

PROJECT TITLE:

MONITORING THE WILLMS CHANNEL RESTORATION PROJECT

Applicant:

Aquatic Systems Research
Stacy K. Li, Ph.D. Principal Investigator
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Type of Organization and Tax Status:

Sole Proprietorship, taxable
A Certified California Small Business (#02775)

EIN:

68-0216240

Collaborators:

Carl Mesick, Ph.D.
Brett Emery

RFP Project Group Type:

Monitoring

LOCATION: Stanislaus River at the Willms property, downstream of Knights Ferry

BENEFITS: Channel alterations in various parts of the lower Stanislaus River from past in-channel gravel mining has created pond-like habitat. Bedload transport is thought to be interrupted which affects spawning suitability downstream of these "ponds". The Stanislaus River water is also thought to be warmed as a consequence of increased residence time through the pond-like habitat. In addition, fish predators such as largemouth bass, smallmouth bass, striped bass and Sacramento squawfish are thought to inhabit these sections in higher densities than the stream-like portions of the Stanislaus River, and thus prey upon juvenile San Joaquin fall-run chinook salmon and juvenile steelhead at higher rates than at other parts of the river. Restoration of the Willms area of the Stanislaus River to stream habitat has been proposed by California Department of Fish and Game to benefit salmonid habitat by increasing amounts of spawning and rearing habitat for salmon and steelhead, while improving water quality (decreasing stream temperature) and reducing levels of predation. If successful, this project may facilitate achieving doubling plan goals. However, stream restoration techniques are still immature and must be monitored in order to document success or failure of such projects and to learn from these successes or failures. Monitoring should be seen as a mandatory adaptive management strategy for any stream restoration project.

There will be no permitting for this work because it is monitoring. The proposed period of monitoring is three years to account for variability of water year and seasoning of the restored site.

ASR is experienced in stream restoration planning. Dr. Stacy Li was a core member of the Rush and Lee Vining creeks Restoration Planning Team, has participated in restoration planning in the Tahoe Basin (Blackwood Creek, Snow Creek, Edgewood Creek, upper Truckee River, and was a member of the Placer County Stream Management Task Force.

Meetings:

Since this is a monitoring program, there will only be one meeting with agency personnel to allow feedback in regards to such aspects as location of sampling sites. Interested parties will be invited to this meeting.

Task 1. Document Habitat Changes.

There will be unavoidable alterations to the physical habitat when the pond-like habitat is converted to a stream habitat. There will be immediate physical changes due to the proposed conversion from pond to stream, but there will also be additional changes due to river influence on the site over time. An aquatic habitat assessment and inventory will be performed. One will be performed prior to construction and

subsequent surveys will occur each year during the fall when chinook salmon are spawning. Quantity and quality of fall-run chinook salmon and steelhead habitat will be evaluated. A variety of habitat variables such as thalweg length, local gradient, aquatic habitat representation, substrate composition, bank stability, amount and kinds of shaded riverine aquatic cover, riparian continuity and depth, pool residual volume index, spawning habitat quality, rearing habitat quality, substrate composition, aquatic invertebrate habitat quality, percent cover type (aquatic vegetation, terrestrial vegetation, boulder, bank undercut, woody debris) and cover proportion within each habitat will also be assessed.

A base map from air photos will also be developed to be used as a reference for this and other all tasks.

This task will be performed all three years to document changes in stream morphology and salmonid habitat. This task will begin the first fall after the contract is approved.

Aquatic Systems Research has performed similar assessments on Rush and Lee Vining creeks and the East Walker River in Mono County, Last Chance Creek in Plumas County, and Summit Creek in Placer County.

