F1-241

PROPOSAL TO CATEGORY III

I. EXECUTIVE SUMMARY

a. PROJECT TITLE AND APPLICANT NAMES

DETERMINING THE INFLUENCE OF HABITAT CONDITIONS ON SURVIVAL OF FOUR RACES OF CHINOOK SALMON AND STEELHEAD IN THE SAN FRANCISCO BAY-DELTA ECOSYSTEM

C. David Vanicek, *Project Manager*; Robert G. Titus, *Principal Investigator*
California State University, Sacramento
Department of Biological Sciences
6000 J Street
Sacramento, CA 95819

b. PROJECT DESCRIPTION AND PRIMARY BIO/ECOLOGICAL OBJECTIVES

We propose to:

- Use otoliths (ear stones) to distinguish the stock origin (hatchery v. wild) and race of individual chinook salmon and steelhead in the San Francisco Bay-Delta Ecosystem.
- With this tool, identify the relative significance of different major habitat zones – natal headwater tributaries, mainstem rivers, the delta, and the bay – as rearing habitat for each race of chinook salmon and steelhead.
- Determine which patterns of rearing in different major habitat zones are associated with survival to ocean entry and then adulthood.
- Use this information to identify when specific races are susceptible to various stressors that affect chinook salmon and steelhead use of different major habitat zones as rearing habitat.

c. APPROACH/TASKS/SCHEDULE

Beginning in fall 1997, juvenile salmon will be sampled successively in time and space as they move through the system to validate a change in otolith microstructure characteristics against an associated change in major habitat zone (e.g. from natal tributary to upper mainstem river to lower river to delta). This effort will include sampling wild juveniles from their natal production area, and hatchery juveniles from the hatchery. Sampling will be coordinated by the Department of Fish and Game with existing juvenile emigration monitoring activities throughout the system.

Also beginning in fall 1997, otoliths from adults will be collected from throughout the system in coordination with existing spawner escapement surveys, tissue collection activities, and the Central Valley Angler Survey. Concurrent collections will also be made at the hatcheries in the system.

Otoliths will be analyzed using an image analysis system to yield the following information:

- A road map that shows how the four races of salmon and steelhead use the various parts of the aquatic ecosystem, including the delta and bay, as juvenile rearing habitat;
- The relationship between different rearing strategies, including those where salmon leave the natal stream as fry v. smolts, and survival to ocean entry and then adulthood.

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- The status of development and overall utility of the methodology in answering these basic life-history questions.

A report summarizing this information will be issued in September 1998. Recommendations for work to be continued in 1998–99 will be based on the outcome of first-year efforts.

d. JUSTIFICATION FOR PROJECT AND FUNDING BY CALFED

The primary need for this work is based on the existing lack of a methodology that (i) allows for stock identification and race-specific monitoring of habitat use; (ii) can be used to compare survival rates of wild salmon and steelhead relative to habitat conditions in the early life history; and (iii) can be used to assess the relative success of hatchery- v. naturally-produced fish. Without these basic assessment tools, the effect of CALFED restoration activities aimed at benefitting salmon and steelhead through improvement of spawning and rearing conditions cannot be objectively evaluated, nor can criteria be developed to improve the efficacy of future restoration efforts.

e. BUDGET COSTS AND THIRD PARTY IMPACTS

We are requesting $35,400 for 1997-98, and $36,580 for 1998-99. We anticipate positive Third Party Impacts to both the salmon and water management communities in the form of reduced uncertainty regarding stock identification of salmon and steelhead, and in the role of priority habitats for juvenile rearing.

f. APPLICANT QUALIFICATIONS

David Vanicek will manage the project. Dr. Vanicek has supervised 27 graduate students on a variety of thesis projects dealing with fisheries and other aquatic issues in his 30 years as a professor in the Department of Biological Sciences at California State University, Sacramento. He has also managed six previous projects contracted through the CSUS Foundation.

Dr. Robert Titus is an adjunct professor in the Department of Biological Sciences at California State University, Sacramento and a biologist with the California Department of Fish and Game. His role as principal investigator on the project is supported by 10+ years of research on anadromous salmonids, including applications of otolith microstructure analysis.

g. MONITORING AND DATA EVALUATION

The development of the proposed work will include consultation with other otolith experts. These contacts along with broader review of the work through oral presentations, reports, and journal articles will provide modes of project monitoring.

h. COORDINATION WITH OTHER PROGRAMS/ CALFED COMPATIBILITY

The proposed work will be coordinated with state and federal coded-wire tagging programs. Releases of coded-wire-tagged fish provide sources of salmon and steelhead of known origin with which to validate otolith-based stock designations. Sampling of juvenile and adult fish will occur through coordination with both state and federal agencies and their hatcheries.

