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# MATANUSKA-SUSITNA REGION SALMON RESEARCH PLAN


Prepared by

**Alaska Department of Fish and Game**

**and**

**Cook Inlet Aquaculture Association**



**March 2008**

# Table of Contents

# Executive Summary

This salmon research plan will provide information important for management of sockeye, coho, chum, and Chinook salmon in the Matanuska-Susitna region.

The sockeye salmon portion of the plan describes a collaborative effort between Alaska Department of Fish and Game (ADF&G) and Cook Inlet Aquaculture Association (CIAA). Research focuses on estimating sockeye salmon production in 15 major sockeye salmon rearing lakes in the Susitna River and Fish Creek watersheds where production has apparently declined in recent years. These investigations will also seek to determine the cause of observed changes in sockeye salmon production through limnological and predator-prey studies in each lake, restore sockeye salmon production through removal of seasonal barriers (mostly beaver dams) to adult salmon migration into spawning habitats, and develop methods for controlling invasive northern pike that feed on juvenile salmon.

CIAA is currently conducting a complete enumeration of both juvenile and adult migrations on seven lakes thought to be key sockeye salmon producers in the Susitna River system and collecting water quality data to better understand the entire salmon life cycle by isolating variables in the lakes that may be limiting productivity. CIAA and ADF&G realize the current cooperative studies need to be expanded to encompass the scale and duration fisheries research demands to build accurate models and management strategies. These projects extend the time frame of the current study and identify additional lakes and creeks where analysis is critical to understanding factors limiting production in the Susitna River basin.

Six projects also provide information important for management of coho, chum, and Chinook salmon in the Susitna and Little Susitna rivers. Attention is focused on these watersheds because they represent the major salmon producing and recreation areas in the Matanuska-Susitna Borough. Two projects would provide information on coho, chum, and Chinook salmon distribution in the Susitna River watershed to better understand salmon spawning distribution in the watershed, and evaluate stock composition of escapements throughout the watershed. Two projects would improve coho and chum salmon escapement estimates through a weir on the Little Susitna River, and a final project would provide information on chum salmon spawner distribution in the Little Susitna watershed.

Annual costs for these projects are projected out over a five year period (Table 1). A number of these projects need to be run well beyond five years in order to provide full value, while the Little Susitna chum salmon spawner distribution could be completed earlier than five years.

**Table 1.** Summary of annual project budgets for Matanuska-Susitna Salmon Research Plan projects.

| PROJECT TITLE | AGENCY | FY09 | FY10 | FY11 | FY12 | FY13 | TOTAL |
|---|---|---|---|---|---|---|---|
| SUSITNA SOCKEYE SALMON ADULT WEIRS | CIAA | $422.4 | $254.6 | $254.6 | $254.6 | $254.6 | $1,441.0 |
| SUSITNA SOCKEYE SALMON SMOLT PRODUCTION | CIAA | $288.8 | $256.2 | $256.2 | $256.2 | $256.2 | $1,313.5 |
| SUSITNA SOCKEYE SALMON FISH PASSAGE REMEDIATION | CIAA | $58.3 | $58.3 | $58.3 | $58.3 | $58.3 | $291.5 |
| SUSITNA SOCKEYE SALMON INVASIVE SPECIES CONTROL | CIAA | $193.0 | $193.0 | $193.0 | $193.0 | $193.0 | $965.0 |
| FISH CREEK SOCKEYE SALMON PRODUCTION | CIAA | $20.2 | $20.2 | $20.2 | $20.2 | $20.2 | $101.0 |
| FISH CREEK SOCKEYE SALMON PRODUCTION | ADFG | $48.1 | $47.8 | $47.8 | $47.8 | $47.8 | $239.4 |
| SYNTHESIS & OVERSIGHT OF SOCKEYE SALMON LAKE INVESTIGATIONS | ADFG | $98.2 | $98.2 | $98.2 | $98.2 | $98.2 | $491.0 |
| SUSITNA RIVER COHO AND CHUM SALMON DISTRIBUTION | ADFG | $276.7 | $450.3 | $467.6 | $484.9 | $502.2 | $2,181.6 |
| SUSITNA RIVER CHINOOK SALMON DISTRIBUTION | ADFG | $273.0 | $394.1 | $409.3 | $424.4 | $439.6 | $1,940.4 |
| LITTLE SUSITNA RIVER WEIR INSEASON ASSESSMENT | ADFG | $98.0 | $51.8 | $53.3 | $54.9 | $56.6 | $314.6 |
| LITTLE SUSITNA RIVER CHUM SALMON ESCAPEMENT | ADFG | $13.2 | $13.6 | $14.0 | $14.4 | $14.9 | $70.1 |
| LITTLE SUSITNA RIVER CHUM SALMON SPAWNER DISTRIBUTION | ADFG | $126.0 | $121.3 | $124.9 | $128.7 | $0.0 | $500.9 |
| | **TOTAL** | **$1,915.9** | **$1,959.4** | **$1,997.4** | **$2,035.6** | **$1,941.7** | **$9,850.0** |

# Introduction

Cook Inlet Aquaculture Association (CIAA) in a joint effort with Alaska Department of Fish and Game (ADF&G) is currently in the midst of a three year study to evaluate and better understand the apparent failure of recent sockeye salmon runs to the Susitna River (Figure 1). Susitna River maintains a high profile in the Matanuska-Susitna Borough focusing the attention of resource managers, local, and state officials. Concerned citizens are actively engaged and looking to CIAA and ADF&G for leadership on this issue.