Task 2. Describe Physical Setting. Any changes in the streambed can be detected by developing an elevational map by measuring many points using an electronic total station. The restored section may have upstream and downstream influences, therefore, ASR will develop a longitudinal elevation profile from about 2,500 linear feet upstream of the restored section, through the restored section, and 2,500 feet downstream of the restored section so that local gradients and sinuosity are known. The survey will be made in conjunction with the habitat delineation survey. An elevation map will be developed by establishing, monumenting, and measuring a series of cross-sections with an electronic total station. These will be compared with "as-builts" survey data if they are available. Surface substrate composition will be assessed with pebble counts during cross-section profiles. Changes in elevations or substrate composition indicate bedload transport. Amount of channel will be reflected in the area of change.

This task will be performed for all three years to determine level of influence of stream flow on the restored site. This task will be performed in conjunction with Task 1.

ASR owns a Sokkia Set B II total station and has used it on the lower American River to profile and map selected banks.

Task 3. Monitor Bedload Transport. Presently, "Willms pond" traps virtually all the gravel in the ponded area. Riffles immediately downstream of the pond are noticeably coarser, indicating "hungry" water. Restoring the stream channel should

restore sediment transport through this area. An indication of reestablishing bedload transport would be the similarity of substrate composition upstream, downstream and within the restored reach. Preconstruction documentation will have occurred in tasks 1 and 2. However, documenting changes in bedload can be difficult, for instance, using Helly-Smith bedload samplers to measure bedload transport above, within, and below reconstructed sections is too expensive and is likely prove to be inconclusive because of the inherent variability of the samples. Instead, ASR will rely upon a combination of the gaging records, comparisons of annual elevational maps developed from total station measurements, aerial photographs, video and photographs taken each year, comparisons (D_{50} , D_{85} etc.) of bulk bed samples taken upstream, within, and downstream of the restored section, and pebble counts taken on any newly formed bars in the restored reach. This task will be performed all three years at three different flow levels within each year. This task will begin as soon as the contract is approved. There are three tentative flows to study: The October attraction flow, the summer base flow and snowmelt releases. The first survey depends upon when the contract is approved.

Task 4. Monitor Water Temperatures. The removal of pond-like habitat will reduce residence time of water traveling through the restored reach and should reduce water temperatures from late spring to early fall. High water temperatures have been identified as a stressor to fall-run chinook salmon, steelhead and perhaps American shad in the Stanislaus River. Onset Optic Stowaway water temperature loggers (at least six) will monitor stream water temperatures at hourly intervals immediately upstream, within, and immediately downstream of the restored reaches during the entire period of study. Work product will be graphs of water temperature over time and its relevance to these fish species.

This task will occur as soon as the contract is approved and water temperature loggers are received from Onset.

ASR has monitored water temperature on the Tuolumne River, Clavey River, SF Tuolumne River, MF Tuolumne River, and NF Tuolumne River in Tuolumne County, Coyote Creek and the Guadalupe River in Santa Clara County, and The Stanislaus River in Stanislaus County.

Task 5. Determine Predator Densities. Removal of pond-like habitat should reduce predator densities. Prior to restoration activities, the ponded area will be sampled (electrofishing, snorkel diving, seining or gill netting) to determine predator density. The technique used depends upon the conditions at the time of sampling. We propose to sample during the period of juvenile chinook salmon emigration each year.

A nearby area with a similar stream morphology to the restored stream section will also be sampled and will serve as a reference. Agency participation in selection of reference sites is welcomed. After the project area is restored, the predator relative

abundance within the reference area will be compared with as similar an area with the restored area. Predator stomachs will be pumped to document level of predation on salmon juveniles. Instantaneous samples of potential prey densities will also be taken.

ASR owns both backpack and alternator driven electrofishing equipment, and is very experienced in snorkel sampling technique (Rush Creek, Lee Vining Creek, Tuolumne River, SF Tuolumne River, MF Tuolumne River, lower Yuba River). Dr. Stacy Li, Principal of ASR, has presented expert testimony before SWRCB hearings on behalf of CDFG using these techniques, and has written and presented papers on collecting observational data in swift water.