This project is highly compatible with CALFED objectives in that it addresses *Population Management* stressors as an action to improve monitoring of juvenile salmon and steelhead use of the Bay-Delta ecosystem. The focus species are chinook salmon (all runs included) and steelhead trout. The proposed monitoring of salmon and steelhead in major habitat zones includes five of the seven priority habitats presented in the RFP.

II. TITLE PAGE

a. TITLE OF PROJECT

DETERMINING THE INFLUENCE OF HABITAT CONDITIONS ON SURVIVAL OF FOUR RACES OF CHINOOK SALMON AND STEELHEAD IN THE SAN FRANCISCO BAY-DELTA ECOSYSTEM

b. APPLICANTS, AFFILIATIONS, ADDRESSES, AND PHONE NUMBERS

C. David Vanicek, *Project Manager;* Robert G. Titus, *Principal Investigator*

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Vanicek: (916) 278-6569, FAX 278-6993, dvanicek@csus.edu
Titus: (916) 654-9865, FAX 653-2588, robtitus@compuserve.com

c. TYPE OF ORGANIZATION AND TAX STATUS

Contracting will be conducted through the California State University Sacramento Foundation (Foundation). The Foundation is a not-for-profit corporation that functions as an auxiliary organization to the California State University, Sacramento campus.

d. TAX IDENTIFICATION NUMBER

The Foundation's Tax Identification Number is 94-1337638.

e. TECHNICAL AND FINANCIAL CONTACT PERSONS

The Financial Contact person at the Foundation is:

Ms. Jacquelyn Blackwelder
Director, Contract Services
California State University Sacramento Foundation
6000 J Street
Sacramento, CA 95819
(916) 278-7565, FAX 278-4886

The Technical Contact person is Robert Titus, listed above under *Applicants*.

f. PARTICIPANTS/COLLABORATORS IN IMPLEMENTATION

Department of Biological Sciences at California State University, Sacramento; and California Department of Fish and Game

g. RFP PROJECT GROUP TYPE: Project Group 3, Services.

I-005225

III. PROJECT DESCRIPTION

a. PROJECT DESCRIPTION AND APPROACH

Four races of chinook salmon (*Oncorhynchus tshawytscha*) in the San Francisco Bay-Delta Ecosystem exemplify the life history flexibility of this species. This flexibility includes variation in both juvenile and adult migration times, duration of juvenile rearing in fresh- and brackish-water habitats, size and age at smolting, and size and age at maturity. This variation not only occurs among races, but within them as well.

The impacts of a variety of stressors on the Bay-Delta ecosystem have greatly reduced the degree to which this variation can be expressed, as reflected in the high-risk status of the winter, spring, and late-fall chinook races. Thus, what the greatly reduced natural production of this top-end organism tells us is that the ecosystem is increasingly losing its capacity to perpetuate the diversity of native aquatic life that it has historically supported.

The CALFED Bay-Delta Program supports activities that will restore the function of the Bay-Delta ecosystem. Measuring the success of CALFED restoration activities in improving natural production of salmon and steelhead requires a method for linking habitat conditions that prevailed during the juvenile rearing phase in freshwater to survival to adulthood. Such a method would need to (i) be applied system-wide, (ii) allow for stock differentiation, and (iii) provide the ability to estimate the residence times of juvenile salmon and steelhead in different major habitat zones. Otolith microstructure analysis can meet these needs. The objectives of the work proposed herein are to use otolith microstructure analysis to determine the origin and life history of individual salmon and steelhead through the freshwater rearing phase, and evaluate the relationship between these characters, ambient environmental conditions in different habitat zones, and survival to ocean entry and then adulthood.

Otoliths are the ear stones in fishes whose growth increments (rings) provide a detailed chronology of the growth history of young fish, much like the growth rings in a tree but on a finer time scale (i.e., days in otoliths v. years in tree rings). The primary determinants of both otolith and fish growth are temperature and food. So, we expect to see variation in otolith growth rates corresponding to rearing periods in different major habitat zones where temperature and food vary. Thus, otolith growth rates will segregate based on gross differences in temperature and food availability in natal headwater tributaries, mainstem rivers, the delta, and the bay. Further, gross differences in rearing conditions within and among streams, and in the time of year that different races use the streams, will yield otolith "signatures" to segregate races, both within and among drainages. When validated for daily ring formation, otoliths can be used as a chronometer to measure the number of days an individual salmon has spent in different major habitat zones during its early life history. Such characterization of juvenile salmon from given racial cohorts, combined with identification as returning adults, will thus establish a means for evaluating the success of individual life histories on a cohort-by-cohort basis.

