fish traps baited with commercial salmon eggs will be placed within 4 small upland and 4 small wetland streams. The traps will be removed after 24 hours and all fish will be identified to species, fork length measured, and weighed.

Task 2. Summer Fish Sampling and Logger Maintenance. July 25 through August 5, 2008. Temperature data loggers will be downloaded, discharge measured, and water samples collected. Fish sampling will be repeated at 4 small upland and 4 small wetland stream sites.

Task 3. Fall Fish Sampling and Logger Removal. September 25 through October 15, 2008. Temperature loggers would be removed in early October. Stream discharge would be measured and water samples collected. Fall fish sampling would be conducted in the last week of September.

Task 4. Data Reporting. October 15 through April 30, 2009. Data analyses and reporting.

Cooperators:

ARRI will be consulting and working with Sue Mauger of Cook Inlet Keeper to ensure that site selection and temperature data collection methods contribute toward more comprehensive studies of water temperatures throughout the Cook Inlet drainage basin.

Literature Cited:

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Responsibility:

Jeffrey C. Davis will be the principal investigator and will be solely responsible for data collection, handling and reporting; and all financial reporting requirements.

Submitted By: _____ Date: _____
Principal Investigator

Approved By: _____ Date: _____
Project Leader