

Determination of Environmental Flow Needs for Aquatic Communities in the Upper Little Red and Upper Saline Watersheds

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Project Summary

The sub-watersheds of Saline and Little Red Rivers are threatened by hydrologic alteration due to anthropogenic land-use changes and surface water withdrawals. The Nature Conservancy proposes to lead the technical process of determining the current environmental flow needs of these watersheds. These flow regimes will provide the scientific basis for determining sustainable uses that will ensure healthy ecosystems now and in the future.

Principle Project Partners:

Steve Filipek, Assistant Chief of Fisheries

Arkansas Game & Fish Commission

2 Natural Resources Drive

Little Rock, AR 72205

Phone: 501-223-6371

sfilipek@agfc.state.ar.us

James Petersen, Hydrologist

U.S. Geological Survey

401 Hardin Road

Little Rock, AR 72211

Phone: 501-228-3620

Petersen@usgs.gov

**Chris Davidson, Endangered Species
Coordinator**

U.S. Fish & Wildlife Service

110 S. Amity Road, Suite 300

Conway, AR 72032

Phone: 501-513-4481

chris_davidson@fws.gov

Total Project Cost: \$70,000

Total Amount Requested: \$35,000

Total Matching Funds/In-kind Services: \$35,000

Proposed Match Sources: TNC, UofA, AGFC, ANRC, SARP, SIFN

This instream flow project will address the following funding priorities outlined in the Arkansas Wildlife Action Plan:

Determine Environmental Flow Needs for Aquatic Communities.

Implement conservation actions and monitoring in the Fayetteville Shale area.

Reduce anthropogenic impact to headwater streams.

Project Area:

The project is focused on two watersheds, the Upper Saline and Upper Little Red, located in the Ouachita Mountains and Boston Mountains ecoregions, respectively. The project area is displayed in Figure 1. The Upper Saline River watershed consists of four forks (South Fork, Middle Fork, Alum Fork, and North Fork) in the counties of Garland, Perry, Saline, and Pulaski. Similarly, the Upper Little Red River watershed drains four headwater streams (Middle Fork, South Fork, Archey Creek, and Turkey/Beech/Devils Fork complex) above Greers Ferry Lake in the counties of Cleburne, Pope, Searcy, Stone and Van Buren. The project area is displayed in Figure 1.

