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4.5 PSP Cover Sheet (Attach to the front of each proposal)

Proposal Title: Stone Lakes Water Hyacinth Control
Applicant Name: Jack Waegell, Florin Resource Conservation District
Mailing Address: 9701 Dino Drive, Suite 170, Elk Grove, CA 95624
Telephone: (916) 682-2630
Fax: (916) 682-8690
Email: inwheel@aol.com

Amount of funding requested: $ 382,559 for 3 years

Indicate the Topic for which you are applying (check only one box).

- ☐ Fish Passage/Fish Screens
- ☐ Habitat Restoration
- ☐ Local Watershed Stewardship
- ☐ Water Quality
- ☑ Introduced Species
- ☐ Fish Management/Hatchery
- ☐ Environmental Education

Does the proposal address a specified Focused Action? ✓ yes _____ no

What county or counties is the project located in? County of Sacramento

Indicate the geographic area of your proposal (check only one box):

- ☐ Sacramento River Mainstem
- ☐ Sacramento Trib: _____
- ☐ San Joaquin River Mainstem
- ☐ San Joaquin Trib: _____
- ☑ Delta: Stone Lakes Basin
- ☐ East Side Trib: _____
- ☐ Suisun Marsh and Bay
- ☐ North Bay/South Bay: _____
- ☐ Landscape (entire Bay-Delta watershed)
- ☐ Other: _____

Indicate the primary species which the proposal addresses (check all that apply):

- ☐ San Joaquin and East-side Delta tributaries fall-run chinook salmon
- ☐ Winter-run chinook salmon
- ☐ Late-fall run chinook salmon
- ☐ Delta smelt
- ☑ Splittail
- ☐ Green sturgeon
- ☑ Migratory birds
- ☐ Other: _____
- ☐ Spring-run chinook salmon
- ☐ Fall-run chinook salmon
- ☐ Longfin smelt
- ☐ Steelhead trout
- ☑ Striped bass
- ☐ All chinook species
- ☐ All anadromous salmonids

Specify the ERP strategic objective and target (s) that the project addresses. Include page numbers from January 1999 version of ERP Volume I and II:
Vol. I - Vision for Reducing or Eliminating Stressors-Invasive Aquatic Plants, pg. 451
Vol. II - Control of invasive species a priority for Sac-San Joaquin Delta Ecological management Zone, pg. 81. Control of water hyacinth in Stone Lakes part of vision for North Delta Ecological Unit, pg. 75. Target 1, Programatic Action 1A under Invasive Aquatic Plants, pg. 111.

I-019819

Indicate the type of applicant (check only one box):

- ☐ State agency
- ☐ Federal agency
- ☐ Public/Non-profit joint venture
- ☑ Non-profit
- ☐ Local government/district
- ☐ Private party
- ☐ University
- ☐ Other: _____

Indicate the type of project (check only one box):

- ☐ Planning
- ☑ Implementation
- ☐ Monitoring
- ☐ Education
- ☐ Research

By signing below, the applicant declares the following:

1.) The truthfulness of all representations in their proposal;

2.) The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and

3.) The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

Jack Waegell

Printed name of applicant

Jack Waegell

Signature of applicant

I-019820

I. STONE LAKES WATER HYACINTH CONTROL

Applicant/Principal Investigator:
Jack Waegell, Florin Resource Conservation District Economic Development Corporation
9701 Dino Drive, Suite 170, Elk Grove, CA 95624
Ph# (916)682-2630
Fax# (916)682-8690
E-mail: inwheel@aol.com

Type of organization: Non-profit **Tax status:** 501(C)(3)

Tax identification number: 94-3309951

Participants and collaborators: Stone Lakes Water Hyacinth Control Group, which includes:

Sacramento Regional County Sanitation District
8521 Laguna Station Rd..
Elk Grove, CA 95758

California Dept. of Boating and Waterways
1629 S St.
Sacramento, CA 95814

Cal Trans, Dept. of Transportation, District 3,
Sacramento Environmental Branch C
P.O. Box 942874, MS-41
Sacramento, CA 94274-0001

Sac-Yolo Mosquito and Vector
Control District
8631 Bond Rd.
Elk Grove, CA 95624

U.S. Fish and Wildlife Service
2233 Watt Ave., Suite 375
Sacramento, CA 95825-0509

Beach Lake Ski Club
6 Alstan Ct.
Sacramento, CA 95831

Al Kuhn
10140 Bruceville Rd..
Elk Grove, CA 95758

Galen Whitney
P.O. Box 38
Hood, CA 95639

Richard Samara
1624 Hood-Franklin Rd..
Elk Grove, CA 95758

Steve Samara
P.O. Box 74
Hood, CA 95639

LaRue Shock
10808 Stone Lake Rd..
Elk Grove, CA 95758

Florin Resource Conservation District
Economic Development Corporation
9701 Dino Drive, Suite 170
Elk Grove, CA 95624

II. EXECUTIVE SUMMARY

Project Description
The Stone Lakes water hyacinth control effort is an ongoing project intended to facilitate long-term control of water hyacinth in the Stone Lakes Basin and prevent the expansion of this destructive weed. The Stone Lakes Water Hyacinth Control Group (SLWHCG), comprised of government agencies, landowners and local businesses, operated from 1996 to 1999 through Sacramento County emergency funds and contributions from group members. While SLWHCG efforts have decreased hyacinth cover in the Basin, reduction of the plant to a sustainable low level would require the group to continue the program for at least three more years. The objective of this proposal is to sustain an ongoing effort to control hyacinth within a 13,717-acre section of the Stone Lakes Basin, and several of the Basin's upper-watershed tributaries, by obtaining Category III funding for labor costs, equipment, materials, and chemical supplies. The Florin Resource Conservation District Economic Development Corporation (FRCD), a member of SLWHCG, is applying for this funding on behalf of the control group.

Primary Biological and Ecological Objectives
The hyacinth now occupying the Stone Lakes Basin, if left unchecked, could potentially expand from 10 acres to 80 acres in 30 to 45 days (Wolverton and McDonald 1978). However, SLWHCG efforts will result in the reduction of hyacinth in the Basin to a level which will be easily maintained by regular SLWHCG control activities. From 2000 to 2002 the SLWHCG will resume its integrated hyacinth control program which optimizes effectiveness while maintaining the lowest potential for environmental harm. After the competitive, dense hyacinth is removed, ecologically essential native plants upon which many organisms depend will return, and oxygen levels will substantially increase. Our hyacinth control efforts aim to expand habitat, and increase food resources (e.g., invertebrates) for fish, including Sacramento splittail and striped bass, giant garter snake, and migratory birds. Downstream biota will benefit indirectly due to the reduction of migrating hyacinth. The program will prevent the expansion of this fast-growing plant into habitats of concern including instream aquatic and shaded riverine aquatic which are in danger of being ecologically damaged and eventually lost due to the high siltation rates caused by this plant.

Budget Costs
FRCD is requesting $382,559 from the 1999 PSP. This amount accounts for a portion of the estimated $547K necessary to continue a large-scale water hyacinth eradication effort in the Stone Lakes Basin and its tributaries for three years. Participants of SLWHCG have agreed to contribute the balance of this amount $165K, in funding, labor and materials, if this proposal is approved.