Recent sockeye salmon returns to the Northern District of Upper Cook Inlet have been substantially less than expected. Sonar estimates of sockeye salmon escapements into Yentna River have been below the escapement goal in 5 of the past 10 years. There could be a number of causes for this recent trend which can be addressed by two broad questions. The first is whether or not the system is producing juvenile salmon that succeed in migrating to sea. The second question is whether or not a sufficient number of adult fish are failing to reach the spawning grounds.

Future studies, mitigation, and rehabilitation strategies in the Susitna River basin must isolate and remediate obvious changes in habitat and rearing conditions. Since the 1980s several key variables that directly impact productivity in the Susitna River system have become obvious to resource mangers. Urbanization, migration barriers, and invasive species have all impacted productivity in the Susitna River system in recent years. These variables will continue to deteriorate the productivity of the system unless mitigation efforts are funded to address the problem. Preliminary data collected by CIAA and ADF&G already indicates the Susitna River system salmonid productivity has changed. Additional studies must be proactive in rehabilitation strategy focused on increasing productivity and monitoring the success of these mitigation efforts.

ADF&G is also focusing on management of Susitna River sockeye salmon by improving (1) estimates of escapement goal ranges that will maximize yields, (2) estimates of spawner abundance and adult production, and (3) forecasts of adult returns used to achieve escapement goals. Projects described in this plan address all three of these concerns. Better estimates of sockeye salmon production from spawners (potential egg deposition) to smolt in major rearing lakes will provide data needed to set escapement goals to maximize yields. Estimates of numbers of adult spawners entering major rearing lake systems will be used to evaluate accuracy of sockeye salmon escapement estimates from the Yentna River sonar project. Finally, sockeye salmon smolt abundance estimates from major rearing lakes will be used to improve forecasts of adult returns.