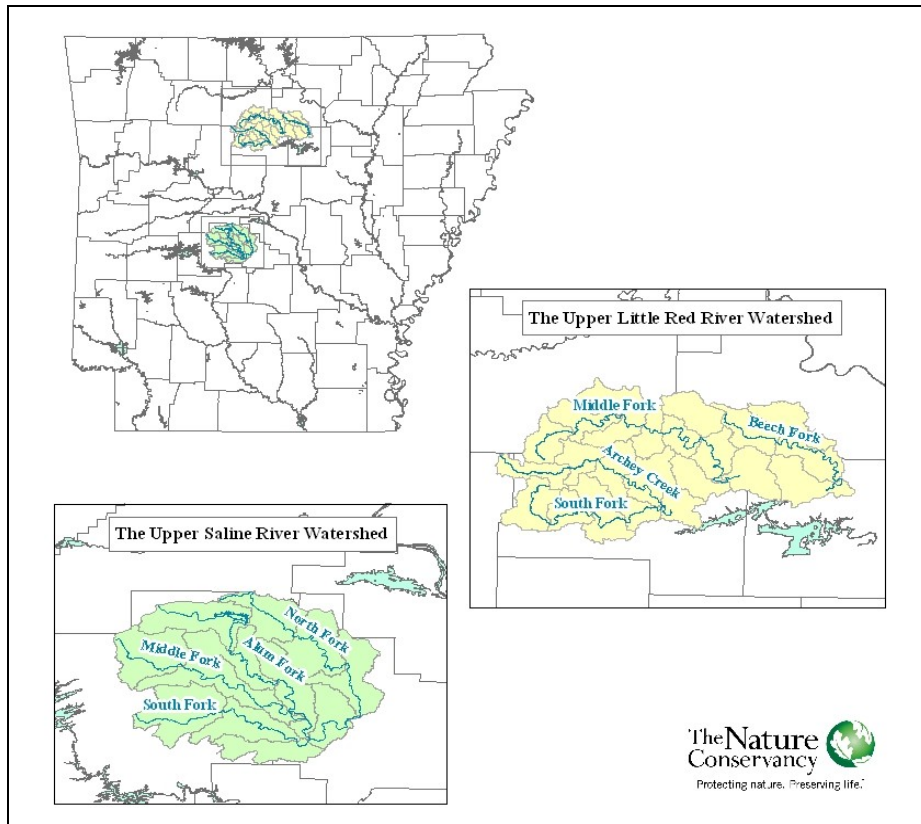


Figure 1. The Upper Saline and Upper Little Red Watersheds

Methods

Defining environmental flow standards for multiple river segments simultaneously is necessary for water managers to effectively integrate human and ecosystem water needs in a timely and comprehensive matter. The Nature Conservancy proposes to develop flow alteration–ecological response relationships for the Upper Saline and Upper Little Red watersheds respectively that can be used as a pilot study for a more broad-based approach to developing the instream flow needs of Arkansas’ rivers in the near future. The methodology is broken up into a series of steps as follows:

Developing a Scientific Instream Flow Team (SIFT)

Form sub-committee of scientists from AR Southern Instream Flow Network (SIFN) team and identify expertise that they can add to the process. Work with sub-committee to *develop initial study plan*.

Building a Hydrologic Foundation

Install pressure transducers at specific monitoring sites and key biological survey locations throughout the 2 watersheds to develop stage-discharge relationships and translate gage heights to specific habitat attributes.

Perform hydrologic analysis of available gage data and to create “baseline” and “developed” condition hydrographs throughout the watersheds (one set for upper Saline and one for upper Little Red). Analysis nodes should be developed for all locations within the two watersheds where water management decisions are needed or anticipated and for all sites at which flow alteration-ecological response relationships are to be developed.

Building an Ecologic Foundation

Gather and organize existing ecological data from the watersheds and similar types of rivers to support flow alteration-ecological response relationships.

Classifying River Segments

Perform geomorphic assessment of each monitoring site, including pebble count and survey of channel cross-sections and longitudinal profile relative to hydrologic conditions.

Computing Flow Alteration

Download pressure transducers and *develop stage relationships* for sites from USGS gages. Model hydrographs for current conditions at each analysis node and *compute degree of alteration* as percent deviation from baseline conditions.

Formulating Flow Alteration-Ecological Response Relationships

Organize a three to four day workshop of riverine scientists to explore the relationships between flow alteration and ecological changes described in the study findings. Experts familiar with the hydrology and ecology of Ozark/Ouachita streams will be assembled to *develop flow alteration-ecological response relationships* for the Upper Saline and Upper Little Red Watersheds respectively. Develop monitoring program and/or research needs for validating and refining these relationships.

Measurable Outcomes/Objective

There is an effort underway to rewrite the State of Arkansas’ Water Plan. If the current effort to develop a new state water plan is made more inclusive of stakeholders, user groups, and conservation leadership and if, Instream Flows are used as the scientific basis for water planning decisions the new plan will lead Arkansas to a sustainable water future. In-stream Flow Determinations scientifically identify the amount of water flowing in a river at a specific time and relate that flow to the biological needs of the river. During the seasons, different flows are needed to maintain the health of a river. The Nature Conservancy is currently a member of the Arkansas Instream Flow Team. The goals of this group are to determine environmental flow needs of healthy Arkansas Rivers, both for enhanced fisheries management and to ensure that environmental flows are a key component and scientific basis for the new State Water Plan. Determining the Environmental Flow Needs for aquatic communities in the Upper Little Red and Upper Saline Watersheds will serve as a pilot project in this effort and a model for larger scale projects in the near future. The following bullets define specific objectives of this proposed project regarding to the Upper Saline and Little Red River watersheds.

