Alaska Clean Water Actions Grant Application for:

Little Susitna Hydrocarbon Evaluation

SCORE:

Tracking Number:	2011ACWA0013	**Facility:**	Little Susitna Hydrocarbon Evaluation
Submitted:	2/19/2010 11:10:19 AM	**Date Added:**	1/26/2010 7:22:48 PM

ACWA Priorities

Specific Waterbody(ies)	Yes
ACWA priority waterbody?	Yes
Waterbody Name	Little Susitna River
Specific Area	Lower River
Specific ACWA action(s)	Action b. Water quality monitoring for TAH in lower river segment.
	Action d. Turbidity monitoring in the lower Little Susitna River.
Description	
Non-Waterbody Specific ACWA Priority	
Applicable Stewardship Priorities	

Project Information

Project Title	Little Susitna Hydrocarbon Evaluation
Funds Requested	$75,428
Non-Federal Matching Funds	$72,988
Total Project Cost	$148,416
Type of ACWA Project:	
2nd Year Funds Requested:	
2nd Year Non-Federal Matching Funds Requested:	
2nd Year Total Project Cost:	
Two-Year Project:	No

Applicant Information

Name of Organization	Aquatic Restoration and Research Institute
Type of Organization	Non-Profit Organization
Address 1	P.O. Box 923
Address 2	
City	Talkeetna
State	Alaska
Zip	99676
Project Contact	Jeffrey C. Davis
Title	President
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IRS ID# or Non-Profit #	

Project Descriptions

Project Summary:

Located in the Matanuska-Susitna Borough (MSB), the Little Susitna River is an important recreational river. One of the primary recreational uses is the salmon sport fishery, which is open in the lower reach of the river from Houston, on the Parks Highway, to Cook Inlet. The intensive use of the lower river has resulted in changes in total aromatic hydrocarbon concentrations and turbidity. Previous hydrocarbon and turbidity sampling has documented values above water quality standards, and data have demonstrated a correlation with lower river boat use. However, the spatial and temporal variability in hydrocarbon and suspended sediment concentrations, the influence of boat motor type and operation on changes in water quality, and the effects to river productivity and biotic communities are not fully understood. This information is necessary to determine the spatial extent and duration of water quality exceedances, evaluating the significance of reduced water quality to ecosystem production and recreation, and identifying management options. Project objectives for FY11 were developed to address ACWA objectives and include (1) further quantifying the spatial and temporal distribution of total aromatic hydrocarbon (TAH) concentrations adjacent to the Public Use Facility (PUF) and determine the relationship between 2-stroke motor use, stream flow, and TAH concentrations; (2) measure stream water turbidity from grab samples and continuous loggers and determine the relationship between turbidity and boat use; (3) measure the effects of water quality on the biotic community; and (4) continue measures of basic water chemical and physical data including water temperature, pH, specific conductivity, and dissolved oxygen.

Problem/Need Statement:

The Little Susitna River is managed under the Susitna Area Recreational Rivers Management Plan. The river supports a highly popular salmon and trout fishery. The lower river is a popular recreational area for motorized and non-motorized boating, camping and sport fishing. Initial studies have determined that the intensive recreational use of the lower river near the PUF have resulted in increasing concentrations of water column total aromatic hydrocarbons and suspended sediment that periodically exceed state water quality standards. ACWA priority actions are to continue monitoring turbidity, water column TAH, boat use patterns, and the aquatic community. These actions are necessary to determine spatial and temporal variability in TAH and turbidity, evaluate whether initial findings are consistent, monitor changes in water quality relative to changing use patterns or management, and to assess potential impacts.