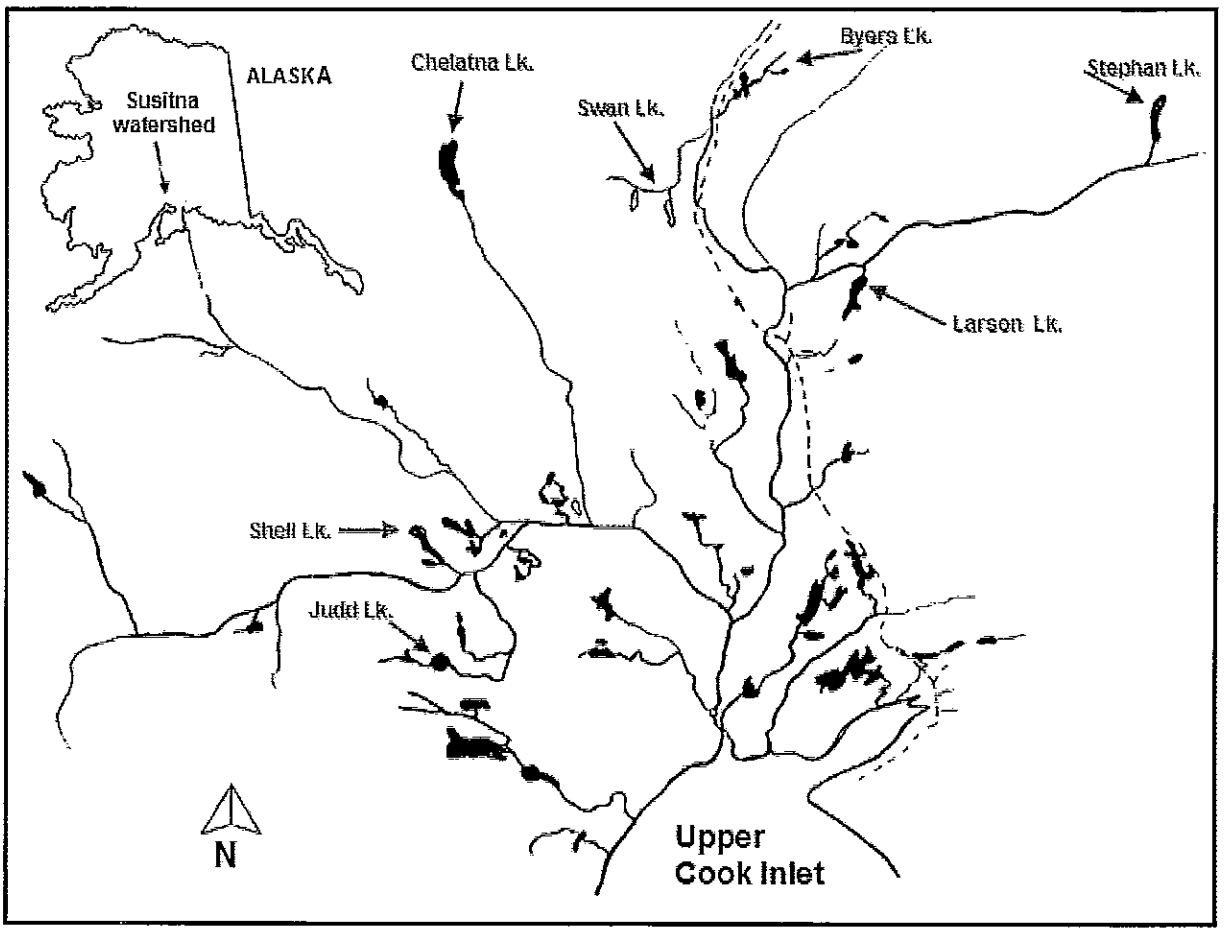


Figure 1. - Susitna River Basin and Study Lakes

# Sockeye Salmon Research and Recovery Plan

**Continuation of Existing Studies**

ADF&G has implemented a program that focuses primarily on adult fish and management's ability to enumerate the return through a mark recapture study. CIAA is conducting a complete enumeration of both juvenile and adult migrations on seven lakes thought to be key sockeye salmon producers in the system. It is this adult to juvenile relationship that allows us to analyze and evaluate production and rearing conditions of each lake in the study. In addition to collection of physical data on juvenile and adult salmon, CIAA is also collecting water quality data to better understand the entire freshwater salmon life cycle by isolating variables in the study lakes that may be limiting productivity. The goal is to collect sound biological data to provide the foundation on which decisions for management and rehabilitation strategies will be drawn.

Funding the current ongoing partnership in 2008 (FY09) between CIAA and ADF&G is the first step towards the assimilation of key data instrumental in designing future projects to mitigate sockeye salmon yield concerns in the Susitna River basin. Weirs operated over the past two years have provided accurate simple counts that complement studies by ADF&G. It is the combination of these strategies and the reliability of weir counts that focus future efforts and rehabilitation strategies that will produce results. CIAA is seeking the final installment of $150,000 in FY09 to operate the enumeration weirs and complete our initial study. For these reasons it is vital the current ongoing study be funded in full to formulate the questions at the basis of future studies.

***Current Susitna Sockeye Salmon Studies***

*Primary Objective:* To estimate abundance of sockeye salmon in seven (7) major rearing lakes in the Susitna River watershed.

*Description:* Investigation involves studies on seven lakes. Four of the lakes are along the mainstem Susitna River and Talkeetna River (Larson, Stephan, Swan and Byers Lakes); and three are on tributaries of the Yentna River (Judd, Shell, and Chelatna Lakes). Studies include enumeration of adult salmon escapement and smolt emigrations at each lake. Age, sex, weight, and length composition of smolt emigrations will be estimated at each weir from samples collected each day. Age, sex, and length composition of adult sockeye salmon escapement will be estimated at each weir from samples collected each day. Environmental conditions will also be measured each day, i.e. percent cloud cover, precipitation (nearest mm), stream and air temperature. The study includes limnological sampling (water chemistry and zooplankton) and collection of dissolved oxygen, light and temperature profiles within each lake.

**Future Studies**

CIAA and ADF&G realize current cooperative studies need to be expanded to encompass the scale and duration fisheries research demands to build accurate models and management strategies. These proposals extend the time frame of the current study and identify additional lakes and creeks where analysis is critical to understanding factors limiting production in the Susitna River basin.

CIAA supports the studies identified in ADF&G's document *Preliminary Draft of Susitna Sockeye Salmon Action Plan.* These studies document vital information needed to investigate and manage the Susitna River system but should be expanded to include additional assessment of the lake rearing systems. This information is essential to understanding factors limiting production throughout the Susitna River basin, since remedial efforts may not be effective if this remains unknown. After just two years of investigation, two such issues have surfaced - fish passage restrictions and invasive predatory pike. Addressing these issues provides proactive mitigation today. We have included two proposals in this plan to ensure adult salmon can transit their natal creeks unabated by excessive fish passage restrictions and invasive species.

***Susitna Sockeye Salmon Adult Weirs***

*Primary Objective:* To estimate abundance of sockeye salmon spawners entering fourteen (14) rearing lakes in the Susitna River watershed.

*Description:* CIAA will conduct adult salmon investigations on fourteen (14) lakes; Byers, Chelatna, Hewitt, Judd, Larson, Lockwood, Red Shirt, Shell, Spink, Stephan, Swan, Trapper, Trinity, and Whiskey. Studies include enumeration of adult sockeye salmon escapement at each lake. Age, sex, and length composition will be estimated at each weir from samples collected each day. Environmental conditions will also be measured each day, i.e. percent cloud cover, precipitation (nearest mm), stream and air temperature. The study includes limnological sampling (water chemistry and zooplankton) and collection of dissolved oxygen, light, and temperature profiles within each lake.

***Susitna Sockeye Salmon Smolt Production***

*Primary Objective:* To estimate abundance of sockeye salmon smolt emigrating from fourteen (14) rearing lakes in the Susitna River watershed.

*Description:* CIAA will conduct salmon smolt investigative studies on fourteen (14) lakes; Byers, Chelatna, Hewitt, Judd, Larson, Lockwood, Red Shirt, Shell, Spink, Stephan, Swan, Trapper, Trinity, and Whiskey. Studies include enumeration of smolt emigration at each lake. Age, sex, weight, and length composition will be estimated at each weir from samples collected each day. Environmental conditions will also be measured each day, i.e. percent cloud cover, precipitation (nearest mm), stream and air temperature. The study includes limnological sampling (water chemistry and zooplankton) and collection of dissolved oxygen, light, and temperature profiles within each lake.

***Susitna Sockeye Salmon Fish Passage Remediation***

*Primary Objective:* Identification and remediation by notching of beaver dams blocking fish passage into spawning lakes, creeks, and sloughs.