Adverse and Third Party Impacts
Crops growing adjacent to chemically treated areas can be impacted by contamination of irrigation water or herbicidal drift. The FRCD, comprised of farmers and landowners, is especially sensitive to this issue. These impacts will be avoided by maintaining no-spray zones around irrigation diversions, and by using drift control agents or pressure reduction methods when wind conditions may cause chemical drift. When winds are strong, and drift cannot be abated, chemical application operations will cease.

Applicant Qualifications
The applicant, Jack Waegell, serves as Chairman to the FRCD and was previously Director of the Florin Soil Resource Conservation District (1965-1985). The majority of supervisory tasks will be performed by Robert Miller. Mr. Miller is a certified agricultural engineer, with experience in the development of water hyacinth control programs, supervision of numerous integrative pest management programs, and water quality sampling. Other members of the SLWHCG have special qualifications and experience related to hyacinth control.

The majority of the program's control operations will be performed by contractors working under the applicant's supervision. These contractors have advanced training in safe and effective handling of herbicides, sensitive plant species recognition, and vegetation monitoring.

Monitoring and Data Evaluation
The hyacinth monitoring program will detect and verify subtle changes in plant cover as the plants are removed. Qualified research staff will perform daily semi-quantitative and bi-annual intensive quantitative evaluations of the treatment areas. Using criteria standardized by the California Department of Boating and Waterways, work crews will rank the amount of hyacinth cover present in each treatment area on a daily basis, and prioritize work schedules according to results. Intensive quantitative sampling using permanent line transects will be performed before and after each treatment season, allowing for statistical documentation of changes in percent plant cover over the project term. The program will provide an analysis of the question: at what rate does the SLWHCG remove hyacinth from the Stone Lakes Basin? All data will be summarized and distributed to the funding agency and SLWHCG members for review and comments.

The removal of hyacinth is expected to improve the condition of the aquatic environment. SLWHCG anticipates little or no chemical to be detected in the water following spraying. Water quality and invertebrate populations within treatment areas will be monitored before and after chemical application using a program derived from a California Fish and Game protocol (1996) designed to assess the biological impact of aquatic herbicide application. The bio-monitoring program will provide an analysis of the following questions 1) a what rate do herbicidal chemicals applied to hyacinth become undetectable, 2) does a short-term impact on biota occur post-treatment, and 3) does a long-term effect on biota occurs with time, after hyacinth removal. The results of the bio-monitoring program will be statistically evaluated and submitted for review by the SLWHCG and the funding agency.

Local Support/Coordination with other Programs
Local support for the project is widespread, with landowners, agencies, and local businesses having much to gain from the eradication of this destructive weed. Letters of support are included in Appendix C. The coordinated efforts of these multiple entities will ensure efficient and thorough removal of hyacinth. Eradication efforts are also coordinated with those of the California Department of Boating and Waterways (CDBW) which is attempting to control hyacinth in adjacent water bodies.

The SLWHCG water hyacinth control operations will be coordinated with an existing education and public outreach program in the Delta region. In an attempt to increase the effectiveness of hyacinth reduction operations throughout the Delta, the SLWHCG promotes public awareness and calls for community assistance in the control of the plant. The SLWHCG has been funded through a Category III grant to develop and distribute a flyer which will describe the deleterious effects of hyacinth and offer advice on preventing its dispersal. Throughout the Delta, bait shops, marinas, boat stores and aquatic plant retailers have pledged their assistance in dispersing the flyer. A Sacramento Regional County Sanitation District (SRCSD) hosted "Water Hyacinth Alert" web page, and a "Boater Alert" notification flyer sent with boater registration cards by CDBW are also coordinated with the program.

Compatibility with CALFED Objectives
The hyacinth eradication program meets CALFED goals by improving the long-term condition of essential aquatic habitats. Hyacinth may always exist within the waters of the Delta system; therefore, a standardized long-term eradication/monitoring policy is an essential component of the CALFED program. The results of this project will provide information which may be used to better manage other water hyacinth removal programs. In the Ecosystem Restoration Project Plan (ERPP), Vol. II, CALFED designated control of water hyacinth in the Stone Lakes-Snodgrass Slough-Lower Cosumnes/Mokelumne complex as part of the vision for the North Delta Ecological Unit (page 75). The management of invasive species was set as a priority for the Sacramento-San Joaquin Delta Ecological Zone (page 81). Under "Reducing or Eliminating Stressors, Invasive Aquatic Plants," Target 1 calls for the reduction of total surface area covered by invasive non-native aquatic plants within existing and open-ended sloughs of the Sacrament-San Joaquin Delta Ecological Management Zone, with a Programmatic Action to conduct large-scale eradication programs (page 111). The Action sets forth a goal of less than 1% coverage of surface area of the sloughs and channels within 10 years. The SLWHCG program will meet this goal for the Stone Lakes Basin within three years.

III. PROJECT DESCRIPTION

Proposed Scope of Work

Project Description:
Water hyacinth, a non-native plant, is often grown in landscaped ponds, only to be dumped in local waters when the plant overtakes its home. Boaters can accidentally transport the plant on trailers or in bilge pumps. Hyacinth reproduces at an astounding rate. In one growing season twenty-five plants can expand to cover 10,000 square meters of water surface (Barret 1989). Until control efforts began in 1996, hyacinth covered approximately 35% of the water surface in Stone Lakes Basin, and was rapidly expanding, causing harmful effects to wildlife and great economic loss to local farmers.

The Stone Lakes water hyacinth control effort is an ongoing project intended to facilitate long-term control of water hyacinth in the Stone Lakes Basin, and prevent the expansion of this destructive weed. The Stone Lakes Water Hyacinth Control Group (SLWHCG) includes representatives of government agencies, local businesses and private landowners who are concerned with the problems of hyacinth in Delta waters. The SLWHCG operated from 1996 to 1999 through emergency funds appropriated by the Sacramento County Board of Supervisors, and supplemented by contributions from all members of the group. While SLWHCG efforts have decreased hyacinth cover in the Basin, reduction of the plant to a sustainable low level would require the group to continue the program for at least three more years. The objective of this proposal is to sustain an ongoing effort to further reduce hyacinth within a 13,717-acre section of the Stone Lakes Basin, and the basin's upper tributaries, by obtaining Category III funding for labor costs, equipment, materials, and chemical supplies. With this funding, the SLWHCG will continue to treat hyacinth for at least three years, using methods developed during the first four years of the group's operations.

The cost and operations of the 2000 - 2002 control effort will again be shared by multiple agencies and landowners. SLWHCG members have agreed to contribute $165K of the $547K needed to sustain the hyacinth eradication effort over the next three years, if CALFED provides the balance.