Specifically, we propose to:

- Use otoliths to distinguish the stock origin (hatchery v. wild) and race of individual chinook salmon and steelhead in the Bay-Delta ecosystem.
- With this tool, identify the relative significance of different major habitat zones – natal

headwater tributaries, mainstem rivers, the delta, and the bay – as rearing habitat for each race of chinook salmon and steelhead.

- Determine which patterns of rearing in different major habitat zones are associated with survival to ocean entry and then adulthood.

- Use this information to identify when specific races are susceptible to the variety of stressors that affect chinook salmon and steelhead use of different major habitat zones as rearing habitat.

b. LOCATION AND/OR GEOGRAPHIC BOUNDARIES OF PROJECT

This project will apply to all counties and watersheds currently supporting chinook salmon and/or steelhead trout within the geographic area shown in Attachment A of the Request for Proposals.

c. EXPECTED BENEFITS

The proposed work addresses *Population Management* stressors as an action to improve the monitoring of juvenile salmon and steelhead use of the Bay-Delta ecosystem, in part through implementation of a stock identification tool. This action will provide the following benefits:

- A road map that shows how juvenile salmon and steelhead use the various parts of the aquatic ecosystem as rearing habitat, including the delta and bay.

- The ability to identify races of juvenile salmon in the delta and other major habitat zones.

- The ability to assess the relative contribution of hatchery and wild fish to in-river spawning (secondary benefit).

- The ability to assess straying of returning adults (secondary benefit).

- Criteria for future CALFED restoration activities by identifying when specific races are susceptible to the variety of stressors affecting chinook and steelhead use of different major habitat zones as rearing habitat.

The species of focus are chinook salmon (all runs included) and steelhead trout. From an ecosystem standpoint, these fishes work well as gross indicators of the health of the system in that they use and are dependent on nearly all accessible portions of the Bay-Delta system to complete their complex life cycle. In addition, because of the observed variation in each species, some life-history stage or type is present in some habitat at any given time of year. This broad coverage is reflected in the fact that the proposed work will include salmon and steelhead use of five of the seven priority habitats presented in the RFP: tidal perennial aquatic habitat (fresh water), seasonal wetland and aquatic habitat, instream aquatic habitat, shaded riverine aquatic habitat, and midchannel islands and shoals habitat.

d. BACKGROUND AND BIOLOGICAL JUSTIFICATION

The primary need for this work is based on the existing lack of a methodology that (i) allows for stock identification and race-specific monitoring of habitat use; (ii) can be used to compare survival

rates of wild salmon and steelhead relative to ambient conditions in the early life history; and (iii) can be used to assess the relative success of hatchery- v. naturally-produced fish. Without these basic assessment tools, the effect of CALFED restoration activities aimed at benefitting wild salmon and steelhead through improvement of spawning and rearing conditions cannot be objectively evaluated, nor can criteria be developed to improve the efficacy of future restoration efforts.

Previous applications of otolith and scale microstructure analysis support the proposed approach and provide the basis for expected benefits. For example, Unwin and Lucas (1993) used scale microstructure analysis to successfully discriminate between hatchery and wild, and"ocean-type" and "stream-type" chinook salmon populations from within the same drainage. Zhang *et al.* (1995) used otoliths to also distinguish hatchery and wild chinook. Neilson *et al.* (1985) used otolith microstructure analysis to evaluate the timing of estuarine rearing and associated growth in juvenile chinook salmon.

Any other approach must involve the marking of millions of both hatchery-produced and wild salmon and steelhead to objectively evaluate the habitat use and success of different cohorts of fish. The only currently used means in California of tagging very small salmon is with coded wire tags. Although it may be feasible to tag all hatchery production, the effort and lack of reliability in first capturing then tagging very large numbers of wild salmon greatly limits the feasibility of this approach. In a sense, all hatchery and wild salmon and steelhead are by default distinctively marked as cohorts in their otoliths because of variation in ambient conditions. In fact, mass-marking at the hatchery can be achieved by inducing banding patterns in the otoliths through water temperature manipulations (e.g. Bergstedt *et al.* 1990, Volk *et al.* 1990).