*Description:* CIAA will survey major sockeye salmon migration corridors and implement remediation strategies to enable fish passage into critical spawning locations where adult fish are failing to reach spawning grounds due to beaver dams.

***Susitna Sockeye Salmon Invasive Species Control***

*Primary Objective:* Identification of invasive species in fourteen (14) lake systems.

*Description:* CIAA will survey major sockeye salmon producing rearing lakes; Byers, Chelatna, Hewitt, Judd, Larson, Lockwood, Red Shirt, Shell, Spink, Stephan, Swan, Trapper, Trinity, and Whiskey in the Susitna River watershed for invasive northern pike and assess fish community structure. CIAA will identify predator prey relationships that may be contributing to the decline in system productivity from historical record. Alaska Dept. of Fish and Game (2007) identified 64 water bodies in the Matanuska-Susitna Borough region where invasive northern pike were either confirmed or suspected to occur. CIAA will develop control techniques to abate northern pike infestation.

***Fish Creek Sockeye Salmon Production***

*Primary Objective:* To estimate freshwater production of sockeye salmon in the Fish Creek watershed and determine limits to production.

*Description:* CIAA and ADFG will jointly estimate freshwater production of sockeye salmon in the Fish Creek watershed from potential egg deposition to smolt over five years. ADFG will conduct limnological sampling monthly from May through September each year to estimate the rearing potential of Big Lake. Hydroacoustic and townet surveys will be conducted in September to estimate abundance of sockeye salmon fry and other juvenile fishes in Big Lake. Abundance of sockeye salmon smolts emigrating from the watershed will be estimated by CIAA. Project results will be used to (1) estimate survival from potential egg deposition to smolt, (2) evaluate limits to sockeye salmon production and identify potential restoration actions, (3) help set an escapement goal, and (4) forecast adult returns.

***Synthesis & Oversight of Sockeye Salmon Lake Investigations***

*Primary Objective:* To provide training of field crews at smolt and adult weir camps, coordinate activities among projects, and synthesize results of lake investigations.

*Description:* This project will fund a seasonal ADF&G biologist to coordinate activities among sockeye salmon lake investigation projects improving efficiency and consistency of research efforts. Each smolt and adult weir field camp will be visited several times per month to provide training for field crews, data quality assurance, and other assistance where needed. After the field season, results from various lake investigations (limnology, predator-prey, fall

fry, smolt, and adult production data) will be assembled into a database and synthesized into a useful product for resource managers.

## Coho, Chum, and Chinook Salmon Projects

Projects listed here would provide information important for management of coho, chum, and Chinook salmon in the Susitna and Little Susitna rivers. Attention is focused on these watersheds because they represent the major salmon producing and recreation areas in the Matanuska-Susitna Borough. Annual costs for these projects are projected out over a five year period. A number of these projects need to be run well beyond five years in order to provide full value, while the Little Susitna chum salmon spawner distribution could be completed earlier than five years.

***Susitna River Coho and Chum Salmon Distribution***

*Primary Objective*: To estimate spawning distribution and stock composition of coho and chum salmon in the Susitna River watershed.

*Description:* Four fish wheels will be operated at Flathorn (Susitna River kilometer 31) each year to capture and apply radio tags to coho *(Oncorhynchus kisutch)* and chum (0. *keta)* salmon for the duration of the run (July through mid-September). Radio tagged salmon will be tracked using a fixed-wing aircraft multiple times throughout the season. Coho and chum salmon distribution estimates will be used to 1) better understand coho and chum salmon spawning distribution in the Susitna River watershed, and 2) evaluate stock composition of escapements throughout the Susitna watershed.

***Susitna River Chinook Salmon Distribution***

*Primary Objective:* To estimate spawning distribution and stock composition of Chinook salmon in the Susitna River watershed.

*Description:* Drift gillnets will be used at Flathorn (Susitna River kilometer 31) each year to capture and apply radio tags to Chinook salmon *(Oncorhynchus tshawytscha)* for the duration of the run (May through July). Tissue samples will also be collected for genetic baseline development. Tissue samples will also be collected for genetic baseline development. Radio tagged salmon will be tracked using a fixed-wing aircraft multiple times throughout the season. Chinook salmon distribution estimates will be used to 1) better understand Chinook salmon spawning distribution in the Susitna River watershed, and 2) evaluate stock composition of escapements throughout the Susitna watershed.

***Little Susitna River Weir Inseason Assessment***

*Primary Objective:* To count coho salmon escapement and obtain a partial count of chum salmon escapement into the Little Susitna River.

*Description:* A weir to count coho salmon currently operates on the Little Susitna River at river kilometer 115. However, weir counts at river kilometer 115 are too late for inseason

management and it is not certain what proportion of coho and chum salmon escapements spawn below river kilometer 115. The weir will be moved back to river kilometer 51 to remedy these concerns.

***Little Susitna River Chum Salmon Escapement***

*Primary Objective:* To count escapement of chum salmon in the Little Susitna River.

*Description:* A weir is currently used to count escapement of coho salmon into the Little Susitna River. But, the weir is installed in late July, which provides only a partial count of chum salmon escapement. This project would initiate weir activities on approximately July 10 to count the entire chum salmon escapement.

***Little Susitna River Chum Salmon Spawner Distribution***

*Primary Objective:* To estimate distribution of spawning chum salmon in the Little Susitna River.