Initial evaluation of Little Susitna River hydrocarbon concentrations and other water quality parameters began in FY08 with water sample collection above and below access points near Houston and the PUF. Concentrations of hydrocarbons exceeded state water quality standards at sites above and below the PUF. Therefore, the number of sampling locations and frequency were increased to provide more information on the duration and spatial extent of hydrocarbon contamination. Weekly TAH and turbidity sampling at sites from 1 km upstream to 4 km downstream from the PUF was continued through July and September of 2008 and in May and June of 2009 (FY09). These same sampling locations and sampling frequency were extended into the fall of 2009 and are scheduled to continue into the spring of 2010 (FY10). Water sampling for hydrocarbon analyses was accompanied by surveys of boat use at the launch and at the entry booth. Grab samples for turbidity were augmented with hourly turbidity measures obtained from data loggers.

TAH concentrations and turbidity exceed state water quality standards during intensive use accompanied by low flows. Flow-corrected TAH concentrations are correlated with 2-cycle boat motor use recorded during the sampling period. Turbidity increased from 5 to 30 NTU compared to background values during intensive use. Juvenile salmon catch rates were significantly higher upstream compared to catch rates within concentrated use areas.

Review of the existing data by the Directorâs of the state resource agencies has lead to the conclusion that even though data collected to date has recorded periods when hydrocarbon concentration exceed water quality standards, additional data collection is necessary prior to listing the waters as impaired. Further data will help determine whether exceedances are persistent, and the spatial extent. Additional TAH and boat use evaluation in FY11 will build upon the current ACWA funded project to provide consistent measures throughout the summer season, which also will allow for further evaluations of initial relationships observed between 2-cycle motors and concentrations. Frequent sampling in a 24-hour period and at increasing distances upstream and downstream during heavy use periods can be used to determine the extent and duration of exceedances as hydrocarbons are transported downstream and evaporate from the water surface. Similarly, continued FY11 turbidity sampling will provide a full season of water quality and boat use data. Additional information will be collected in order to confirm background concentrations. Biotic measures will build upon previous data collection and provide a measure of potential impacts from water quality exceedances and a tool to evaluate system recovery.

Project Description:

Project objectives for FY11 were developed to address ACWA objectives and include (1) quantifying the spatial and temporal distribution of TAH concentrations adjacent to the PUF and determine the relationship between boat motor use, stream flow, and TAH concentrations; (2) measure stream water turbidity from grab samples and continuous loggers and determine the relationship between turbidity and boat use: (3) measure the effects of water quality on the biotic community; and (4) continue measures of basic water chemical and physical data including water temperature, pH, specific conductivity, and dissolved oxygen.

Fall 2010 sampling for TAH will maintain continuity with spring sampling while including some sampling locations upstream and downstream to define the longitudinal extent of exceedances. Sampling will be conducted for four weeks during the August coho fishery. The sampling objectives following the 2010 field season will shift from defining the spatial and temporal extent of exceedances to monitoring changes in concentrations. The sampling design during the spring of 2011 will be conducted to monitor hydrocarbon concentrations at key locations during periods of heavy use. Fall 2010 sampling will include an intensive sampling event. During heaviest use periods of the coho fishery, water samples will be collected at 3-hour intervals from 06:00 until 21:00 Sunday and Monday, and from 06:00 to 15:00 on Tuesday at the sampling location downstream from the boat launch. Discharge will be measured on each sampling date.

We will conduct boat use surveys and Alaska State Parks will continue to collect information on motor size and type at the entry booth. Boat use observations and surveys will begin approximately 1 hour prior to initiating sampling and continue until sampling is complete. Observers will record information on all boats using the launch or passing through the launch area. Observers will record the boat motor type (2-stroke, 2-stroke direct injection, 4-stroke, or inboard) and motor size for outboard motors. Observers will record boat operation time within the launch area and the direction of travel. The water sampling crew also will record the location of all stationary boats and the observation location and direction of travel of other boats observed.

Stream water turbidity, dissolved oxygen, and water temperature will be recorded hourly with HACH mini-sondes deployed at two or more sampling stations downstream from the PUF and at a reference site located upstream of concentrated boat use. The data recorders will be deployed from July through September of 2010 and mid May through June of 2011. Grab samples will be collected concurrently, analyzed for turbidity, and will include samples collected at a cross-section to document lateral variability. Stream water pH and specific conductivity will be measured concurrently at the furthest upstream and downstream sampling locations. Measures of the macroinvertebrate and juvenile fish community will be used to assess potential biotic responses to water quality changes. These measures will be compatible with, and augment, previous studies.