Task 6. Document spawning activity above within and below reconstructed sections. Salmon do not use the ponded areas for spawning. ASR will survey immediately upstream, within the project area for salmon spawning activity during spawning season to document this project benefit. To assess quality of spawning conditions, ASR will establish artificial redds and measure intragravel water quality (vertical hydraulic gradient (VHG), dissolved oxygen (DO), temperature, turbidity) at the top and bottom of a riffle located immediately above, within, and immediately below the restoration site.

The survey will begin after the contract is approved and during the fall-run chinook salmon spawning season.

ASR and Carl Mesick have made similar measurements in the Stanislaus River 1994-1996. Similar work was performed on the Tucannon River in Washington State.

Task 7. Reports:

The work products will be in the form of data and reports. There will be annual reports at the end of each year that describe the activities, data, and findings for each task. These will be due the spring of the succeeding year after field data has been collected. The last annual report will include all the previous data and conclusions.

Budget: Monitoring Program is budgeted for three years to accommodate variation in water year and seasoning of the restoration site.

Budget management will be controlled by monthly reports to the CALFED Project Manager. These reports will describe what study activities occurred in each task. Invoices will show amount budgeted for each task, the amount charged to that task on previous invoices, the amount charged on the present invoice, and the amount remaining.

Task/Personnel	Year 1	Year 2	Year 3
Task 1. Document Habitat Changes			
S. Li			
Hours	26	10	10
Direct Salary	\$ 845	\$ 325	\$ 325
Overhead	\$ 845	\$ 325	\$ 325
B.Emery			
Hours	26	10	10
Salary	\$ 1,040	\$ 400	\$ 400
C. Mesick			
Hours	26	10	10
Salary	\$ 1,690	\$ 650	\$ 650
Expenses	\$ 580	\$ 300	\$ 300
Total	\$ 5,000	\$ 2,000	\$ 2,000

Task/Personnel	Year 1	Year 2	Year 3
Task 2. Describe Physical Setting			
S. Li			
Hours	80	56	56
Direct Salary	\$ 2,600	\$ 1,820	\$ 1,820
Overhead	\$ 2,600	\$ 1,820	\$ 1,820
B.Emery			
Hours	80	56	56
Direct Salary	\$ 3,200	\$ 3,200	\$ 3,200
C. Mesick			
Hours	80	56	56
Salary	\$ 5,200	\$ 3,640	\$ 3,640
Expenses	\$ 1,400	\$ 520	\$ 520
Total	\$ 15,000	\$ 11,000	\$ 11,000

Task/Personnel	Year 1	Year 2	Year 3
Task 3. Monitor Bedload Transport			
S. Li			
Hours	72	72	72
Direct Salary	\$ 2,340	\$ 2,340	\$ 2,340
Overhead	\$ 2,340	\$ 2,340	\$ 2,340
B.Emery			
Hours	104	104	104
Direct Salary	\$ 4,160	\$ 4,160	\$ 4,160
Expenses	\$ 1,160	\$ 1,160	\$ 1,160
Total	\$ 10,000	\$ 10,000	\$ 10,000

Task/Personnel	Year 1	Year 2	Year 3
Task 4. Monitor Water Temperatures			
S. Li			
Hours	36	30	30
Direct Salary	\$ 1,170	\$ 975	\$ 975
Overhead	\$ 1,170	\$ 975	\$ 975
B.Emery			
Hours	60	54	54
Direct Salary	\$ 2,400	\$ 2,160	\$ 2,160
Expenses	\$ 2,260	\$ 890	\$ 890
Total	\$ 7,000	\$ 5,000	\$ 5,000

Task/Personnel	Year 1	Year 2	Year 3
Task 5. Determine Predator Densities			
S. Li			
Hours	90	90	90
Direct Salary	\$ 2,925	\$2,925	\$2,925
Overhead	\$ 2,925	\$2,925	\$2,925
B.Emery			
Hours	90	90	90
Direct Salary	\$ 3,600	\$ 3,600	\$ 3,600
C. Mesick			
Hours	90	90	90
Direct Salary	\$ 5,850	\$ 5,850	\$ 5,850
Expenses	\$ 1,800	\$ 1,800	\$ 1,800
Total	\$ 18,000	\$ 18,000	\$18,000