*Description:* Adult chum salmon will be captured in the lower Little Susitna River and marked with a radio tag throughout the run. Mobile tracking will be done by boat and aircraft to identify and define important spawning areas.

# Budget Summary

**Table 1.** Summary of annual project budgets for Matanuska-Susitna Salmon Research Plan projects.

| PROJECT TITLE | AGENCY | FY09 | FY10 | FY11 | FY12 | FY13 | TOTAL |
|---|---|---|---|---|---|---|---|
| SUSITNA SOCKEYE SALMON ADULT WEIRS | CIAA | $422.4 | $254.6 | $254.6 | $254.6 | $254.6 | $1,441.0 |
| SUSITNA SOCKEYE SALMON SMOLT PRODUCTION | CIAA | $288.8 | $256.2 | $256.2 | $256.2 | $256.2 | $1,313.5 |
| SUSITNA SOCKEYE SALMON FISH PASSAGE REMEDIATION | CIAA | $58.3 | $58.3 | $58.3 | $58.3 | $58.3 | $291.5 |
| SUSITNA SOCKEYE SALMON INVASIVE SPECIES CONTROL | CIAA | $193.0 | $193.0 | $193.0 | $193.0 | $193.0 | $965.0 |
| FISH CREEK SOCKEYE SALMON PRODUCTION | CIAA | $20.2 | $20.2 | $20.2 | $20.2 | $20.2 | $101.0 |
| FISH CREEK SOCKEYE SALMON PRODUCTION | ADFG | $48.1 | $47.8 | $47.8 | $47.8 | $47.8 | $239.4 |
| SYNTHESIS & OVERSIGHT OF SOCKEYE SALMON LAKE INVESTIGATIONS | ADFG | $98.2 | $98.2 | $98.2 | $98.2 | $98.2 | $491.0 |
| SUSITNA RIVER COHO AND CHUM SALMON DISTRIBUTION | ADFG | $276.7 | $450.3 | $467.6 | $484.9 | $502.2 | $2,181.6 |
| SUSITNA RIVER CHINOOK SALMON DISTRIBUTION | ADFG | $273.0 | $394.1 | $409.3 | $424.4 | $439.6 | $1,940.4 |
| LITTLE SUSITNA RIVER WEIR INSEASON ASSESSMENT | ADFG | $98.0 | $51.8 | $53.3 | $54.9 | $56.6 | $314.6 |
| LITTLE SUSITNA RIVER CHUM SALMON ESCAPEMENT | ADFG | $13.2 | $13.6 | $14.0 | $14.4 | $14.9 | $70.1 |
| LITTLE SUSITNA RIVER CHUM SALMON SPAWNER DISTRIBUTION | ADFG | $126.0 | $121.3 | $124.9 | $128.7 | $0.0 | $500.9 |
| | **TOTAL** | **$1,915.9** | **$1,959.4** | **$1,997.4** | **$2,035.6** | **$1,941.7** | **$9,850.0** |

# Literature Cited

Alaska Department of Fish and Game. 2007. Management Plan for Invasive Northern Pike in Alaska. Alaska Department of Fish and Game. Alaska Department of Fish and Game, Division of Sport Fish, Anchorage. 58 pp.

# Appendices

## CURRENT SUSITNA SOCKEYE SALMON STUDIES

*Primary Objective*: To estimate abundance of sockeye salmon in seven (7) major rearing lakes in the Susitna River watershed.

*Description*: Investigation involves studies on seven lakes. Four of the lakes are along the mainstem Susitna River and Talkeetna River (Larson, Stephan, Swan and Byers Lakes); and three are on tributaries of the Yentna River (Judd, Shell, and Chelatna Lakes). Studies include the enumeration of adult salmon escapement and smolt emigrations at each lake. Age, sex, weight, and length composition of smolt emigrations will be estimated at each weir from samples collected each day. Age, sex, and length composition of adult sockeye salmon escapement will be estimated at each weir from samples collected each day. Environmental conditions will also be measured each day, i.e. percent cloud cover, precipitation (nearest mm), stream and air temperature. The study includes limnological sampling (water chemistry and zooplankton) and collection of dissolved oxygen, light and temperature profiles within each lake.

*Duration*: One Year

*Budget Summary*: Total cost of the CIAA component of the current ongoing study is budgeted at $750,000. In 2006 CIAA requested $500,000, a two-to-one match for our commitment of $250,000 to be used over the three year study to make this joint effort possible. In 2006 CIAA received $200,000 of the CIP funding request, in 2007 CIAA received $150,000. CIAA is asking for the allocation of the **remaining $150,000** in funding to match our commitment to the current ongoing Susitna River sockeye salmon study.

## SUSITNA SOCKEYE SALMON ADULT WEIRS

*Primary Objective*: To estimate abundance of sockeye salmon spawners entering fourteen (14) rearing lakes in the Susitna River watershed.

*Description*: CIAA will conduct adult salmon investigative studies on fourteen (14) lakes; Byers, Chelatna, Hewitt, Judd, Larson, Lockwood, Red Shirt, Shell, Spink, Stephan, Swan, Trapper, Trinity, and Whiskey. Studies include enumeration of adult sockeye salmon escapement at each lake. Age, sex, and length composition will be estimated at each weir from samples collected each day. Environmental conditions will also be measured each day, i.e. percent cloud cover, precipitation (nearest mm), stream and air temperature. The study includes limnological sampling (water chemistry and zooplankton) and collection of dissolved oxygen, light, and temperature profiles within each lake.