The proposed work would be a new project.

e. PROPOSED SCOPE OF WORK

Beginning in fall 1997, juvenile salmon will be sampled successively in time and space as they move through the system to validate a change in otolith microstructure characteristics against an associated change in major habitat zone (e.g. from natal tributary to upper mainstem river to lower river to delta). This effort will include sampling wild juveniles as they emigrate from their natal production area, and hatchery juveniles just prior to their release from the hatchery. Sampling will be coordinated through the Department of Fish and Game with existing juvenile emigration monitoring activities throughout the system, including the upper Sacramento River both above and below Battle Creek, Mill Creek, Deer Creek, Sacramento River at GCID, Butte Creek, Sacramento River at Knights Landing, Feather River, lower American River, Sacramento River at Sacramento, Mokelumne River, Stanislaus River, San Joaquin River at Mossdale, interior Delta points including the State and Federal pumping facilities, Chipps Island, and in San Francisco Bay. Sampling will also occur at Coleman, Feather River, Nimbus, and Mokelumne River fish hatcheries and at the Merced River Fish Facility. Sampling will be as comprehensive as possible with regard to stock coverage, and as regulations– for example, under both the State and Federal Endangered Species Acts – allow.

Also beginning in fall 1997, otoliths from adults will be collected from throughout the system in coordination with existing Department of Fish and Game spawner escapement (carcass) surveys, tissue collection activities, and the Central Valley Angler Survey. Concurrent collections will also be made at Coleman, Feather River, Nimbus, and Mokelumne River fish hatcheries, and at the

Merced River Fish Facility.

Otoliths will be dissected and prepared for analysis using standard procedures as described by Titus and Mosegaard (1991). Both qualitative and quantitative analyses of otolith microstructure patterns will be made using a Macintosh computer-based image analysis system, including the imaging software, *Bony Parts*. Qualitative analyses will include the delineation of rearing periods in different major habitat zones as reflected in variation in otolith increment widths and patterns. Quantitative analyses will include otolith increment counts within rearing periods to determine corresponding residence times, and measurement of otolith increment widths.

The primary work product will be a report that documents the protocols for otolith microstructure analysis, and summarizes the following:

- The amount of time that four races of salmon and steelhead spent in their natal stream, other riverine environments, and the delta and bay.
- The age at which four races of salmon and steelhead entered the delta and ocean, as applicable.
- The relationship between different rearing strategies, including those where salmon leave the natal stream as fry v. smolts, and survival to ocean entry and then adulthood.
- The status of development and overall utility of the methodology in answering these basic life-history questions.

Life-history information obtained from juvenile salmon and steelhead will correspond to habitat conditions experienced during the 1997-98 season. Life-history information collected on adult salmon and steelhead will correspond to habitat conditions experienced during 1993-94 and 1994-95 (assuming adult ages of 3 and 4). (Ideally, the proposed work would have a minimum seven year duration so life history success in three full life cycles could be assessed, from the early juvenile stage through adulthood three and four years later.) The report will be issued in September 1998. Recommendations for work to be continued in 1998–99 will be based on the outcome of first-year efforts.

f. MONITORING AND DATA EVALUATION

The proposed work will be coordinated with state and federal coded-wire tagging programs. Releases of coded-wire-tagged fish provide sources of salmon and steelhead of known origin with which to validate otolith-based stock designations. As described in the *Proposed Scope of Work* above, sampling of juvenile and adult fish will occur through coordination with both state and federal agencies and their hatcheries.

The development of the proposed work will include consultation with otolith experts both within and outside California such as Dr. John Butler of the National Marine Fisheries Service in La Jolla, Dr. Z. Zhang of the Department of Fisheries and Oceans in British Columbia, and Mr. Eric Volk of the Washington State Department of Fisheries. These contacts along with broader review of the work through oral presentations, reports, and journal articles will provide modes of project monitoring.

Data evaluations will include:

- Summaries of where, when, and how many salmon and steelhead were collected for otolith analysis in juvenile and adult surveys, and from hatcheries.
- The stock composition of fish collected, to the extent that it may be known prior to otolith analysis.
- Summaries of otolith microstructure characteristics, increment counts, and increment widths for each population and sampling station, as applicable.
- Analyses to statistically distinguish different populations.
- Analyses that relate how the fish used the system as rearing habitat, based on otolith analyses, to ambient conditions over that time period.