Task/Personnel	Year 1	Year 2	Year 3
Task 6. Document spawning activity above within and below reconstructed sections.			
C. Mesick			
Hours	240	240	240
Salary	\$ 10,800	\$ 10,800	\$10,800
Expenses	\$ 1,200	\$ 1,200	\$ 1,200
Total	\$ 12,000	\$ 12,000	\$12,000

Task/Personnel	Year 1	Year 2	Year 3
Task 7. Reports			
S. Li			
Hours	40	40	56
Direct Salary	\$ 1,300	\$ 1,300	\$ 1,820
Overhead	\$ 1,300	\$ 1,300	\$ 1,820
B. Emery			
Hours	40	40	60
Salary	\$ 1,600	\$ 1,600	\$ 2,400

Expenses	\$ 800	\$ 800	\$ 960
Total	\$ 5,000	\$ 5,000	\$ 7,000
Annual Total	\$ 72,000	\$ 63,000	\$ 65,000
Grand Total	\$200,000		

Organization:

Dr. Stacy Li will serve as Principal-In-Charge of the monitoring program. He will be responsible to CALFED for reporting, budget control, and delivery of work products. Dr. Carl Mesick and Brett Emery will be under Dr. Li's supervision.

Aquatic Systems Research Team is comprised of:

Stacy K. Li, Ph.D.; Principal Fish Behavior, Fish Ecology, Instream Flow Assessment, Aquatic Biology, Stream Temperature Simulation, Experimental Design, Stream Restoration.

Dr. Stacy K. Li is the Principal of Aquatic Systems Research and has over twenty five years experience in behavioral, ecological and evolutionary fish biology and natural resource management. His experience includes serving as Principal-in-Charge, project manager, principal investigator, task leader and aquatic biologist on close to 150 biological investigations in California, Nevada, Oregon, and Washington. He has worked in 38 of the counties in California. His recent experience has emphasized determining instream flow and habitat requirements of anadromous and resident salmonids associated with hydroelectric power production and consumptive water use projects, and stream restoration of the creeks that feed Mono Lake or Lake Tahoe.

Dr. Li is experienced in many aspects of aquatic biology. He has participated in over 20 Instream Flow Incremental Methodology (IFIM) investigations of large and small riverine systems, Exhibit E (FERC License Application) and Environmental Impact Report (EIR) document preparation, and consultation with local, state, and federal agencies. His expertise includes experimental design and execution, swiftwater data acquisition techniques for habitat suitability criteria development and hydraulic simulation, database management, statistical analysis, IFIM habitat simulation, habitat suitability criteria development, habitat time series analysis, stream temperature simulation, and technical report preparation. Dr. Li was personally trained in the Cooperative Instream Flow Group's Stream Temperature Model by the Model's developer, Dr. Fred Theurer and was the first to use the model on the Tucannon River, Washington. He has used USFS Region 5 stream habitat classifications (McCain *et al.* 1990) for a three year water quality monitoring program in Plumas National Forest and participated in an Shaded Riverine Aquatic Cover (SRA) HEP evaluation on the lower American River, and commented on timber harvest plans in Santa Clara County. He recently was trained in using the new

federal methodology for identifying and delineating jurisdictional wetlands, and in David Rosgen's applied fluvial geomorphology techniques. He has provided expert witness testimony before the Placer County Board of Supervisors, the State Water Resources Control Board, and the El Dorado Superior Court. Dr. Li is a Core Member Mono Basin Streams Restoration Planning Team and participated in developing restoration plans for Rush and Lee Vining creeks, the main tributaries to Mono Lake. He has experience with a variety of rare and endangered species surveys, including the first survey for the California freshwater shrimp in Lagunitas Creek.