Intended Approach to the Problem of Water Hyacinth Invasion:
The SLWHCG operates an integrated program designed to optimize effectiveness while maintaining the lowest potential for environmental harm. Depending on the season, plant condition, and location, the SLWHCG utilizes two herbicidal chemicals and various hand-removal methods to control hyacinth (see **Tasks, Deliverables and Phases** for expanded methods). Through monitoring and adaptive management techniques, the SLWHCG has developed a number of innovative and successful approaches for large-scale hyacinth control. For example, boom corralling, as fabricated by SLWHCG, has dramatically decreased the time and effort involved in hand removal, and reduces the need for herbicidal chemicals. Through Sacramento Regional County Sanitation District (SRCSD) field studies, and in collaboration with other members of the SLWHCG, we have also improved herbicide application methods.

The goal of the program is to reduce total surface area within the Stone Lakes Basin waters to less than 1%. Once this goal is achieved, the small number of plants remaining (or plants reintroduced into the system) will be maintained by regular USFWS maintenance crews. These crews will search for plants throughout the year.

Tasks, Deliverables and Phases:
Task 1: Control Operations
From March 1 to November 30 of each year, chemical control efforts occur on all suitable spray days, with herbicide being applied from boat-mounted spray rigs or terrestrial sprayers. Suitable spray days have winds less than 10 mph, no detectable inversion layer, and no rain in 12 hours. A two-person crew, consisting of a driver and a sprayer, operates a jon boat which has been modified to convey a 30-gallon spray rig. Crews use terrestrial sprayers where in-channel access is restricted by dense hyacinth growth, channel conditions (i.e., too shallow or narrow), or the lack of a boat launching site. Approximately three weeks after treatment, the crew returns and treats plants again. Spraying is repeated until the eradication of all plants within a section has occurred.

Rodeo® herbicide is used most frequently due to its relatively benign nature and low residual effect in water, and is most efficient early in the growing season and on seedlings and plants just out of dormancy. Reward® is used on late stage and late season plants which tend to be resistant to Rodeo®. However, Rodeo® is used again at the end of the season when plants actively translocate nutrients to the roots.

It is imperative that hyacinth be dislodged from non-target vegetation and agricultural irrigation systems. However, control staff take specific precautions, utilizing alternative eradication methods around these features. Herbicidal

spraying halts 20 meters short of any non-resilient or special-status plant species, and, when using Reward®, 100 meters short of any irrigation intake valves.

When possible, or where immediate results are required (i.e., a pump is in danger of being damaged), the crews remove hyacinth by hand, using long-handled pull forks. After the plants dry out on the bank, landowners dispose of them.

Once hyacinth has been removed from a section, adjacent mats separate and disperse into the cleared areas. The clumps are difficult to treat and require more herbicide than the large continuous mats. In an attempt to increase efficiency while minimizing use of expensive herbicides, the crews utilize a booming method. When floating booms are strategically placed, the migration of plants is prevented, allowing sprayers to apply herbicide to captured plants. Plants are also corralled into a single point along the shore, then removed by hand.

Task 2: Invertebrate Monitoring
Monitoring of the invertebrate community within treated areas will occur between June 1 and November 30 of each year. See **VI. Monitoring and Data Collection Methodology** for methods.

Task 3: Water Quality Monitoring
Monitoring of water quality within treated areas will occur from June 1 and November 30 of each year. See **VI. Monitoring and Data Collection Methodology** for methods.

Task 4: Water Hyacinth Monitoring
Crews monitor each section for dead/dying plants, new recruitment, and movement of plants due to wind, currents, etc. (see **Monitoring and Data Collection Methodology** below for methods). Monitoring of plants will occur from February 1 to December 31 of each year. See **VI. Monitoring and Data Collection Methodology** for methods.

Task 5: Project Management
Project management will consist of 1) supervision of FRCD project responsibilities, 2) coordination of water hyacinth control efforts among SLWHCG members, 3) supervision of contracted work, 4) and financial report preparation. Management tasks will be shared between the FRCD chairman and other volunteer FRCD members, and a paid supervisor.

Deliverable 1: Quarterly Reports
The financial status of the project will be summarized and presented to CALFED four times per year, by the 10th day of the month following each quarter. This report will include all components described in Attachment C of the February 1999 PSP.

Deliverable 2: Annual Reports
Information obtained monitoring efforts will be summarized and reported annually. Daily, pre- and post-season analysis of water hyacinth condition will be summarized in research paper format and will include thorough methods, results and discussion sections. Included in this annual report will be the results of invertebrate and water quality monitoring. All reports will be placed into a format compatible with MS Access, and supplied to the funding agency, as well as the SLWHCG for review and comments. The due date for the annual reports will be December 31 of each year.

Deliverable 3: Final Report
A final report will be submitted to CALFED which will include a summary of all project monitoring, and financial data. This report will be presented to CALFED by December 31, 2002.

Project Schedule:
The control program will occur in three one-year phases. CALFED could potentially fund one, two or three years of operations. Monitoring of invertebrates or water quality could also be eliminated from the program. A schedule of phases and tasks is provided in Table 1.

TABLE 1.
Start / Completion of Specific Tasks

Task	Phase 1 Start / Completion	Phase 2 Start / Completion	Phase 3 Start / Completion
Task 1: Growing Season Operations and Maintenance	Mar. 1, 2000 / Nov. 30, 2000	Mar. 1, 2001 / Nov. 30, 2001	Mar. 1, 2002 / Nov. 30, 2002
Task 2: Invertebrate Sampling	Jun. 1, 2000 / Nov. 30, 2000	Jun. 1, 2001 / Nov. 30, 2001	Jun. 1, 2002 / Nov. 30, 2002
Task 3: Water Quality Sampling	Jun. 1, 2000 / Nov. 30, 2000	Jun. 1, 2001 / Nov. 30, 2001	Jun. 1, 2002 / Nov. 30, 2002
Task 4: Water Hyacinth Monitoring	Feb. 1, 2000 / Dec. 31, 2000	Feb. 1, 2001 / Dec. 31, 2001	Feb. 1, 2002 / Dec. 31, 2002
Task 5: Project Management	Jan.1, 2000/ Dec. 31, 2000	Jan.1, 2001/ Dec. 31, 2001	Jan.1, 2002/ Dec. 31, 2002

Location and Geographic Boundaries of the Project

The project is located within the Sacramento River watershed, north of the confluence of the Cosumnes River and Mokolumne River, in Sacramento County. Eradication will be performed within the Stone Lakes Basin and upper tributaries of the Basin (Map 1). The Basin is comprised of 250 acres of managed waters and includes the Southern Pacific Railroad borrow channel and associated lakes and sloughs. During heavy rainfall events the northern-most end of Stone Lakes Basin receive water from Morrison Creek; while at the southern end, the channel connects to the Snodgrass Slough system, which is linked to the Mokolumne Delta. Control operations within the upper watershed, including Laguna Creek, Elk Grove Creek, Morrison Creek, and Union House Creek, will occur up to Highway 99.

While the majority of the Basin is occupied by the Stone Lakes National Wildlife Refuge, other land owners include the USFWS, Department of Water Resources, Sacramento County Parks and Recreation Department, Caltrans, Sacramento Regional County Sanitation District, and private land owners.