- Organize a team of experts to serve as an Arkansas Scientific Instream Flow Team
- Develop regional watershed curves for “natural” and “altered” hydrologic conditions
- Measure and compute degrees of hydrologic alteration for defined stream segments
- Develop flow alteration-ecological response relationships for each watershed

Species of Greatest Concern

Species of greatest concern in the Upper Saline and Upper Little Red basins are listed below in Tables 1 and 2 respectively.

	Scientific Name	Common Name	Global Status	State Status
Fish	<i>Noturus lachneri</i>	Ouachita madtom	G2	S2
	<i>Crystallaria asprella</i>	Crystal darter	G3	S2?
	<i>Percina uranidea</i>	Stargazing darter	G3	S3
Mussels	<i>Alasmidonta marginata</i>	Elktoe	G4	S3
	<i>Cyprogenia aberti</i>	Western fanshell	G2	S2
	<i>Lampsilis ornata</i>	Southern pocketbook	G5	S1
	<i>Lampsilis powellii</i>	Arkansas fatmucket	G1G2	S2
	<i>Toxolasma lividus</i>	Purple lilliput	G2	S2
	<i>Villosa arkansasensis</i>	Ouachita creekshell	G2	S2
	<i>Obovaria jacksoniana</i>	Southern hickorynut	G1G2	S2
	<i>Lampsilis abrupta</i>	Pink mucket	G2	S2
	<i>Pleurobema cordatum</i>	Ohio pigtoe	G3	S2
	<i>Pleurobema rubrum</i>	Pyramid pigtoe	G2	S2
	<i>Ligumia recta</i>	Black sandshell	G5	S2

Table 1. Aquatic Species of Greatest Conservation Need, Upper Saline River

	Scientific Name	Common Name	Global Status	State Status	Federal Status
Fish	<i>Percina nasuta</i>	Longnose darter	G3	S2	
	<i>Etheostoma moorei</i>	Yellowcheek darter	G1	S1	C
	<i>Etheostoma stigmaeum</i>	Speckled darter	G5	S2/S3	
	<i>Notropis buchanani</i>	Ghost shiner	G5	S2/S3	
Mussels	<i>Lampsilis satura</i>	Sandbank pocketbook	G2	S2	
	<i>Cyprogenia aberti</i>	Western fanshell	G2	S2	
	<i>Lampsilis streckeri</i>	Speckled pocketbook	G1Q	S1	LE
	<i>Uniomorus tetralasmus</i>	Pondhorn	G4	S2	
	<i>Toxolasma lividus</i>	Purple liliput	G2	S2	
	<i>Ligumia recta</i>	Black sandshell	G5	S2	
	<i>Pleurobema rubrum</i>	Pyramid pigtoe	G2	S2	
<i>Pleurobema rubrum</i>	Pyramid pigtoe	G2	S2		

Table 2. Aquatic Species of Greatest Conservation Need, Upper Little Red River

Leverage of Existing Resources

Outreach to agency technical staff will be accomplished by convening a multi-disciplinary team of scientists to determine the desired environmental flow regimes for the Upper Saline and Upper Little Red watersheds. This project has a large and diverse number of partners involved and work is already underway.

Winthrop Rockefeller Foundation (WRF): providing funding for equipment and operating expenses

Arkansas Game & Fish Commission (AGFC): providing technical assistance relating to fish community structure and instream flow needs, expert knowledge, time, and specialized skills

U.S. Fish and Wildlife Service (USFWS): providing technical assistance relating to endangered species occurrences, needs and monitoring, expert knowledge, time, and specialized skills

U.S. Geological Survey (USGS): providing technical assistance relating to hydrology, expert knowledge, time, and specialized skills

Southern Aquatics Resource Professionals (SARP): providing funding for outside expert facilitating ecological flow development

Southern Instream Flow Network (SIFN): providing funding for outside expert facilitating ecological flow development

Updating the Scientific Community and Comprehensive Wildlife Conservation Strategy

The success and impact of this project relies largely on the continued involvement of scientific experts from various agencies, organizations, and institutions. We commit that the results of this project will be presented to the scientific community following conclusion of the study. In addition, we will update the CWCS database as the project is completed.