**Brett Emery, B.A., Principal Associate
Environmental Science, Hydrology and Geomorphology, Wetlands
Delineation**

Mr. Emery has over seven years of experience as a consultant in geomorphology and hydrology. He has extensive field and analytical experience in both natural and altered wetland and riparian systems, including: mapping and analyzing the hydrology and geomorphology of watersheds - evaluating channel and sediment transport dynamics - analyzing the effects of land use on the stability of fluvial systems, the quality of riparian and aquatic habitats - and conducting detailed wetland habitat delineation, enhancement, and design. He has assisted in the preparation of environmental impact reports, including identifying potential environmental impacts of proposed development, developing appropriate mitigation measures, and identifying alternate project designs. He has recently been trained in the Rosgen stream channel classification system.

**Carl F. Mesick, Ph.D, Principal Associate
Fisheries Biologist, Fish Ecology, Stream Restoration**

Dr. Carl F. Mesick has over fourteen years of experience as a fisheries scientist evaluating the effects of water diversions, hydroelectric operations, stream restoration projects, timber harvest, and mine operations on trout, salmon non-game species of fish, and invertebrates. His expertise includes studies of instream flow, stream habitat restoration, water temperature, riparian vegetation, sedimentation and substrate transport, entrainment at diversion at intakes, food availability, fish passage, fish habitat preference, fish population monitoring, and stream habitat classification. He also specializes in experimental studies of the effects of flow and habitat structure on trout populations.

Dr. Mesick has broad professional experiences. He is trained in the Rosgen stream channel classification system and the USFS Region 5 Stream Habitat

Classification System. He performed a ten year limiting factor analysis on brown trout in the various streams in the Mono Basin and other parts of the eastside sierra, and has reviewed USFS timber harvest plans. He has testified on behalf of California Trout, Inc. in the SWRCB Mono Lake Water Rights Hearing. He has contributed to the restoration of Mono Basin streams as a core member of the Mono Basin Stream Restoration Planning Team. He is a co-author of the CVPIA doubling plan, a plan to double the anadromous fish populations in the Central Valley streams, and has taught a stream restoration class sponsored by the California/Nevada Chapter of the American Fisheries Society.

REFERENCES

Gary E. Smith
Environmental Specialist 4
Division of Environmental Services
California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95658
(916) 654-2571
(916) 653-2588 Fax
Lee Vining Creek Instream Flow Investigation
Mono Lake Water Rights Hearing
Rush Creek Instream Flow Investigation
Green Creek Water Rights Hearing

Darrell Wong
Senior Fisheries Biologist
California Department of Fish and Game
CDFG-Region 5
407 West Line St., Bishop, CA 93514
East Walker River damage assessment

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

AQUATIC SYSTEMS RESEARCH

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME

STACY K. LI

DATE EXECUTED

28 JULY 1997

EXECUTED IN THE COUNTY OF

PLACER

PROSPECTIVE CONTRACTOR'S SIGNATURE

Stacy K. Li

PROSPECTIVE CONTRACTOR'S TITLE

Principal

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

AQUATIC SYSTEMS RESEARCH

Agreement No. _____

Exhibit _____

**STANDARD CLAUSES --
SMALL BUSINESS PREFERENCE AND CONTRACTOR IDENTIFICATION NUMBER**

NOTICE TO ALL BIDDERS:

Section 14835, et. seq. of the California Government Code requires that a five percent preference be given to bidders who qualify as a small business. The rules and regulations of this law, including the definition of a small business for the delivery of service, are contained in Title 2, California Code of Regulations, Section 1896, et. seq. A copy of the regulations is available upon request. Questions regarding the preference approval process should be directed to the Office of Small and Minority Business at (916) 322-5060. To claim the small business preference, you must submit a copy of your certification approval letter with your bid.

Are you claiming preference as a small business?



Yes*

_____ No

*Attach a copy of your certification approval letter.