These approaches to monitoring and data evaluation are standard for the type of work being proposed, and no other similar approaches are known.

g. IMPLEMENTABILITY

The proposed project may be fully implemented under existing conditions. Additional collection permits may have to be secured as other salmon races and steelhead become listed under State and Federal endangered species laws. The Department of Fish and Game is providing the analytical equipment necessary to complete the otolith analyses.

REFERENCES CITED

Bergstedt, R. A., R. L. Eshenroder, C. Bowen, III, J. G. Seelye, and J. C. Locke. 1990. Mass-marking of otoliths of lake trout sac fry by temperature manipulation. Am. Fish. Soc. Symp. 7:216–223.

Neilson, J. D., G. H. Geen, and D. Bottom. 1985. Estuarine growth of juvenile chinook salmon (*Oncorhynchus tshawytscha*) as inferred from otolith microstructure. Can. J. Fish. Aquat. Sci. 42:899–908.

Titus, R. G., and H. Mosegaard. 1991. Selection for growth potential among migratory brown trout (*Salmo trutta*) fry competing for territories: evidence from otoliths. Can. J. Fish. Aquat. Sci. 48:19–27.

Unwin, M. J., and D. H. Lucas. 1993. Scale characteristics of wild and hatchery chinook salmon (*Oncorhynchus tshawytscha*) in the Rakaia River, New Zealand, and their use in stock identification. Can. J. Fish. Aquat. Sci. 50:2475–2484.

Volk, E. C., S. L. Schroder, and K. L. Fresh. 1990. Inducement of unique otolith banding patterns as a practical means to mass-mark juvenile Pacific salmon. Am. Fish. Soc. Symp. 7:203–215.

Zhang, Z., R. J. Beamish, and B. E. Riddell. 1995. Differences in otolith microstructure between hatchery-reared and wild chinook salmon (*Oncorhynchus tshawytscha*). Can. J. Fish. Aquat. Sci. 52:344–352.

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IV. COSTS AND SCHEDULE TO IMPLEMENT PROPOSED PROJECT

a. BUDGET COSTS

Project Phase and Task	Direct Labor Hours	Direct Salary & Benefit Costs	Laboratory & Misc. Operating Costs	Travel (Local)	Travel (Non-local, including Lodging & Per Diem)	Indirect (Over-head) Costs	Total Cost
Otolith Collection, Analysis, & Reporting: Year 1	GSA*, Range C @ 1,920 hrs	$22,000 ($10.35 per hr + 10%)	$3,600	$2,400	$2,000	$5,400 (18%)	$35,400
Otolith Collection, Analysis, & Reporting: Year 2	GSA*, Range D @ 1,920 hrs	$23,000 ($10.78 per hr + 10%)	$3,600	$2,400	$2,000	$5,580 (18%)	$36,580

* Graduate Student Assistant

Funding for the proposed project is being sought for two, one-year phases. The first year will be a pilot phase for the project, and the second-year phase will complete implementation of the method as a working tool.

The Principal Investigator has submitted a similar proposal to the Interagency Ecological Program for the San Francisco Bay/Delta Estuary (IEP) for funding of the pilot phase in 1997-98. The IEP will not decide on funding for 1997-98 until August 1997. If funding is secured from the IEP, we will consult with CALFED to determine if there is an interest in augmenting the proposed project to meet CALFED needs. If there is no interest, we will retract the current proposal from CALFED.

b. SCHEDULE MILESTONES

Phase	Time Period	Task
1	Sep/Oct 1997:	Initiate collection of otoliths.
1	Continuously through June 1998:	Collect and analyze otoliths, compile data.
1	Sep 1998:	Issue progress report on Phase 1 results.
2	Sep 1998:	Initiate second cycle of otolith collections.
2	Continuously through June 1999:	Collect and analyze otoliths, compile data.
2	Sep 1999:	Issue final report.

c. THIRD PARTY IMPACTS

We anticipate positive Third Party Impacts to both the salmon and water management communities in the form of reduced uncertainty regarding identification of salmon and steelhead stocks, and in the role of priority habitats for juvenile rearing.

V. APPLICANT QUALIFICATIONS

The planned organization of the proposed project will consist of a project manager, a principal investigator, and the equivalent of one full-time graduate student assistant (GSA). The GSA position may be split between two qualified candidates that would each work part-time.

David Vanicek will manage the project. Dr. Vanicek, a Certified Fisheries Scientist with the American Fisheries Society, has been a professor in the Department of Biological Sciences at the California State University, Sacramento since 1967. His qualifications as a project manager include having supervised 27 graduate students on a variety of thesis projects dealing with fisheries and other aquatic issues. Professor Vanicek has also managed six projects contracted through the CSUS Foundation. He will also provide the laboratory space and access to a variety of equipment with which to facilitate the work.