Making a public connection

We understand the importance of keeping the public well informed about the nature of our work, and we have a longstanding commitment to public outreach and education. We commit to engendering some positive publicity related to this project in an effort of raising awareness of Arkansas' valuable water resources.

Project Deliverables by Task

Task 1. Developing a *Scientific Instream Flow Team (SIFT)*

Deliverables

- Arkansas ‘SIFT’ initiated with interagency participation.
- Adaptable study plan developed with input from ‘SIFT’ members.

Task 2. Building a Hydrologic Foundation

Deliverables

- 2.1 Map of 2 watersheds showing pressure transducer locations and GPS coordinates of each location.
- 2.2 Statistical analyses and summary tables of key hydrologic parameters for baseline and developed conditions for at least 1 USGS gage for each of the 2 watersheds.

Task 3. Building an Ecologic Foundation

Deliverables

- 3.1 Enumerative bibliography including publications relevant to study.

Task 4. Classifying River Segments

Deliverables

- 4.1 Data sheets and graphic representation of channel cross-sections, longitudinal profile, and substrate analysis at each transducer location.
- 4.2 Geomorphic description of each monitoring location based on Levels 1 and 2 using the Rosgen classification methodology.

Task 5. Computing Flow Alteration

Deliverables

- 5.1 Data sheets compiled from pressure transducers indicating stage and water temperature.
- 5.2 Table indicating stage relationships between monitoring locations and relevant USGS gages.
- 5.3 Results from hydrologic analysis indicating current degree of hydrologic alteration for defined stream segments.

Task 6. Formulating Flow Alteration-Ecological Response Relationships

Deliverables

- 6.1 Flow alteration-ecological response relationships which define critical components of ecological response to anthropogenic flow alterations.
- 6.2 Recommendations for research and monitoring valuable for strengthening or refining defined relationships.

Deliverables Calendar

Task	Description	Deliverable	Start Date	Completion Date
1	Developing a <i>Scientific Instream Flow Team (SIFN)</i>	1.1	Month 0	Month 1
		1.2	Month 0	Month 1
2	Building a Hydrologic Foundation	2.1	Month 1	Month 2
		2.2	Month 4	Month 6
3	Building an Ecologic Foundation	3.1	Month 0	Month 7
4	Classifying River Segments	4.1	Month 1	Month 4
		4.2	Month 4	Month 5
5	Computing Flow Alteration	5.1	Month 5	Month 6
		5.2	Month 5	Month 6
		5.3	Month 6	Month 7
6	Formulating Flow Alteration-Ecological Response Relationships	6.1	Month 8	Month 9-12
		6.2	Month 8	Month 9-12

The Nature Conservancy has great interest in watershed protection and restoration, and has successfully implemented many watershed-scale projects across the country, including Arkansas. This experience is critical in generating involvement at many levels for the protection of our state's unique and valuable surface waters. The Conservancy's Arkansas Field Office has a successful track record in leveraging limited conservation dollars through collaborations with multiple partners toward measurable conservation successes.

Josh Duzan, Biohydrologist will be responsible for coordination between partnering agencies and completion of this project. Duzan has worked as a freshwater scientist and project manager with The Nature Conservancy since February 2004. Since joining the Conservancy, he has completed multiple courses relating to *Fluvial Geomorphology* and *Hydrologic Modeling*. In addition to this coursework, Duzan has a wide array of on-the-ground experience throughout the state, including the Upper Saline and Upper Little Red watersheds. In 2006-2008 he worked with the Ouachita Rivers Project Manager Joy DeClerk, to complete an EPA funded study to quantify and prioritize major sediment sources in the Middle Fork Saline River. Duzan is currently working as technical lead with USFWS and TNC staff on several restoration projects in the Middle and South Forks of the Upper Little Red River watershed.