Project Workplan

Objectives:

Objective 1: Quantify the spatial and temporal distribution of TAH concentrations adjacent to the public use facility and determine the relationship between 2-stroke motor use, stream flow, and TAH concentrations.

Task 1: QAPP and Sampling Plan Approval
a. Start and end date: July 1 to July 31, 2010.

b. Description: The ARRI project manager will modify the existing approved Quality Assurance Project Plan and Sampling Plan for ADEC review and approval. Previously approved QAPP and Sampling Plan will be modified for the specific project tasks. These documents will describe in detail the frequency, duration, and location of all proposed sampling, including those listed under separate objectives. They will identify the equipment that will be used and how the equipment will be calibrated and maintained. It will describe the analytical methods that will be used and who will be handling and analyzing the water samples. The methods that will be used to determine data accuracy, precision, and completeness will be outlined. Data handling, management and reporting will be described. It will detail the responsibilities of all staff members and contractors and who will be responsible for each phase of the project. A draft QAPP and Sampling Plan will be completed within 3 days of receiving ADEC authorization to work. The project manager will coordinate with the ADEC project manager to address any inadequacies in the documents. ARRI will focus on completing this task as soon as possible.

c. Product or deliverable: ADEC approved QAPP and Sampling Plan.

d. Budget: Total cost for this task is estimated at $2,346. Budget includes personnel time modifications to the QAPP and sampling plan and printing of draft and final documents.
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e. Need for Continued Funding: None

The budget here should break down grant vs match funds. These values carryover to the Budget sections with the required details.

Task 2: TAH Sampling and Analyses

a. Start and end date: July 2010 through June 2011.
b. Description:
During the fall coho fishery, water samples for TAH analyses will be collected at locations above and below the PUF during peak use times that coincide with the fall coho salmon fisheries. Fall sampling will be conducted for four weeks through August. Samples will be collected weekly on weekends, with more frequent sampling to coincide with peak use. Sampling locations will be at 8.0, 4.0, and 1.0 km upstream of the PUF; at the PUF, and 4.0 km, 8.0 km, and 16 km downstream. Sampling will occur from approximately 13:00 to 16:00 during the most active time at the launch. During peak use, intensive sampling events will occur every three hours from 06:00 to 21:00 on Sunday and Monday, and 06:00 to 15:00 on Tuesday, at the PUF. Water samples will be collected in containers provided by a commercial laboratory. Spring of 2011 sampling will be modified to initiate hydrocarbon monitoring. Sampling will be conducted on weekends at the PUF for 4 weeks in June. Samples will be collected at 09:00, 12:00, 15:00, and 18:00. We will use the sampler and methods developed by the U.S.G.S. Samples will be preserved and shipped immediately to the laboratory for analyses. One duplicate sample and one field blank will be collected and submitted on each sampling date. A portion of each sample will be held by the laboratory for repeat analyses, if necessary. The laboratory will use EPA method 624 or as directed by ADEC. The exact methodology will be described in detail within the QAPP and approved by ADEC prior to beginning sample collection.

Resulting TAH concentrations will be standardized by changes in discharge.

c. Product or deliverable: Concentration of TAH and BETX during heavy use times at multiple locations surrounding the PUF. Data will be presented within the draft and final reports or as requested by the ADEC project manager.
d. Budget: Total cost for this task is $45,663. Budget items for this task include vehicle and boat costs for accessing the sampling sites, personnel time, sample shipping, and analytical costs. Contractual costs are $7,560. Travel is estimated at $3,700. Personal Services are estimated at $32,288.