IV. ECOLOGICAL AND BIOLOGICAL BENEFITS

Ecological and Biological Benefits

Primary Benefit and Scientific Questions:
Water hyacinth in the Stone Lakes Basin will be reduced to below 1% cover, allowing for long-term control by a small-scale maintenance operation. The long-term reduction of hyacinth, and the reduction in the amount of chemicals required to control hyacinth will result in ecological and economic benefits. Monitoring efforts will provide an analysis of the scientific questions, which include, 1) at what rate do herbicidal chemicals applied to hyacinth become undetectable, 2) does a short-term impact on invertebrates (e.g., reduction) occur post-treatment, and 3) does a long-term effect on invertebrates (e.g. overall increase) occur with time, after hyacinth removal.

Ecological : Stressors Addressed

- **Undesirable species interactions; competition from introduced plants:** Ecologically essential native plants, upon which many organisms depend, are prevented from germinating by the hyacinth which blocks almost all light and out competes native plants. The project directly addresses this stressor by removing invasive, non-native, water hyacinth from the Stone Lakes Basin.
- **Water quality; low dissolved oxygen conditions:** One acre of hyacinth can deposit approximately 500 tons of rotting plant material each year, burying benthic organisms and decreasing the water's oxygen supply (Raynes 1964). Large-scale fish kills have resulted from complete depletion of oxygen under hyacinth mats (Timmer and Weldon 1967; Sharma et al. 1978). Following the removal of hyacinth, oxygen levels will increase substantially over pretreatment levels.
- **Channel form changes; channel aggradation due to fine sediments:** Siltation rates within the Stone Lakes Basin's shallow sloughs and channels will decrease after the dense, continuously decaying and sediment trapping hyacinth mats are removed.

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Ecological: Species of Concern

- **Fish:** Fish are adversely affected by increasing hyacinth density which causes a decline in critical and significant food sources, zooplankton and phytoplankton (Gopal et al. 1984; Scott et al. 1979). In shallow water, where tidal action sweeps hyacinth roots across the substrate, benthic communities are disturbed as turbidity is increased. Typical Delta fish, both native and non-native, are present within the Stone Lakes Basin. In addition to increased oxygen levels, the program will result in a long-term increase in benthic and planktonic invertebrates, encouraging the return and expansion of many fish populations. The return of beneficial aquatic plants, including native species, will enhance food and shelter for all native biota.
- **Sacramento splittail:** *Pogonichthys macrolepidotus*, a native minnow, is probably present within the Stone Lakes Basin, as these fish prefer slow-moving water and dead-end sloughs in areas which are subject to flooding (Stone Lakes National Wildlife Refuge EIS 1991). The adult of this species prefers large stretches of open water. However, in Stone Lakes Basin, hyacinth covers many of these ideal areas, and displaces the emergent vegetation that the splittail requires for spawning. Hyacinth control will increase total habitat area for the splittail.
- **Striped bass:** *Morone saxatilis*, a sought-after sport fish, requires open water in which to feed and broadcast spawn their floating eggs. The USFWS has identified Stone Lakes Basin as potential rearing habitat for striped bass. By reducing floating aquatic vegetation, the hyacinth control program will improve habitat conditions for striped bass within the basin.
- **Giant garter snake:** The removal of water hyacinth will allow for the establishment of giant garter snake preferred vegetation types, including tule and cattail.
- **Migratory birds:** Few birds are capable of utilizing hyacinth-invaded habitat. It is nearly impossible to swim through, and provides only low-quality foraging habitat. Hyacinth removal will open water surface for foraging waterfowl. Forage fish, including threadfin shad and Mississippi silverside, have been observed in North Stone Lake. Populations of these important prey species will be enhanced with hyacinth removal, further increasing the aquatic food base.

Ecological: Habitats of Concern

- **Instream aquatic** and **shaded riverine aquatic:** The hyacinth now occupying the Stone Lakes Basin, if left unchecked, could potentially expand from 10 acres to 80 acres in 30 to 45 days (Wolverton and McDonald 1978). Living and dead roots within the water column create a continuous vertical net which traps fine sediment. This sediment, along with a constant supply of decaying material, accumulates under mats, increasing siltation rates (Mitsch 1977). Lakes, sloughs, and small channels eventually fill in and disappear. However, the eradication program is preventing, and will continue to prevent the expansion of this fast-growing plant, decreasing siltation rates, slowing aggradation, and preventing the loss of these valuable habitats.
- **Tidal perennial aquatic habitat**: In the downstream reaches, this habitat, in addition to those listed above, will benefit from hyacinth removal, as dispersal from the Basin is reduced.

Durability and Adaptive Management:
Once hyacinth in the basin has been reduced to less than 1% cover, it will be easily controlled through small-scale maintenance. An infestation such as that which was allowed to develop in earlier years will not be allowed to occur again. Information gathered through the monitoring program will allow for the development of enhanced hyacinth removal methods. By adapting chemical and manual control methods, the SLWHCG has already increased efficacy, decreased chemical usage, and reduced costs.

Linkages

Other Funding Sources and Program Components:
FRCD will contribute approximately 2500 hours of volunteer labor. This time will be donated by FRCD members as they manage, coordinate, and monitor program activities.

Since 1996, the agencies and private landowners of SLWHCG have supported SRCSD and USFWS control efforts with an average annual amount of $57,000 worth of equipment, materials, and in-kind services. This level of support is anticipated to remain constant until such time as the water hyacinth infestation has been reduced to a level that can be handled as part of the routine management of the Stone Lakes National Wildlife Refuge by the USFWS.

The USFWS has been granted $35,000 from the National Fish and Wildlife Foundation. This funding will help to support USFWS water hyacinth control operations during the 1999 season.

Hyacinth control operations will be coordinated existing education and public outreach activities in the Delta region. In an attempt to increase the effectiveness of hyacinth operations in the Delta, the SLWHCG promotes public awareness and calls for community assistance in the control of the plant. SLWHCG has been granted $9600 in Category III funds to develop and distribute a flyer which will describe the deleterious effects of hyacinth and offer

advice on preventing its dispersal. Bait shops, marinas, boat stores and aquatic plant retailers have pledged their assistance in dispersing the flyer. An SRCSD hosted "Water Hyacinth Alert" web page, and a "Boater Alert" notification flyer sent with boater registration cards by CDBW are also coordinated with the program.

Current Status and Accomplishments to Date:
Between the months of July and December, 1996, the SLWHCG reduced hyacinth cover by 85%. Five large mats which covered approximately 50 acres have been completely dissolved and plant density adjacent to the banks has been significantly decreased. It is now apparent that if the FRCD portion of the program is funded, potential exists for hyacinth to be reduced to a level that can be controlled by a small-scale maintenance operation, which will be directed by USFWS.

Through monitoring and adaptive management, SLWHCG has developed a number of innovative approaches to hyacinth control. Boom corralling, a technique which utilizes equipment fabricated by SLWHCG, has dramatically decreased the time and effort involved in hand removal, and reduced the need for chemicals.