Steve Filipek, with the Arkansas Game & Fish Commission will providing technical assistance relating to fish community structure and instream flow needs of these riverine systems. In his 30 years of service, Filipek has served in a variety of roles within the agency. He currently is the statewide Assistant Chief of the Fisheries Division over the programs section, which includes the Stream Team program, malacologist (mussel biologist), herpetologist, nongame aquatics program and the rivers/streams biologist. He is a certified fisheries scientist with the American Fisheries Society and has a Bachelor of Science degree in fisheries biology from Colorado State University.

James Petersen, hydrologist with the U.S. Geological Survey will provide technical assistance relating to hydrology and biology of the study area. In his career with the USGS, Petersen has produced a wide array of publications on the instream habitat, fish communities, water quality and hydrology of Arkansas rivers. In 2008, Petersen has co-authored a scientific report relating directly to the objectives of this project entitled "Water Quality and Biological Characteristics of the Middle Fork of the Saline River, Arkansas."

Chris Davidson, Endangered Species Coordinator with the U.S. Fish and Wildlife Service will provide technical assistance relating to endangered species occurrences, needs and monitoring. Davidson began his tenure with the U. S. Fish and Wildlife Service's Arkansas Ecological Services Field Office in 2003 as endangered species coordinator for the state. In this role, he is responsible for coordinating all ESA activities including listing actions, recovery planning and implementation, and Section 7 and 10 activities in the state. Davidson received his B.S. in Fisheries and Wildlife Biology from Arkansas Tech University in 1995 and his M. S. in Aquatic Biology from Arkansas State University in 1997.

**STATE WILDLIFE GRANT PROGRAM
SUBGRANT PROJECT BUDGET**

1. Budget summary

Complete the project budget summary form below.

Budget Category	State Wildlife Grant Funds (Federal)	Cash Match (Non-Federal)	In-Kind Match (Non-Federal)	Total Project Cost
Salaries	28,455.00	5,000.00	5,000.00	38,455.00
Contract Services				-
Supplies and Materials		18,455.00		18,455.00
Travel				-
Equipment				-
Indirect Costs	6,545.00	6,545.00		13,090.00
TOTAL	35,000.00	30,000.00	5,000.00	70,000.00

2. Non-Federal Match (cash and/or in-kind)

Matching funds included in the grant budget are subject to the same requirements and conditions that apply to federal funds. These requirements include the certifications and assurances submitted with the grant application and any conditions attached to the grant award.

Additional details about match can be found here:

<http://wsfprograms.fws.gov/subpages/toolkitfiles/43cfr12.pdf>

3. Budget Narrative

In addition to completing the subgrant project budget summary above, a detailed, itemized budget justification must also be completed on a separate sheet. It must contain the reason for each requested budget item and provide the basis and rationale for its cost. All requested (federal and non-federal) items must be thoroughly justified and clearly tied to project tasks, schedule and deliverables.

4. Indirect Costs

Indirect costs will only be approved if the applicant has an existing, approved rate from a cognizant federal agency. A copy of the current federal approval must be submitted with the grant proposal. Indirect cost rates greater than 10 percent must be must be justified in the budget narrative.

5. Grant period

Project costs and cash and/or in-kind matching can only be incurred after a formal grant award is made by the U.S. Fish and Wildlife Service and a grant agreement is executed by and between the Arkansas Game and

Budget and match questions may be addressed to

[Matthew Warriner](#)
Federal Aid Coordinator

***Determination of Environmental Flow Needs for Aquatic Communities in the Upper
Little Red and Upper Saline Watersheds***

*Project Leader: Josh Duzan, Biohydrologist
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January 2009*

Detailed Budget Narrative

Salaries SWG \$28,455 Non-Federal Match \$10,000 Total \$38,455

Josh Duzan, Biohydrologist, The Nature Conservancy, will provide approximately 110 days (0.42 FTE) for overall project management, implementation, coordination, and reporting. Additional Nature Conservancy staff, including Director of Southern Freshwater Program and regional Senior Biohydrologist will provide technical support as needed. Salaries include fringe benefits and some overtime may be required. Match will be generated from a combination of TNC staff time as well as partner staff time providing in-kind technical support towards project implementation and data analysis.

