Susitna-Watana Hydroelectric Project (FERC No. 14241)

Fish Distribution and Abundance in the Upper and Middle/Lower Susitna River (Studies 9.5 and 9.6): Draft Chinook and Coho Salmon Identification Protocol

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

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LIST OF ACRONYMS AND SCIENTIFIC LABELS

Abbreviation	Definition
ADF&G	Alaska Department of Fish and Game
AEA	Alaska Energy Authority
FDA	Fish distribution and abundance
GRTS	Generalized Random Tessellation Stratified
IP	Implementation Plan
ISR	Interim Study Report
PIT	Passive integrative transponder
PRM	Project river mile
QAQC	Quality assurance quality control

1. INTRODUCTION

During the first study year of the Susitna-Watana Hydro Fish Distribution and Abundance Studies, sampling occurred along over 200 miles of the Susitna River including many salmon-bearing tributaries. As in other larger glacial river systems in Alaska, Chinook and coho salmon in the Susitna River exhibit a wide variety of phenotypic variation and can appear very different among reaches, rearing habitats (e.g., turbid mainstem vs. tannic upland slough), and stages of smoltification. There is little data available regarding the accuracy of field identification of juvenile salmonids as most field biologists do not collect voucher specimen or samples with which they could verify field identifications and/or estimate a rate of error associated with their field identification, yet differentiating between these two species in some Alaska rivers can be challenging. This issue has been noted both historically in the Taku River (Meehan and Vania 1961) and, more recently, in the Copper River (Phil Joy, ADF&G, personal communication, October, 2014) and in the Susitna River where AEA field crews, including ADF&G Chinook salmon experts, incorrectly identified coho salmon when collecting Chinook salmon genetic samples in 2013 (Chris Habicht, ADF&G, personal communication, August, 2014). A QAQC review of the Chinook and coho salmon field calls from the 2013 Susitna River data set indicates that the primary phenotypic characteristics that are used to distinguish between the two species (e.g., anal fin shape and coloration, adipose fin pigmentation, parr mark shape/width, etc.) are highly variable across sub-populations of juveniles within each species and that the range of variation overlaps across species making field identification of juveniles of these two species more challenging.

In light of this, AEA has enhanced the ongoing fish sampling under the Susitna-Watana Hydroelectric Project's Study Program by developing a protocol and accompanying Susitna River specific field identification guide that will be used by all field crews. This standardized protocol will support accurate and consistent field identification across field teams. It will allow for additional quality control and assurance of field identification calls and for estimation and reporting of any field identification error that may occur in future studies. In addition, for the fish that were sampled for genetics, it will be possible to correct any erroneous field identification in the database. Furthermore, if systematic error is evident from the genetics analysis, for example all samples collected from salmon at one location or within a specific size category are identified as one species, it may be possible to make species identification adjustments to the data base for non-sampled individuals from that same group. Such corrections would be done by adding a genetic identification to the database to preserve the original field data.

2. FIELD TRAINING

The pre-sampling orientation of field crews will be expanded to include site specific information of phenotypic variation in juvenile Chinook and coho salmon. During orientation and training of field staff, Susitna-experienced Senior Fish Scientists will review with field crew a Susitna-specific identification guide that is developed in collaboration with ADF&G as well as the other field identification guides provided in Section 5.1.4 of the Implementation Plan (R2 Resource Consultants 2013). Field teams, led by senior staff, will then visit locations where both Chinook

and coho salmon phenotypic overlap has been found in the past and will use the field guide to identify individual fish.

3. GENETIC VERIFICATION

AEA will standardize the collection of genetic samples across habitats and sampling events. Field crews will be instructed to collect genetic samples on all Chinook salmon collected upstream of Impediment 1 in Devils Canyon (PRM 154.8) and to subsample for genetics downstream of Impediment 1. To determine the appropriate sample size for genetics sub-sampling, a power analyses will be conducted using the 2012 and 2013 data. Genetic identification data will be used to estimate the variation in field identification error rate across species and habitats. The power analysis will be used to estimate the appropriate sample size necessary to ensure that the fish identification error is within +/-5% of the true error rate. This analysis will be conducted in the spring of 2015.

Once the total sample size is determined, the first X Chinook and coho salmon collected at each site (GRTS or transect macrohabitat or check of a rotary screw trap) will be sampled for genetics using the omniswab technique. After that, one out of every Y individuals identified will be swabbed for genetics in order to meet pre-determined sample sizes in a way that is representative across habitats and time. The number of genetic samples collected will be tracked during the study season and the number of samples collected at each site may be adjusted as necessary to meet our desired sample size.

4. MERISTIC ANALYSIS

Because of the time required for transfer and analysis of genetics samples, it may be weeks or months until the samples are analyzed. To help improve field identification, more rapid and direct feedback to field crews is needed. Thus, vouchers will be taken for quick meristic analysis and specimens will be used as a teaching tool. Up to 20 juvenile Chinook, coho, and undifferentiated Pacific salmon may be taken as voucher specimens from each hydrologic segment: Lower and Middle. No meristics are needed in the Upper River as 100 % of all juvenile salmon collected are sampled for genetics analysis. Dissection and meristic analysis of pyloric caeca and branchiostegal counts will occur after collection, and specimens will be kept in viewable containers at a central location (field camp) for staff to review. Voucher specimens will focus on those individuals that are especially difficult to identify in the field or have unique characteristics leading to uncertainty in identification.

5. PHOTOGRAPH QUALITY CONTROL

In the next study year, undifferentiated Pacific salmon that are handled, fish used for genetic analysis, PIT-tagged fish, and PIT-tag recaptures will be photographed. Based on data from 2013 and 2014, there is photo documentation of approximately 4,000 PIT-tagged Chinook and coho salmon as well as undifferentiated fish and those selected for genetic samples but not PIT-tagged.

A Senior Fish Biologist with experience identifying Susitna River juvenile salmon will review photographs of all Chinook, coho, and undifferentiated Pacific salmon as a part of the AEA's data QAQC process. The reviewer will have the option to 1) confirm species call made in the field, 2) override the species call made in the field by assigning a new species and providing justification, or 3) determine that neither confirmation nor reassignment can be made based on photograph. Results from meristic and genetic analysis may also be used to establish a photo review error rate for those individuals for which species calls are confirmed or reassigned. Photographic reviews will be conducted as soon as possible after field data is collected and during the sampling season to provide feedback to field crews. A final review will be done and at the culmination of the field season prior to data analysis.

6. REFERENCES

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