Linkage to ERP Actions and Goals:
The hyacinth eradication program meets CALFED goals by improving the long-term condition of essential aquatic habitats. Hyacinth may always exist within the waters of the Delta system; therefore, a standardized long-term eradication/monitoring policy is an essential component of the CALFED program. The results of this project will provide information which may be used to better manage other water hyacinth removal programs. In ERP, Vol. II, CALFED designated control of water hyacinth in the Stone Lakes-Snodgrass Slough-Lower Cosumnes/Mokelumne complex as part of the vision for the North Delta Ecological Unit (page 75). The management of invasive species was set as a priority for the Sacramento-San Joaquin Delta Ecological Zone (page 81). Under "Reducing or Eliminating Stressors, Invasive Aquatic Plants," Target 1 calls for the reduction of total surface area covered by invasive non-native aquatic plants within existing and open-ended sloughs of the Sacrament-San Joaquin Delta Ecological Management Zone, with a Programmatic Action to conduct large-scale eradication programs (page 111). The Action sets forth a goal of less than 1% coverage of surface area of the sloughs and channels within 10 years. The SLWHCG program will meet this goal for the Stone Lakes Basin within three years.

System-Wide Ecosystem Benefits:
Water hyacinth migrates to the southern end of the Stone Lakes Basin, and spreads throughout the Delta, where eradication efforts by the CDBW are abated by the steady supply of plants. A secondary benefit of the project will be increased effectiveness of control efforts in downstream waters, where the CDBW is attempting to develop a low maintenance control program.

Compatibility with Non-Ecosystem Objectives

Social:
- **Recreation:** Boat access is impeded and engines are damaged in areas where hyacinth mats have blocked channels or launch ramps. The potential for recreational fishing is decreased due to the reduced fish populations; and fishing access is lost when dense mats cover the water surface. Boating and fishing potential within the Stone Lakes Basin will increase substantially with a reduction in hyacinth cover.
- **Human health:** Hyacinth provides ideal habitat for mosquitoes, a vector of human diseases (Sucharit et al.1981). Mosquito populations will decrease when hyacinth is removed.
- **Public outreach and aesthetics:** The Stone Lakes Basin is an integral part of our natural history, and provides excellent birding and nature walk opportunities. Control of exotic weeds allows for a more appealing environment for wildlife viewers, as well as the wildlife they have come to see. Many local residents attend weekend refuge tours sponsored by the USFWS. An annual public event, "Walk on the Wildside," brings thousands to the area, and includes tours and displays from many organizations.

Economical:
- **Reduced damage to agricultural equipment, irrigation structures, and channels:** Hyacinth can damage pumps, and reduce flow through irrigation canals by 40% to 95% (Bogart 1949; Guscio et al. 1965). Agencies and farmers have reported economic losses due to increased labor costs (for hyacinth removal) and repair costs. Once hyacinth is removed, those within the Basin, as well as downstream, will benefit from a reduction in long-term costs, including the costs of large-scale channel dredging and pump repair.
- **Increased water supplies:** The high evapo-transpiration rate of hyacinth, plus its large storage capacity, accounts for a loss of up to 38.68 acre-inches of water per month over the normal evaporation rate of an acre of open water. This amount of water could irrigate an acre of corn for one year. Hyacinth removal will result in a reduction in evapo-transpiration and sedimentation rates, and more water will be available to farmers as well as wildlife.
- **Businesses:** Marinas will benefit from reduced control costs and increased facility use.

- **Flood protection:** Economic losses have resulted from flooding which occurs when dense mats hinder water conveyance. An immediate benefit of hyacinth removal will be the prevention of such flooding.

V. TECHNICAL FEASIBILITY AND TIMING

Alternative Methods
The SLWHCG considered several alternative methods of hyacinth eradication, including various biological control methods. For example, two species of weevils and a fungus forage exclusively upon hyacinth. However, these control agents do not reproduce as fast as hyacinth and can not significantly reduce coverage. While mechanical harvesters allow rapid removal of hyacinth, they can not reach plants along the shore, and cost up to 75 times more per acre than chemical control.

Permits and Compliance
The SLWHCG complies with all applicable laws and regulations. Sub-contracted sprayers will use herbicides through a "permit to apply pesticide" obtained through the County Agricultural Commission (CAC). The sprayers will report chemical use rates to the CAC. The State of California Department of Pesticide Regulation requires that any applicator of a pesticide either holds, or is supervised by someone who holds, a Qualified Applicator Certificate. The sub-contracted sprayer will hold such a certificate. FRCD complies with federal laws by following all chemical labeling procedures for storing, mixing, loading, applying, and disposal.

The project complies with, and supports ecosystem enhancement goals set forth in the NEPA document, Stone Lakes National Wildlife Refuge EIS, 1991.

Other Implementation Issues
The SLWHCG foresees no additional implementation issues.

VI. MONITORING AND DATA COLLECTION METHODOLOGY

Biological and Ecological Objectives

Daily and Periodic water Hyacinth Monitoring:
- **Objective: Reduce the surface cover of water hyacinth to less than 1%.**
- **Question: At what rate does the SLWHCG remove hyacinth from the Stone Lakes Basin?**

After the substantial 1996 control success, hyacinth reduction estimates were easily facilitated through visual observations or aerial photography. Presently, with hyacinth in narrow bands along the shorelines, and as the remaining plant cover approaches zero, we require greater precision to detect minor changes. Detection of these changes is critical to determine whether the plant is actually being eradicated or merely maintained in its present condition. Cover (% plant cover per water surface area) may be determined by various means (Bonham 1989). Modified point sampling, as used by the Florida Department of Natural Resources (Bartodzieg and Leslie 1991), and other less intensive methods were rejected for their inability to detect minor changes. Two types of hyacinth monitoring will occur throughout the three year-long phases (Table 2). In addition to formal monitoring, FRCD will continue its photo documentation program in which infested areas are photographed before and after treatment.

Biomonitoring:
- **Objective: Improve the condition of the aquatic environment in the long-term while minimizing impacts to the environment in the short-term.**
- **Questions:**
  1. **at what rate do herbicidal chemicals applied to hyacinth become undetectable,**
  2. **does a short-term impact on biota occur post-treatment, and**
  3. **does a long-term effect on biota occur with time, after hyacinth removal.**

Aquatic invertebrates are used by multiple State and Federal agencies in the assessment of overall aquatic health. The complex invertebrate community is affected by dissolved oxygen levels, temperature, turbidity, and water chemistry. Invertebrates also serve as an essential food base for fish and waterfowl. While a main objective of the program is to increase fish and bird populations, the expansion of such populations may take months to years to occur. Invertebrates colonize suitable environments rapidly, and invertebrate sampling is far more cost effective. Monitoring of water quality and invertebrate communities will occur throughout the three-year program.

Monitoring Parameters and Data Collection Approach
Daily Water Hyacinth Monitoring:
Daily reporting will be modeled after sampling protocol developed by the CDBW (Table 3). Each work crew will perform a daily survey within a prescribed area, and semi-quantitatively estimate water hyacinth present based on a ranking scale (modeled after Summary of Operations, Water Hyacinth Control Program, CDBW 1987). The crews

will also record plant condition (i.e., healthy, dying, dead) and flowering phenology (% flowering), and suggest appropriate equipment for the treatment of the area, (i.e., Jon boat, terrestrial, hand removal, etc.). These daily reports will also serve to evaluate the response of hyacinth to treatment.