*Duration*: Five Years

*CIAA Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $134.1 | $115.0 | $115.0 | $115.0 | $115.0 | $593.9 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $119.7 | $104.3 | $104.3 | $104.3 | $104.3 | $536.9 |
| 400 Supplies | $168.7 | $35.4 | $35.4 | $35.4 | $35.4 | $310.1 |
| 500 Equipment | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Total Direct Costs | $422.4 | $254.6 | $254.6 | $254.6 | $254.6 | $1,441.0 |

## SUSITNA SOCKEYE SALMON SMOLT PRODUCTION

*Primary Objective*: To estimate abundance of sockeye salmon smolt emigrating from fourteen (14) rearing lakes in the Susitna River watershed.

*Description*: CIAA will conduct salmon smolt investigative studies on fourteen (14) lakes; Byers, Chelatna, Hewitt, Judd, Larson, Lockwood, Red Shirt, Shell, Spink, Stephan, Swan, Trapper, Trinity, and Whiskey. Studies include enumeration of smolt emigration at each lake. Age, sex, weight, and length composition will be estimated at each weir from samples collected each day. Environmental conditions will also be measured each day, i.e. percent cloud cover, precipitation (nearest mm), stream and air temperature. The study includes limnological sampling (water chemistry and zooplankton) and collection of dissolved oxygen, light, and temperature profiles within each lake.

*Duration*: Five Years

*CIAA Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $128.0 | $115.0 | $115.0 | $115.0 | $115.0 | $588.1 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $104.3 | $104.3 | $104.3 | $104.3 | $104.3 | $521.5 |
| 400 Supplies | $56.5 | $36.8 | $36.8 | $36.8 | $36.8 | $203.9 |
| 500 Equipment | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Total Direct Costs | $288.8 | $256.2 | $256.2 | $256.2 | $256.2 | $1,313.5 |

## SUSITNA SOCKEYE SALMON FISH PASSAGE REMEDIATION

*Primary Objective*: Identification and remediation (notching) of beaver dams blocking fish passage into spawning lakes, creeks, and slews.

*Description*: CIAA will survey major sockeye salmon migration corridors and implement remediation strategies to enable fish passage into critical spawning habitats where adult fish are failing to reach spawning grounds due to beaver dams.

*Duration*: Five Years

*CIAA Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $14.7 | $14.7 | $14.7 | $14.7 | $14.7 | $73.3 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $40.0 | $40.0 | $40.0 | $40.0 | $40.0 | $200.0 |
| 400 Supplies | $3.7 | $3.7 | $3.7 | $3.7 | $3.7 | $18.3 |
| 500 Equipment | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Total Direct Costs | $58.3 | $58.3 | $58.3 | $58.3 | $58.3 | $291.5 |

## SUSITNA SOCKEYE SALMON INVASIVE SPECIES CONTROL

*Primary Objective*: Assess impacts of invasive species on sockeye salmon production in fourteen (14) lake systems.

*Description*: CIAA will survey major sockeye salmon rearing lakes (Byers, Chelatna, Hewitt, Judd, Larson, Lockwood, Red Shirt, Shell, Spink, Stephan, Swan, Trapper, Trinity, and Whiskey) in the Susitna River watershed to assess invasive northern pike populations and fish community structure. CIAA will identify predator-prey relationships that may be contributing to decline in sockeye salmon productivity. CIAA will investigate control techniques to reduce northern pike abundance. A blue-ribbon panel will be assembled to develop a detailed research plan for these investigations.

*Duration*: Five Years

*CIAA Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $40.3 | $40.3 | $40.3 | $40.3 | $40.3 | $201.3 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $110.0 | $110.0 | $110.0 | $110.0 | $110.0 | $550.0 |
| 400 Supplies | $42.8 | $42.8 | $42.8 | $42.8 | $42.8 | $213.8 |
| 500 Equipment | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Total Direct Costs | $193.0 | $193.0 | $193.0 | $193.0 | $193.0 | $965.0 |

## FISH CREEK SOCKEYE SALMON PRODUCTION

*Primary Objective:* To estimate freshwater production of sockeye salmon in the Fish Creek watershed and determine limits to production.

*Description:* CIAA and ADFG will jointly estimate freshwater production of sockeye salmon in the Fish Creek watershed from potential egg deposition to smolt over a five year period. An adult weir, currently operated by ADF&G on Fish Creek, will provide estimates of spawner abundance, as well as, age, sex, and length composition of escapement. Otoliths will be collected from escapement to estimate hatchery contribution. ADF&G will conduct limnological sampling monthly from May through September each year to estimate rearing potential of Big Lake. Measured parameters will include water temperature, dissolved oxygen, light penetration, phytoplankton and zooplankton density and species composition. ADF&G will conduct hydroacoustic and tow net surveys in September to estimate abundance of sockeye salmon fry and other juvenile fishes in Big Lake. Tow netting with a mid-water trawl will be conducted in conjunction with acoustic surveys at night to estimate species composition of ensonified targets, mean size of each species of juvenile fish and age composition of juvenile sockeye salmon in the lake. Abundance of sockeye salmon smolts emigrating from the watershed will be estimated by CIAA using a fyke net. All smolts will be directed into the live box by wings extending from the shoreline to the front of the fyke trap providing a total smolt enumeration. Otoliths will be collected from a sample of fall fry and smolts to estimate hatchery contribution. Fall fry and smolt samples will be analyzed at the ADF&G Pathology Laboratory to estimate incidence of disease and parasites in juveniles. Fall fry samples will also be analyzed to estimate occurrence of enzymes produced when fish are exposed to hydrocarbons. Project results will be used to (1) estimate survival from potential egg deposition to smolt, (2) evaluate limits to sockeye salmon production and identify potential restoration actions, (3) help set an escapement goal, and (4) forecast adult returns.