Task 3: Boat Use Surveys
a. Start and end date: July 2010 through June 2011.
b. Description:
The most likely source of hydrocarbons to the Little Susitna River will be quantified along with stream flow dilution. On each sampling date an observer will record all boat use at the launch. The observer will record the time that each boat enters or leaves the water at the launch or passes through the launch area. The observer will record the motor type (2-stroke, 2-stroke direct injection, 4-stroke, inboard) and motor size. Observers will obtain information from boat owners when necessary. The observer will note the duration of time the motor is running while in the launch area and the direction of travel. Additional information on boat operation time, distance traveled, and the amount of fuel used will be obtained from willing operators. Boat use surveys will begin approximately 1 hour prior to hydrocarbon sampling and continue throughout the sampling period. In addition, the hydrocarbon sampling crew will note the number of boats, engine type, size, boat location or direction of travel for all boats encountered during sampling.

Daily boat use data also will be collected by State Park staff at the launch entry booth. Staff will record boat size, motor type (2-stroke or 4-stroke), and motor size when collecting launch fees. Copies of daily data sheets will be provided to ARRI at the end of the season.

c. Product or deliverable: Relative number and use of 2-cycle motors and measures of discharge. Model of hydrocarbon inputs and a comparison with analytical measures. Data will be presented in the draft and final reports or as directed by the ADEC project manager.

d. Budget: Total cost for this task is $27,415. Costs for this task include personnel services including State Park staff time, some transportation costs for boat access and use of velocity meters and other related supplies. Personal services are estimated at $27,000.

f. Need for future funding: None

Objective 2: Quantify changes in turbidity and determine if there are differences in the abundance of prey items or the catch rate of juvenile salmonids during active use locations and times.

Task 4. Quantify changes in Turbidity
a. Start and end date: July 2010 through June 2011.

b. Description:
Turbidity within the Little Susitna River will be measured at two locations below the PUF and at an upstream reference site. Turbidity will be recorded hourly using HACH mini-sondes. Turbidity also will be measured from grab samples collected at times and locations concurrent with TAH sampling. Water samples will also be

collected on each sampling date across the stream channel to determine lateral variability. The turbidity probe on the sondes will be calibrated with commercial standards prior to deployment. Sondes will be located approximately 4 and 8 km downstream from the boat launch, and at an upstream reference location. The upstream reference site will be placed well above all potential boat traffic. Sondes will be deployed in early July of 2010 and removed prior to freeze up in late September. Sondes would be deployed again from May through June of 2011. Three grab samples will be collected at each sampling location and on each sampling date and analyzed for turbidity on site. The resulting turbidity value will be the average of these three samples. Samples collected for stream background concentrations will be collected upstream near Houston. Lateral variability will be determined from approximately 5 samples collected across the channel.

c. Product or deliverables: Stream water turbidity comparing reference and potentially impacted stream reaches.

d. Budget: Total cost for this task is $24,805. This includes personal services at $3,750. The other major cost is the use of Mini-sondes for continuous turbidity. The HACH Environmental rental rate for these meters is $6,775 per season and this value is used to calculate match funds for three meters at $20,325.

f. Need for future funding: None

Task 5: Evaluate the Abundance of Prey and Juvenile Salmonids

a. Start and end date: July, 2010 to June 2011.
b. Description: Sampling will be conducted to evaluate the relative catch rate of juvenile salmon and prey items in drift. Sampling will be conducted during peak boat use during the coho (fall 2010) and Chinook (spring 2011) sport fisheries at sampling locations above and within peak use areas. Juvenile salmon will be captured in baited minnow traps at three locations above and three locations within peak use areas. Ten traps will be placed on outside bends within areas of similar depth, velocity, and cover. Traps will be removed after 12 to 24 -hour soak time. All captured fish will be counted, identified, and measured. Fish will be observed for DELT (Deformities, Eroded fins, Lesions, or Tumors) anomalies per U.S.G.S. methodology.