Periodic Water Hyacinth Monitoring:
An intensive quantitative sampling program will take place at the beginning and end of each treatment season. The SRCSD will monitor total cover in Basin waters to predict control costs, and share the data with other agencies. Research staff will use a line-intercept method, modified from Tansley and Chip (1926), to estimate the total cover of hyacinth present within the total project site. Each transect will extend perpendicular from the shoreline for a distance equal to one half the distance to the opposite shoreline. Distances will be calculated beforehand using aerial photos and/or GPS coordinates.

Biomonitoring:
The biomonitoring program is derived from a California Fish and Game protocol (1996) designed to assess biological impacts of aquatic herbicide use. The procedures include: chemical analyses for diquat dibromide (Reward®) and glyphosate (Rodeo®) residues, and population monitoring of benthic and planktonic invertebrates. Appendix A contains expanded biomonitoring methods.

Data Evaluation Approach

Daily Water Hyacinth Monitoring:
An area which exhibits diminishing ranks will be indicative of a successful control method, while rank increase will demonstrate that a method was insufficient. The amount of time and the expense necessary to reduce an area to a lower ranking will be derived from the results. This information will be shared with other agencies to compare efficiency and estimate long-term control costs. Periodic monitoring will yield precise comparative data to be used in a statistical analysis of hyacinth population trends over time. Qualified staff will report findings using accepted research paper format including thorough methods, results and discussion sections. This information will be submitted annually to CALFED and SLWHCG members for their review and comments.

Biomonitoring:
Results of the biomonitoring program will be analyzed using Student's t-tests, and biotic indices, including the Shannon-Weaver diversity index. Analysts will identify significant differences between detected chemical residues and community abundance/diversity. The results will be placed into scientific report format and submitted annually to CALFED and the SLWHCG.

Table 2. Monitoring and Data Collection Information

QUESTION TO BE EVALUATED	MONITORING PARAMETERS AND DATA COLLECTION APPROACH	DATA EVALUATION APPROACH	COMMENTS/DATA PRIORITY
At what rate does the SLWHCG remove hyacinth from the Stone Lakes Basin?	Change in cover of water surface-Daily ranking -CDBW method Periodic analysis using line-intercept method	Evaluated rate at which cover increases or decreases after treatment	A trend toward less than 1% cover by 2002 indicates success
At what rate do herbicidal chemicals applied to hyacinth become undetectable?	Amount of chemical detected in water column before and at intervals after treatment	Constituent concentration compared using Student's t-test	No significant difference indicates success
Does a short-term impact on biota occur post-treatment?	Abundance and diversity of aquatic invertebrates, sampled before and after treatment	Shannon-Weaver diversity index - compared with Students t-test	No significant difference indicates success
Does a long-term effect on biota occur with time, after hyacinth removal?	Abundance and diversity of aquatic invertebrates, sampled before and at intervals after treatment	Shannon-Weaver diversity index - compared with Students t-test	A significant increase indicates success

Table 3. Ranking Scale for Daily Reporting of Water Hyacinth Cover

RANK	DESCRIPTION
1	Observers must search, hunt, and peck, to locate water hyacinth.
2	Observers can easily spot plants floating as singles or dinner-plate sized groups.
3	Plants are found in small, non-continuous mats, 20-30 ft. long, and no greater than 30 ft. wide
4	Plants are found in large, continuous mats greater than 30 ft. wide
5	Plants are found in large, continuous mats greater than 30 ft. wide and are causing or will cause problems and need immediate attention.

VII. LOCAL INVOLVEMENT

County Notification
The County of Sacramento has been notified of this proposal for funding through a letter directed to Supervisor Don Nottoli (Appendix B). This ongoing water hyacinth control program has been coordinated and partially funded through the County of Sacramento.

Support of Local Groups
Local support for project activities is widespread, with State, Federal and local agencies, landowners, and local businesses working cooperatively. Letters of support are included in Appendix C.

Affected Landowners
All affected landowners have granted permission for access onto their property. Letters of support and permission are provided in Appendix C.

Public Outreach
The SLWHCG water hyacinth control operations will be coordinated with an existing education and public outreach program in the Delta region. In an attempt to increase the effectiveness of hyacinth reduction operations throughout the Delta, the SLWHCG promotes public awareness and calls for community assistance in the control of the plant. The SLWHCG has been funded through a $9600 Category III grant to develop and distribute a flyer which will describe the deleterious effects of hyacinth and offer advice on preventing its dispersal. Throughout the Delta, bait shops, marinas, boat stores and aquatic plant retailers have pledged their assistance in dispersing the flyer. An SRCSD hosted "Water Hyacinth Alert" web page, and a "Boater Alert" notification flyer sent with boater registration cards by CDBW are also coordinated with the program.

Third Party Impacts

Impacts:
Most lands adjacent to the open water habitat of the Stone Lakes Basin are agricultural. Crops such as tomatoes, corn, and grapes are often produced near areas of water hyacinth receiving chemical treatment. Drift from these chemical sprays could potentially damage adjacent crops. Many of these crops are also irrigated with the water from treatment areas. Certain chemicals used in the treatment of water hyacinth can damage crops if applied directly to irrigation water.

Mitigation: The FRCD, comprised of farmers and landowners, is especially sensitive to this issue. These impacts will be avoided by maintaining no-spray zones around irrigation diversions. Here, hyacinth shall be either manually removed or treated with a chemical labeled for use in irrigation water. All chemicals shall be applied only as directed by the label and by local restrictions set by the CAC. To avoid drift onto crops, no chemical shall be applied when an inversion layer is present or if winds exceed 10 mph. If winds are in excess of 5 mph, drift control agents will be used and spray pressure will be decreased.

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VIII. Cost

Budget

Over the next three years, an estimated $547K will be needed to eradicate water hyacinth from the Stone Lakes Basin. The FRCD is requesting a total of $382,559 from CALFED to fund a substantial portion of this eradication program. The balance of the funding will be provided through equipment, material, and labor contributions from other members of SLWHCG. Tables 4- 6 specify the breakdown of costs for each project phase and task for which CALFED funding is requested.

TABLE 4.
Breakdown of Cost Estimates for
Proposed CALFED Funded Tasks in Phase I*

Task	Direct Labor Hours	Direct Salary and Benefits	Service Contracts	Materials and Acquisition Costs	Miscellaneous and other Direct Costs	Overhead and Indirect Costs	Total Task Cost
Task 1- Growing season operations and maintenance	0	$0	$79,250	$10,000	$4,000	$0	$93,250
Task 2 - Invertebrate sampling, analysis, and reporting	40	$1000	$9,482	$0	$100	$0	$10,582
Task 3 - Water quality sampling, analysis, and reporting	40	$1000	$14,240	$0	$100	$0	$15,340
Task 4 - Water hyacinth eradication progress monitoring and reporting	415	$10,375	$0	$500	$100	$0	$10,975
Task 5 -Project Management	240	$6,000	$0	$0	$0	$0	$6,000
						PHASE I TOTAL	$136,147

* Phase I corresponds to all work to be completed between Jan. 1, 2000 and Dec. 31, 2000.