Supplies and Materials SWG \$0 Non-Federal Match \$18,455 Total \$18,455

A total of 25 water level and temperature recording data loggers will be purchased for recording site specific depth and temperature readings at each of the project monitoring locations. A total of 6 barometric pressure data loggers will also be purchased to be spaced throughout the study area for accurate barometric pressure compensation. Additionally, one copy of RIVERMorph® geomorphic assessment software will be purchased to aid in stream classification and hydrologic analysis..

Indirect Costs SWG \$6,545 Non-Federal Match \$6,545 Total \$13,090

The Nature Conservancy has a current 23% Negotiated Indirect Cost Rate (NICRA) that is accepted by the USFWS (See Attachment 1).

**Nonprofit Organization
Indirect Cost Negotiation Agreement**

EIN #: 53-0242652

Organization:

The Nature Conservancy
4245 North Fairfax Drive, Suite 100
Arlington, Virginia 22203-1606

Date: August 13, 2008

**Report No(s): 08-A-682(07F)
08-A-683(09P)**

Filing Ref.:
Last Negotiation Agreement
dated July 24, 2007

The indirect cost rates contained herein are for use on grants, contracts, and other agreements with the Federal Government to which 2 CFR 230 (OMB Circular A-122) applies, subject to the limitations in Section II.A. of this agreement. The rates are negotiated by the U.S. Department of the Interior, National Business Center, and the subject organization in accordance with the authority contained in 2 CFR 230.

Section I: Rates

Page 1 of 2

Type	Effective Period		Rate	Locations	Applicable To
	From	To			
Final	07/01/06	06/30/07	23.28% 1/	All	All Programs
Fixed Carryforward	07/01/08	06/30/09	23.28% 1/	All	All Programs

Fringe Benefit Rates

Final	07/01/06	06/30/07	40.00% 2/	All	Regular Fringes
Final	07/01/06	06/30/07	12.00% 3/	All	Short-Term Fringes
Final	07/01/06	06/30/07	12.00% 4/	All	Foreign Fringes
Provisional	07/01/08	06/30/09	41.00% 2/	All	Regular Fringes
Provisional	07/01/08	06/30/09	12.00% 3/	All	Short-Term Fringes
Provisional	07/01/08	06/30/09	13.00% 4/	All	Foreign Fringes

1/ **Base:** Total direct costs, less external transfers, the value of land sold or donated to government agencies and other conservation organizations. Equipment costs valued between \$5,000 and \$50,000 are included in the base limited to the first year of capitalization. **All subawards, regardless of dollar amounts, are included in the base.**

Note: TNC has agreed to make all reasonable efforts to implement the exclusion of the portion of subawards in excess of \$25,000 subject to a new system implementation in the FY 2011 rate negotiation.

2/ **Base:** Total salaries and wages for regular employees.

3/ **Base:** Total salaries and wages for short-term employees.

4/ **Base:** Total salaries and wages for foreign employees.

Note: The foreign fringes rate is applicable to benefits that are paid centrally by TNC's headquarters. Additional benefits are paid locally by TNC's foreign locations which are charged directly to government awards.

Treatment of fringe benefits: Fringe benefits applicable to direct salaries and wages are treated as direct costs; fringe benefits applicable to indirect salaries and wages are treated as indirect costs.

Treatment of paid absences: (a) For employees paid on TNC's U.S. payroll, the costs of vacation, holiday and sick leave pay are included in the organization's fringe benefit rate and are not included in the direct cost of salaries and wages. Claims for direct salaries and wages must exclude those amounts paid or accrued to employees for periods when they are on vacation, holiday or sick leave. Other paid absences are billed directly. (b) For employees paid on local payrolls in other country programs, paid absences are billed directly.