*Duration*: Five Years

*CIAA Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $16.0 | $16.0 | $16.0 | $16.0 | $16.0 | $80.0 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $1.2 | $1.2 | $1.2 | $1.2 | $1.2 | $6.0 |
| 400 Supplies | $3.0 | $3.0 | $3.0 | $3.0 | $3.0 | $15.0 |
| 500 Equipment | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Total Direct Costs | $20.2 | $20.2 | $20.2 | $20.2 | $20.2 | $101.0 |

## FISH CREEK SOCKEYE SALMON PRODUCTION, (continued).

*ADFG Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $13.3 | $13.3 | $13.3 | $13.3 | $13.3 | $66.7 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $33.2 | $33.2 | $33.2 | $33.2 | $33.2 | $166.1 |
| 400 Supplies | $1.6 | $1.3 | $1.3 | $1.3 | $1.3 | $6.6 |
| 500 Equipment | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Total Direct Costs | $48.1 | $47.8 | $47.8 | $47.8 | $47.8 | $239.4 |

*Project Total Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $29.3 | $29.3 | $29.3 | $29.3 | $29.3 | $146.7 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $34.4 | $34.4 | $34.4 | $34.4 | $34.4 | $172.1 |
| 400 Supplies | $4.6 | $4.3 | $4.3 | $4.3 | $4.3 | $21.6 |
| 500 Equipment | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Total Direct Costs | $68.3 | $68.0 | $68.0 | $68.0 | $68.0 | $340.4 |

## SYNTHESIS and OVERSIGHT of SOCKEYE SALMON LAKE INVESTIGATIONS

*Primary Objective:* To provide training of field crews at smolt and adult weir camps, coordinate activities among projects, and synthesize results of lake investigations.

*Description:* This project will fund a seasonal ADF&G biologist to coordinate activities among sockeye salmon lake investigation projects improving efficiency and consistency of research efforts. Each smolt and adult weir field camp will be visited several times per month to provide training for field crews, data quality assurance, and other assistance where needed. After the field season, results from various lake investigations (limnology, predator-prey, fall fry, smolt, and adult production data) will be assembled into a database and synthesized into a useful product for resource managers.

*Duration*: Five Years

*ADFG Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $31.0 | $31.0 | $31.0 | $31.0 | $31.0 | $155.0 |
| 200 Travel | $2.4 | $2.4 | $2.4 | $2.4 | $2.4 | $12.0 |
| 300 Contractual | $62.0 | $62.0 | $62.0 | $62.0 | $62.0 | $310.0 |
| 400 Supplies | $2.8 | $2.8 | $2.8 | $2.8 | $2.8 | $14.0 |
| 500 Equipment | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Total Direct Costs | $98.2 | $98.2 | $98.2 | $98.2 | $98.2 | $491.0 |

## SUSITNA RIVER COHO AND CHUM SALMON DISTRIBUTION

*Primary Objective:* To estimate spawning distribution and stock composition of coho and chum salmon in the Susitna River watershed.

*Description:* Four fish wheels will be operated at Flathorn (Susitna River kilometer 31) each year to capture and apply radio tags to coho *(Oncorhynchus kisutch)* and chum (0. *keta)* salmon. Salmon will be captured and tagged throughout the day for the duration of the run (July through mid-September) to account for differential migration timing. Tags will be deployed based on individual fish wheel catch rates to account for differential catchability. Age, sex, and length composition of adult coho and chum salmon escapement will be estimated from samples collected each day. Tissue samples will also be collected for genetic baseline development. Radio tagged salmon will be tracked using a fixed-wing aircraft multiple times throughout the season. Coho and chum salmon distribution estimates will be used to 1) better understand coho and chum salmon spawning distribution in the Susitna River watershed, and 2) evaluate stock composition of escapements throughout the Susitna watershed.

*Duration*: Five Years

*ADFG Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $66.5 | $230.6 | $239.4 | $248.3 | $257.2 | $1,042.0 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $0.0 | $47.0 | $48.8 | $50.6 | $52.4 | $198.9 |
| 400 Supplies | $174.2 | $172.7 | $179.3 | $186.0 | $192.6 | $904.8 |
| 500 Equipment | $36.0 | $0.0 | $0.0 | $0.0 | $0.0 | $36.0 |
| Total Direct Costs | $276.7 | $450.3 | $467.6 | $484.9 | $502.2 | $2,181.6 |

## SUSITNA RIVER CHINOOK SALMON DISTRIBUTION

*Primary Objective:* To estimate spawning distribution and stock composition of Chinook salmon in the Susitna River watershed.