Direct Labor Hours - total number of person hours projected to accomplish the designated task and phase.
Direct Salary and Benefits - total amount of funding needed to compensate (in salary and benefits) direct labor hours necessary to accomplish the designated task and phase.
Service Contracts - funding needed to contract with outside entities to accomplish tasks that cannot be completed in-house. May include contracted spraying, aerial photography, or mechanical harvesting.
Materials and Acquisition Costs - funding needed to cover predictable material costs such as herbicides, spreader/stickers, drift control agents, fuel, and booming materials.
Miscellaneous and other Direct Costs - funding needed to cover miscellaneous costs: equipment maintenance and repair.
Overhead Labor and Indirect Costs - indirect overhead costs: payroll, insurance costs, processing, and general administration.

TABLE 5.
Breakdown of Cost Estimates for
Proposed CALFED Funded Tasks in Phase II*

Task	Direct Labor Hours	Direct Salary and Benefits	Service Contracts	Materials and Acquisition Costs	Miscellaneous and other Direct Costs	Overhead and Indirect Costs	Total Task Cost
Task 1- Growing season operations and maintenance	0	$0	$71,325	$9,000	$4,000	$0	$84,325
Task 2 - Invertebrate sampling, analysis, and reporting	40	$1000	$9,482	$0	$100	$0	$10,582
Task 3 - Water quality sampling, analysis, and reporting	40	$1000	$14,240	$0	$100	$0	$15,340
Task 4 - Water hyacinth eradication progress monitoring and reporting	415	$10,375	$0	$500	$100	$0	$10,975
Task 5 -Project Management	240	$6,000	$0	$0	$0	$0	$6,000
						PHASE II TOTAL	$127,222

* Phase II corresponds to all work to be completed between Jan. 1, 2001 and Dec. 31, 2001.

Direct Labor Hours - total number of person hours projected to accomplish the designated task and phase.
Direct Salary and Benefits - total amount of funding needed to compensate (in salary and benefits) direct labor hours necessary to accomplish the designated task and phase.
Service Contracts - funding needed to contract with outside entities to accomplish tasks that cannot be completed in-house. May include contracted spraying, aerial photography, or mechanical harvesting.
Materials and Acquisition Costs - funding needed to cover predictable material costs such as herbicides, spreader/stickers, drift control agents, fuel, and booming materials.
Miscellaneous and other Direct Costs - funding needed to cover miscellaneous costs: equipment maintenance and repair.
Overhead Labor and Indirect Costs - indirect overhead costs: payroll, insurance costs, processing, and general administration.

TABLE 6.
Breakdown of Cost Estimates for
Proposed CALFED Funded Tasks in Phase III*

Task	Direct Labor Hours	Direct Salary and Benefits	Service Contracts	Materials and Acquisition Costs	Miscellaneous and other Direct Costs	Overhead and Indirect Costs	Total Task Cost
Task 1- Growing season operations and maintenance	0	$0	$64,193	$8,100	$4,000	$0	$76,293
Task 2 - Invertebrate sampling, analysis, and reporting	40	$1000	$9,482	$0	$100	$0	$10,582
Task 3 - Water quality sampling, analysis, and reporting	40	$1000	$14,240	$0	$100	$0	$15,340
Task 4 - Water hyacinth eradication progress monitoring and reporting	415	$10,375	$0	$500	$100	$0	$10,975
Task 5 -Project Management	240	$6,000	$0	$0	$0	$0	$6,000
						PHASE III TOTAL	$119,190

* Phase III corresponds to all work to be completed between Jan. 1, 2002 and Dec. 31, 2002.

Direct Labor Hours - total number of person hours projected to accomplish the designated task and phase.
Direct Salary and Benefits - total amount of funding needed to compensate (in salary and benefits) direct labor hours necessary to accomplish the designated task and phase.
Service Contracts - funding needed to contract with outside entities to accomplish tasks that cannot be completed in-house. May include contracted spraying, aerial photography, or mechanical harvesting.
Materials and Acquisition Costs - funding needed to cover predictable material costs such as herbicides, spreader/stickers, drift control agents, fuel, and booming materials.
Miscellaneous and other Direct Costs - funding needed to cover miscellaneous costs: equipment maintenance and repair.
Overhead Labor and Indirect Costs - indirect overhead costs: payroll, insurance costs, processing, and general administration.

Schedule

Potential for Incremental CALFED Funding for Distinct Project Phases: Phases for the water hyacinth control program have been defined at one year intervals. Phase I will begin on Jan. 1, 2000 and end Dec. 31, 2000, followed by Phase II in 2001, and Phase III in 2002 (Table 7). CALFED could potentially fund one, two or three years of operations. Monitoring of invertebrates or water quality could also be eliminated from the program.

TABLE 7.
Start / Completion of Specific Tasks

Task	Phase 1 Start / Completion	Phase 2 Start / Completion	Phase 3 Start / Completion
Task 1: Growing Season Operations and Maintenance	Mar. 1, 2000 / Nov. 30, 2000	Mar. 1, 2001 / Nov. 30, 2001	Mar. 1, 2002 / Nov. 30, 2002
Task 2: Invertebrate Sampling	Jun. 1, 2000 / Nov. 30, 2000	Jun. 1, 2001 / Nov. 30, 2001	Jun. 1, 2002 / Nov. 30, 2002
Task 3: Water Quality Sampling	Jun. 1, 2000 / Nov. 30, 2000	Jun. 1, 2001 / Nov. 30, 2001	Jun. 1, 2002 / Nov. 30, 2002
Task 4: Water Hyacinth Monitoring	Feb. 1, 2000 / Dec. 31, 2000	Feb. 1, 2001 / Dec. 31, 2001	Feb. 1, 2002 / Dec. 31, 2002
Task 5: Project Management	Jan.1, 2000/ Dec. 31, 2000	Jan.1, 2001/ Dec. 31, 2001	Jan.1, 2002/ Dec. 31, 2002

IX. COST-SHARING

Since 1996, the agencies and private landowners of SLWHCG have supported SRCSD and USFWS control efforts with an average annual amount of $57,000 worth of equipment, materials, and in-kind services. In 1999, these same group participants are anticipated to contribute approximately $55,000 dollars in equipment, materials and in-kind service to an effort that will also be funded by $35,000 in grant funds from the National Fish and Wildlife Federation (NFWF) administered through the USFWS. This level of support (approximately $55,000 per year) is anticipated to remain constant until such time as the water hyacinth infestation has been reduced to a level that can be handled as part of the routine management of the Stone Lakes National Wildlife Refuge by the USFWS.