Macroinvertebrate drift is a measure of the relative food available for juvenile fish. Stream macro-invertebrates will be collected from drift nets placed at three locations above and within peak use areas. Drift nets will be placed just below the water surface. Nets will be left in place until the nets are full. Water velocity will be measured at the net opening at placement and prior to removal in order to calculate the total volume of filtered water. Samples will be combined for a composite for each site. All invertebrates within the sample will be identified to the lowest possible taxonomic level.

c. Product or deliverable: The resulting data will be provided within the final report. Results will determine differences in biotic parameters between sites that have heavy boat use and adjacent reference sites.

d. Budget: Total cost for this task is $19,167. This includes $16,200 in personal services including invertebrate sample identification, $1,420 in travel for boats and vehicles.

f. Need for further funding: None

Objective 3. Obtain baseline measures of discharge water chemistry and temperature.

Task 6. Measure basic water chemistry and temperature.
a. Start and end date: July 2010 through June 2011.

b. Description:
Water samples will be analyzed for pH and specific conductivity concurrent with TAH sampling. Stream water temperature and dissolved oxygen will be measured hourly by the HACH mini-sondes. Stream water pH, specific conductivity, and temperature will be measured in situ using a YSI hand-held meter and probe. Meters will be checked for accuracy prior to each sampling event and calibrated using commercial standards when necessary. More details on sampling methods, sample locations, sample frequency and sample analyses will be provided within the QAPP and adjusted as directed by the ADEC project manager.

Discharge will be measured upstream of the boat launch near My Creek. Water depth and velocity will be measured using a Swoffer velocity meter and top-set rod. The velocity meter will be checked for accuracy prior to each sampling event and calibrated when necessary.

c. Product or deliverable: Basic water chemistry and temperature data at multiple locations near the PUF. Data will be presented in draft and final reports.

d. Budget: Total cost for this task is $850. Personal services are $0 as samples will be collected concurrent with hydrocarbon sampling; $700 for use of velocity, turbidity, pH and conductivity meters.

e. Need for further funding:

Task 7: Data Formatting for STORET, Draft and Final Reports
a. Start and end date: October 1, 2010 through June 30, 2011.

b. Description: Sampling locations, dates, methods, and resulting measurement values will be formatted for uploading into the STORET database. ARRI staff will attend training provided by ADEC on STORET formatting. Data will either be transferred to ADEC or uploaded by ARRI staff.

Draft and final written reports will be prepared. The final report will provide background information and describe the project need, objectives, and the approach that was taken to meet the objectives. Field methods will be described and the project QAPP and sampling plan will be attached. All of the data results will be presented and described relative to the project objectives. We will make recommendations on further data collection, if necessary.

TAH concentrations from all sampling dates will be compared with previous results and with state Water Quality Standards. Changes in TAH concentrations will be compared with boat use data to evaluate potential correlations with the numbers and duration of boats operating prior to and during sampling events and as recorded at the entrance booth. Results of intensive sampling events will allow for more accurate comparisons using the change in concentration every three hours and boat use by motor type. Intensive sampling also will allow for the calculation of the rate at which hydrocarbons are removed from the system due to longitudinal transport and evaporation.

c. Product or deliverable: The draft report will be submitted to the ADEC project manager by the end of the 3rd Quarter. Comments on the draft document will be incorporated and a final document submitted prior to the end of July 2011, or as requested by the ADEC project manager.

d. Budget: Total costs for this task are $22,836. Budget items for this task include personal services at $22,350 and printing costs.

Organizational Experience

Organization and Project Manager Experience:

The Aquatic Restoration and Research Institute (ARRI) is incorporated as a non-profit corporation within the State of Alaska and recognized as a non-profit under section 501(c)(3) of the Internal Revenue Service code. ARRI is a licensed business within Alaska and the Matanuska-Susitna Borough. The ARRI is bonded and insured. ARRI is a small corporation with 10 employees. ARRIôs professional staff includes Aquatic Ecologists, Environmental Scientists, Fishery Biologists, and Field Technicians. ARRI works with Universities, employing graduate students in stream or fish ecology, and providing these students with additional financial support and the use of equipment and facilities. Student interns, that are recent college graduates, are used to fill any additional field technician positions.