Robert Titus will be the Principal Investigator on the project. Dr. Titus is an adjunct professor in the Department of Biological Sciences at the California State University, Sacramento and a biologist with the California Department of Fish and Game. His role in providing the technical expertise on the project is supported by 10+ years of research on population dynamics, behavior, early life history, and population trends of anadromous salmonids, including applications of otolith microstructure analysis (see references below). Dr. Titus has contributed to a variety of studies on chinook salmon and steelhead in the Bay-Delta system in his position with the Department of Fish and Game.

Dr. Titus has assembled an image analysis system at the Department of Fish and Game that will be available for use on the proposed project. As a collaborator, the Department of Fish and Game will coordinate fish sampling for otoliths with existing State and Federal monitoring programs.

SELECTED PUBLICATIONS, MANUSCRIPTS, AND REPORTS OF THE PRINCIPAL INVESTIGATOR, ROBERT TITUS

Titus, R. G., D. C. Erman, and W. M. Snider. History and status of steelhead in California coastal drainages south of San Francisco Bay. Hilgardia (accepted for publication).

Titus, R. G. and H. Mosegaard. 1992. Fluctuating recruitment and variable life history of migratory brown trout, Salmo trutta L., in a small, unstable stream. J. Fish Biol. 41:239–255.

Titus, R. G. and H. Mosegaard. 1991. Selection for growth potential among migratory brown trout (Salmo trutta) fry competing for territories: evidence from otoliths. Can. J. Fish. Aquat. Sci. 48:19–27.

Titus, R. G. 1990. Territorial behavior and its role in population regulation of young brown trout (Salmo trutta): new perspectives. Ann. Zool. Fennici 27:119–130.

Titus, R. G. and H. Mosegaard. 1989. Smolting at age 1 and its adaptive significance for migratory trout, Salmo trutta L., in a small Baltic-coast stream. J. Fish Biol. 35 (Suppl. A):351–353.

Mosegaard. H. and R. Titus. 1987. Daily growth rates of otoliths in yolk sac fry of two salmonids at five different temperatures. Pages 221–227 in S. O. Kullander and B. Fernholm (eds.). Proc. Fifth Cong. Europ. Ichthyol., Stockholm, 1985. Swed. Mus. Nat. Hist., Stockholm.

Mosegaard, H. and R. G. Titus. Mass-marking brown trout (Salmo trutta) alevins using thermally-coded otolith increment formation (manuscript).

Titus, R. G. and H. Mosegaard. Spatial, temporal, and fry-size effects in population regulation of migratory brown trout (Salmo trutta) (manuscript).

Vyverberg, K., B. Snider, and R. G. Titus. 1997. Lower American River, chinook salmon spawning habitat evaluation, October 1994. Calif. Dept. Fish Game, Environmental Services Division, Stream Flow Habitat Evaluation Program Report. 44 pp + apps.

Snider, B., and R. Titus. 1996. Evaluation of juvenile anadromous salmonid emigration monitoring in the Sacramento River near Knights Landing, November 1995–July 1996. Calif. Dept. Fish Game, Environmental Services Division, Stream Flow Habitat Evaluation Program Report. 20 pp + 57 figs, app. (DRAFT)

Snider, B., and R. Titus. 1996. Fish Community Survey, Lower American River, January through June 1995. Calif. Dept. Fish Game, Environmental Services Division, Stream Flow Habitat Evaluation Program Report. 28 pp + figs, app.

Snider, B., and R. G. Titus. 1995. Lower American River, emigration survey, November 1993–July 1994. Calif. Dept. Fish Game, Environmental Services Division, Stream Flow Habitat Evaluation Program Report. 21 pp + figs, app.

VI. COMPLIANCE WITH STANDARD TERMS AND CONDITIONS

All standard terms and conditions as presented in the RFP are agreeable and able to be complied with by the applicants. A signed *Nondiscrimination Compliance Statement* is attached.

Item

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

California State University Sacramento Foundation

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

John Terence Manns

DATE EXECUTED

July 28, 1997

EXECUTED IN THE COUNTY OF

Sacramento

PROSPECTIVE CONTRACTOR'S SIGNATURE

John Terence Manns

PROSPECTIVE CONTRACTOR'S TITLE

Associate Director, Research

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

California Stete University Sacramento Foundation

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