Section II: General

A. Limitations: Use of the rates contained in this agreement is subject to any applicable statutory limitations. Acceptance of the rates agreed to herein is predicated upon these conditions: (1) no costs other than those incurred by the subject organization were included in its indirect cost rate proposal, (2) all such costs are the legal obligations of the grantee/contractor, (3) similar types of costs have been accorded consistent treatment, and (4) the same costs that have been treated as indirect costs have not been claimed as direct costs (for example, supplies can be charged directly to a program or activity as long as these costs are not part of the supply costs included in the indirect cost pool for central administration).

B. Audit: All costs (direct and indirect, federal and non-federal) are subject to audit. Adjustments to amounts resulting from audit of the cost allocation plan or indirect cost rate proposal upon which the negotiation of this agreement was based will be compensated for in a subsequent negotiation.

C. Changes: The rates contained in this agreement are based on the organizational structure and the accounting system in effect at the time the proposal was submitted. Changes in organizational structure, or changes in the method of accounting for costs which affect the amount of reimbursement resulting from use of the rates in this agreement, require the prior approval of the responsible negotiation agency. Failure to obtain such approval may result in subsequent audit disallowance.

D. Fixed Carryforward Rate: The fixed carryforward rate is based on an estimate of the costs that will be incurred during the period for which the rate applies. When the actual costs for such periods have been determined, an adjustment will be made to the rate for future periods, if necessary, to compensate for the difference between the costs used to establish the fixed rate and the actual costs.

E. Agency Notification: Copies of this document may be provided to other federal offices as a means of notifying them of the agreement contained herein.

F. Record Keeping: Organizations must maintain accounting records that demonstrate that each type of cost has been treated consistently either as a direct cost or an indirect cost. Records pertaining to the costs of program administration, such as salaries, travel, and related costs, should be kept on an annual basis.

G. Reimbursement Ceilings: Grantee/contractor program agreements providing for ceilings on indirect cost rates or reimbursement amounts are subject to the ceilings stipulated in the contract or grant agreements. If the ceiling rate is higher than the negotiated rate in Section I of this agreement, the negotiated rate will be used to determine the maximum allowable indirect cost.

H. Use of Other Rates: If any federal programs are reimbursing indirect costs to this grantee/contractor by a measure other than the approved rates in this agreement, the grantee/contractor should credit such costs to the affected programs, and the approved rate should be used to identify the maximum amount of indirect cost allocable to these programs.

I. **Central Service Costs:** Where central service costs are estimated for the calculation of indirect cost rates, adjustments will be made to reflect the difference between provisional and final amounts.

J. **Other:**

1. The purpose of an indirect cost rate is to facilitate the allocation and billing of indirect costs. Approval of the indirect cost rate does not mean that an organization can recover more than the actual costs of a particular program or activity.

2. Programs received or initiated by the organization subsequent to the negotiation of this agreement are subject to the approved indirect cost rate if the programs receive administrative support from the indirect cost pool. It should be noted that this could result in an adjustment to a future rate.

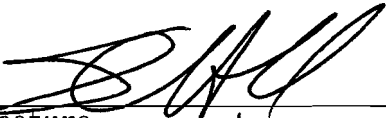
3. New indirect cost proposals are necessary to obtain approved indirect cost rates for future fiscal or calendar years. The proposals are due in our office 6 months prior to the beginning of the year to which the proposed rates will apply.

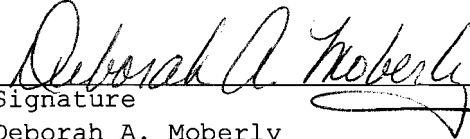
Section III: Acceptance

Listed below are the signatures of acceptance for this agreement:

By the Nonprofit Organization:

By the Cognizant Federal Government Agency:

 /s/
Signature
Stephen C. Howell
Name (Type or Print)
Chief Financial & Administrative Officer
Title
8/11/08
Date

 /s/
Signature
Deborah A. Moberly
Name
Indirect Cost Coordinator
Indirect Cost Services
Title
U.S. Department of the Interior
National Business Center
Agency
Date August 13, 2008
Negotiated by Elena Chan
Telephone (916) 566-7111