X. APPLICANT QUALIFICATIONS

Supervision of sub-contracted work, monitoring of water hyacinth condition, and preparation of quarterly and annual reports will be performed by Robert S. Miller. Mr. Miller's biosketch has been provided below. Jack Waegell, as Chairman of the FRCD, is the applicant for this funding (see biosketch below). Other voluntary members of FRCD will assist Mr. Waegell in overseeing the program. Program activities will be coordinated through Tom Harvey, Refuge Manager, USFWS, and Bryan Young, Natural Resource Supervisor, SRCSD, who will serve as consultants to FRCD (biosketches – Appendix D). Tom Harvey will also be responsible for the USFWS long-term maintenance program, after the intensive three-year project is completed. Sub-contracted work will include chemical application on water hyacinth, hand removal of water hyacinth, and collection of samples for the biomonitoring program. All assigned sprayers will be trained in the safe and effective handling of herbicides, and recognition of sensitive plant species. Qualified research consultants will collect samples for biomonitoring tasks. Analysis of biomonitoring samples will be sub-contracted out to qualified laboratories.

Collaborating Parties

Private Landowners - Will continue to control hyacinth within their property borders through chemical applications and mechanical removal. Chemical applications will be coordinated through the FRCD.
California Department of Boating and Waterways (CDBW)- Will continue to serve as a consultant to FRCD. Through regular steering meetings, this agency will assist in prioritizing areas of treatment, developing methods of treatment, and keeping program participants updated on technological advances made in hyacinth control elsewhere in the state, country, and world. This agency will also lend support of additional hyacinth spray crews or spray equipment, as needed, on an emergency basis.
Sacramento Regional County Sanitation District (SRCSD) - Along with California Department of Boating and Waterways (CDBW), SRCSD will continue to serve as a consultant to FRCD. Through regular steering meetings,

this agency will assist in prioritizing areas of treatment, developing methods of treatment, and implement a community outreach program. SRCSD staff will also continue to control hyacinth on adjacent County-owned property. Bryan Young, Natural Resource Supervisor, is the principal SRCSD participant in the water hyacinth program. A brief biosketch of Mr. Young is included in the following section.

U.S. Fish and Wildlife Service (USFWS) - Along with California Department of Boating and Waterways (CDBW), USFWS will continue to serve as a primary consultant to FRCD. Through regular steering meetings, this agency will assist in prioritizing areas of treatment, developing methods of treatment, and implementing a community outreach program. USFWS staff will also continue to control hyacinth chemically and mechanically and assist with the monitoring program. Tom Harvey, manager of the Stones Lake National Wildlife Refuge, is the principal USFWS participant in the water hyacinth program. A brief biosketch of Mr. Harvey is included in the following section.

Sac-Yolo Mosquito and Vector Control District - Will continue to chemically treat hyacinth as directed by FRCD.

Biosketches of Key Participants

Robert S. Miller - President, Robert S. Miller & Associates Engineering Consultants

Education
B.S. Civil Engineer, University of New Mexico, Albuquerque
Licenses
State of California, Professional Engineer, Agriculture
Hyacinth and Related Experience

1948-1981 U.S. Department of Agriculture Soil Conservation Service – Various positions up to and including Assistant State (CA) Engineer. Three years on loan to State Water Resources Control Board from USDA as an Agricultural Advisor to the Board advising on all aspects of agriculture including pest control. During this time was active in monitoring water quality. Supervised 40 engineers state wide.

1981-1983 Project engineer and agricultural supervisor for one million acre development in Chaco area of Paraguay S.A. Integrated pest management was part of overall plan and eradication of hyacinth and other noxious weeds was a part of the activities. Supervised spray, land leveling, survey, labor crews.

1983-Present Robert S. Miller & Associates Engineering Consultants Wetland design and development, wetland rehabilitation and restoration, and wetland mitigation. Have worked on over 70,000 acres in Arizona, California, Oregon, Washington and Hawaii some of which involved eradication of hyacinth, tamarisk, pickle weed, fragimites and other noxious weeds. This work developed habitat for waterfowl as well as special status species throughout the several states.

Jack Waegell - Chairman, Florin Resource Conservation District

Education
B.S. Plant Science, University of Davis, CA
Service on Boards
Chairman, Florin Resource Conservation District, 1985-1999
Director, Florin Soil Resource Conservation District, 1965-1985
President, Waegell Bros. Inc.
Director, Sacramento County Farm Bureau, 1965-1990
Experience
General farming of 1000 acres in eastern portion of Sacramento County.
Diversified farming of: wheat, corn, clover seed, sudane seed, hay, sheep, and cattle.

VI. COMPLIANCE WITH STANDARD TERMS AND CONDITIONS

The applicant /principal investigator, Jack Waegell, as a representative of the Florin Resource Conservation District Economic Development Corporation, is agreeable to and able to comply with all terms and conditions set forth in the Category III February 1999 Proposal Solicitation Package. PSP Table D indicates that the applicant is required to submit a Nondiscrimination Compliance Statement (attached) and a Small Business Preference form (attached).

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Appendix A -
Biomonitoring program for 2000 - 2002 Water Hyacinth Control Program
in the Stone Lakes Basin

The biomonitoring program is derived from a California Fish and Game protocol (1996) designed to assess the biological impact of aquatic herbicide application. The procedures include:

a) chemical analyses of water for diquat dibromide (Reward®) and glyphosate (Rodeo®) residues; and
b) population monitoring of benthic (bottom dwelling) and planktonic (free swimming) invertebrates.

Water will be tested for either diquat dibromide or glyphosate, depending on which chemical is used during the month to be sampled. Field sample collection, storage of samples and transport will be the responsibility of contracted research staff. However, water and invertebrate samples will be precessed by the BSK Analytical Laboratories and Fish and Game Water Pollution Control Lab, respectively. Invertebrates will be sampled and processed according to the California Lentic Bioassessment Procedures (California Department of Fish and Game 1996).

Sampling Stations: FRCD staff will select three sampling sites within the Stone Lakes Basin. Two sites will be within herbicide treatment areas. One site, which will not be treated, will serve as a control. At each site, researchers will establish a transect using the Global Position System (GPS). Two samples will be collected at each transect for a total of six sample locations.

Water Sample Collection Schedule: At each location, one set of samples will be collected for each month; June, July, August, September, October. One set consists of four samples:

1) one day prior to treatment
2) day of treatment (4-6 hrs)
3) two days post treatment
4) four days post treatment

3 transects x 2 sample sites each = 6 samples/day x 4 days/month = 24 samples/month
24 samples/month x 5 month of sampling per year = 120 samples/year
120 samples/year x 3 years = 360 total water samples

Invertebrate Sample Collection Schedule: At each location, one set of samples will be collected each month; June, August, and October. One set consists of three samples:

1) one day prior to treatment
2) eight days post treatment
3) sixteen days post treatment

3 transects x 2 samples sites each = 6 samples/day x 3 days/month = 18 samples/month
18 samples/month x three months/year = 54 samples/year
54 samples/year x 3 years = 162 total invertebrate samples

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Appendix B-

Letter to County of Sacramento:
Directed to Supervisor Don Nottoli
(following one page)

I-019839

Stressors-Invasive Aquatic Plants, pg 451
or Sac-San Joaquin Delta Ecological
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