*Description:* Drift gillnets will be used at Flathorn (Susitna River kilometer 31) each year to capture and apply radio tags to Chinook salmon *(Oncorhynchus tshawytscha).* Chinook salmon will be captured and tagged for the duration of the run (May through July) to account for differential migration timing. Tags will be deployed based on relative abundance among channels and fishing sites to account for differential catchability. Age, sex, and length composition of adult Chinook salmon escapement will be estimated from samples collected each day. Tissue samples will also be collected for genetic baseline development. Radio tagged salmon will be tracked using a fixed-wing aircraft multiple times throughout the season. Chinook salmon distribution estimates will be used to 1) better understand Chinook salmon spawning distribution in the Susitna River watershed, and 2) evaluate stock composition of escapements throughout the Susitna watershed.

*Duration*: Five Years

*ADFG Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $105.7 | $230.6 | $239.5 | $248.3 | $257.2 | $1,081.3 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $2.0 | $47.0 | $48.8 | $50.6 | $52.4 | $200.8 |
| 400 Supplies | $129.3 | $116.5 | $121.0 | $125.5 | $130.0 | $622.3 |
| 500 Equipment | $36.0 | $0.0 | $0.0 | $0.0 | $0.0 | $36.0 |
| Total Direct Costs | $273.0 | $394.1 | $409.3 | $424.4 | $439.6 | $1,940.4 |

## LITTLE SUSITNA RIVER WEIR INSEASON ASSESSMENT

*Primary Objective:* To count coho salmon escapement and obtain a partial count of chum salmon escapement into the Little Susitna River.

*Description:* A weir to count coho salmon currently operates on the Little Susitna River at river kilometer 115. The weir is too far upstream to provide data for inseason assessment of run strength. Previously, the weir was operated at river kilometer 51 but was moved to river kilometer 115 at the public's request. However, weir counts at river kilometer 115 are too late for in season management and it is not certain what proportion of coho and chum salmon escapements spawn below river kilometer 115. The weir will be moved back to river kilometer 51 to remedy these concerns. Change in location will require a wider weir (spanning larger stream channel) and a remote field camp. Additional staffing will be required to accommodate the heavy boat traffic at river kilometer 51. The table below shows only the additional funds needed to operate the weir at river kilometer 51, the balance will be derived using existing project funds currently expended at the existing river kilometer 115 site.

*Duration*: Five Years

*ADFG Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $69.9 | $44.4 | $45.7 | $47.1 | $48.5 | $255.6 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $1.7 | $1.8 | $1.8 | $1.8 | $1.9 | $9.0 |
| 400 Supplies | $18.4 | $5.6 | $5.8 | $6.0 | $6.2 | $42.0 |
| 500 Equipment | $8.0 | $0.0 | $0.0 | $0.0 | $0.0 | $8.0 |
| Total Direct Costs | $98.0 | $51.8 | $53.3 | $54.9 | $56.6 | $314.6 |

## LITTLE SUSITNA CHUM SALMON ESCAPEMENT

*Primary Objective:* To count escapement of chum salmon in the Little Susitna River.

*Description:* Total escapement of chum salmon into the Little Susitna River is currently not assessed. A weir used to count escapement of coho salmon into the Little Susitna River is installed in late July, which provides only a partial count of chum salmon escapement. This project would initiate weir activities on approximately July 10 to count the entire chum salmon escapement. Age, sex, and length data will also be collected from chum salmon. The table below depicts funds necessary to extend the duration of the existing counting weir.

*Duration*: Five Years

*ADFG Budget*:

| Line Item | **FY09** | **FY10** | **FY11** | **FY12** | **FY13** | **Total** |
|---|---|---|---|---|---|---|
| 100 Personnel | $9.4 | $9.7 | $10.0 | $10.3 | $10.6 | $50.0 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $2.7 | $2.8 | $5.5 |
| 300 Contractual | $2.5 | $2.6 | $2.6 | $0.0 | $0.0 | $7.7 |
| 400 Supplies | $1.3 | $1.3 | $1.4 | $1.4 | $1.5 | $6.9 |
| 500 Equipment | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Total Direct Costs | $13.2 | $13.6 | $14.0 | $14.4 | $14.9 | $70.1 |

## LITTLE SUSITNA RIVER CHUM SALMON SPAWNER DISTRIBUTION

*Primary Objective:* To estimate distribution of spawning chum salmon in the Little Susitna River.

*Description:* Distribution and location of spawning habitat for chum salmon in the Little Susitna River is not well documented. To better understand where chum salmon spawn, adult chum salmon will be captured in the lower Little Susitna River and marked with a radio tag. Tagged fish will be monitored throughout the spawning season. Mobile tracking will be done by boat and aircraft to identify and define important spawning areas. Two stationary monitoring sites, one each at river kilometer 51 and 115, would provide distribution of spawners relative to these locations. These locations are the former and current locations, respectively, of a weir used to assess coho salmon and partial assessment of chum salmon escapement.

*Duration*: Four Years

*ADFG Budget*:

| Line Item | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|---|---|---|---|---|---|---|
| 100 Personnel | $60.3 | $91.6 | $94.4 | $97.2 | $0.0 | $343.5 |
| 200 Travel | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| 300 Contractual | $3.0 | $3.4 | $3.5 | $3.6 | $0.0 | $13.5 |
| 400 Supplies | $31.7 | $26.3 | $27.0 | $27.9 | $0.0 | $112.9 |
| 500 Equipment | $31.0 | $0.0 | $0.0 | $0.0 | $0.0 | $31.0 |
| Total Direct Costs | $126.0 | $121.3 | $124.9 | $128.7 | $0.0 | $500.9 |