ARRI was formed to:

ñConduct scientific research of aquatic ecosystems and conduct aquatic ecosystem restoration, and disseminate information on aquatic ecosystems and aquatic ecosystem restoration equally to the public, government agencies, and non-government organizations through publications, seminars, lectures, demonstration projects and any other means.ò

The objective of the organization is to provide information to Government Agencies, NGOs, and the public to ensure that development within Alaska is conducted in a manner that avoids impacts to aquatic systems.

The project manager, Jeffrey C. Davis, has an advanced degree (M.S. Biology, Idaho State University) in aquatic ecology with an emphasis on water quality and stream habitat monitoring. Mr. Davisôhas managed over 30 previous projects monitoring and evaluating impacts associated with anthropogenic disturbance. He is currently managing projects on the assessment of hydrocarbon inputs from boat use on the Little Susitna River, using fish distribution to assess fish passage through culverts, and an assessment of the influence of variable stream temperatures on juvenile fish distribution and fitness. He has authored a monitoring manual for the U.S. Forest Service with detailed guidance on sampling plan development and methodology. He has conducted stream research and monitoring on a number of streams within southcentral Alaska. Studies include water quality assessments of streams subject to urban development on Chester Creek, Wasilla Creek, and Cottonwood Creek. He has developed and implemented projects on the Little Susitna River and Montana Creek using aerial photography to evaluate riparian modifications due to development, transportation, and recreational access. He developed methods to assess impacts related to ATV use and conducted surveys of ATV crossings on the Kenai Peninsula and the Mat-Su Borough. Mr. Davis worked for the Alaska Department of Fish and Game reviewing state forest harvest plans and forest practices implementation on Prince of Wales, the Kenai Peninsula, and the Mat-Su Borough. Mr. Davis worked with the Science and Technical committee on the development of Region II forestry riparian standards and has developed a monitoring approach to assess potential forest practices impacts, which is being implemented in the Willow area. Mr. Davis worked on a scientific committee to prioritize fish passage restoration projects within the Mat-Su Borough. Mr. Davis is currently serving on a committee to develop wetland assessment methods and to develop fish passage restoration prioritization methods. Mr. Davis has developed methodology and assessed the effectiveness of stream bank restoration projects within the Mat-Su Borough, Anchorage, and the Kenai Peninsula.

Grant Administration:

ARRI and the project manager have demonstrated their ability to successfully manage project funds and submit timely and accurate reports. ARRI and the project manager has successfully managed 14 previous ACWA projects, 6 projects as a contractor for ADEC, 7 projects for the U.S. Fish and Wildlife Service, 4 projects for the Matanuska-Susitna Borough, and 2 Alaska Department of Fish and Game managed project through the Sustainable Salmon Fund. ARRI has completed all financial and progress reporting requirements on time. The project manager is totally responsible for all projects accounting and reporting.

Employees are required to submit weekly time sheets that list the hours worked per day, the project worked on, and the project task. The project manager tracks equipment and materials used for each task and checks out all equipment for field work by project and task. The purchase of materials and supplies specific for each project require prior approval by the project manager. Each purchase is recorded by project and cost category. The project quality assurance officer is in charge of coordinating with contract laboratories and ensuring the samples are processes correctly and on time. The project manager coordinates with QA officer upon receipt of contract laboratory invoices to make sure that sample results have been received and to make sure that the invoice is billed to the correct project. The receipts for all project related expenses are kept in a separate file for each project and a copy for annual corporation expenses. Microsoft Money is used to track all corporation expenses. An Excel file is kept for each project tracking all project expenses and personnel time for quarterly reports.

The project manager completes draft progress and financial reports. The QA officer reviews the progress reports to for accuracy and compliance with DEC contract conditions. The project manager submits electronic and hard copies of the project reports to the ADEC project manager. The ARRI project manager works with the ADEC project manager and administration staff clarify reports and to provide any additional information, as necessary.

Description