

STATE OF CALIFORNIA

**STANDARD AGREEMENT**

STD 213 (Rev 06/03)(CA ST PKS, EXCEL 6/1/2016)

AGREEMENT NUMBER C1770800
REGISTRATION NUMBER

1. This Agreement is entered into between the State Agency and Contractor named below:

STATE AGENCY'S NAME

Department of Parks and Recreation

CONTRACTOR'S NAME

County of Fresno, Department of Agriculture

2. The term of this Agreement is: January 1, 2018 through December 31, 2018

3. The maximum amount of this Agreement is: \$ 17,042.36  
Seventeen Thousand Forty Two Dollars and Thirty Six Cents

4. The parties agree to comply with the terms and conditions of the following exhibits which are by this reference made a part of the Agreement.

Exhibit A - Scope of Work	1 page
Exhibit A - Attachment 1, Treatment of Water Hyacinth in the San Joaquin River	2 pages
Exhibit B - Budget Detail and Payment Provisions	1 page
Exhibit B - Attachment 2, Cost Sheet	1 page
Exhibit C* - General Terms and Conditions	GTC 04/2017
Check mark one item below as Exhibit D:	
<input checked="" type="checkbox"/> Exhibit - D Special Terms and Conditions (Attached hereto as part of this agreement)	2 pages
<input type="checkbox"/> Exhibit - D* Special Terms and Conditions	
Exhibit D - Attachment A, USFWS Biological Opinion - Section 7 Permit	76 pages
Exhibit D** - Attachment B, Statewide General NPDES Permit No. CAG990005	86 pages
Exhibit D - Attachment C, NMFS Biological Opinion	12 pages
Exhibit D - Attachment D, Water Hyacinth Protocol	14 pages



Items shown with an Asterisk (\*), are hereby incorporated by reference and made part of this agreement as if attached hereto. These documents can be viewed at <http://www.dgs.ca.gov/ols/Resources/StandardContractLanguage.aspx>  
 Items shown with a double Asterisk (\*\*), are hereby incorporated by reference and made part of this agreement as if attached hereto. This document can be viewed at [http://www.waterboards.ca.gov/water\\_issues/programs/npdes/pesticides/weed\\_control.shtml](http://www.waterboards.ca.gov/water_issues/programs/npdes/pesticides/weed_control.shtml)

IN WITNESS WHEREOF, this Agreement has been executed by the parties hereto.

CONTRACTOR	
CONTRACTOR'S NAME (if other than an individual, state whether a corporation, partnership, etc.) County of Fresno, Department of Agriculture	
BY (Authorized Signature) 	DATE SIGNED (Do not type) 9-12-17
PRINTED NAME AND TITLE OF PERSON SIGNING BRIAN PACHECO, CHAIRMAN, Board of Supervisors	
ADDRESS 1730 S. Maple Avenue Fresno, CA 93702-4516	
STATE OF CALIFORNIA	
AGENCY NAME Department of Parks and Recreation	
BY (Authorized Signature) 	DATE SIGNED (Do not type) 10/4/17
PRINTED NAME AND TITLE OF PERSON SIGNING Lynn Sadler, Deputy Director	
ADDRESS 1 Capitol Mall, Suite 500 Sacramento, CA 95814	

California Department of General Services Use Only
<b>D.G.S. APPROVAL NOT REQUIRED</b>
<input type="checkbox"/> Exempt per:

ATTEST:  
BERNICE E. SEIDEL, Clerk  
Board of Supervisors  
By Susan Bishop Deputy

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## COST SHEET

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### SUPERVISION/ADMINISTRATION

Classification Supervising Agricultural Standards Specialist

Hours	5
Hourly Rate	\$61.04
Labor Costs	<u>\$305.20</u>

### SURVEY/TREATMENT BY BOAT

Classification Agricultural Standards Specialist

Hours	360
Hourly Rate	\$36.34
Labor Costs	<u>\$13,082.40</u>

TOTAL PERSONNEL SERVICES	\$13,387.60
10% Indirect Costs	\$1,338.76

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**TOTAL LABOR** **\$14,726.36**

### VEHICLES

Vehicle Mileage	2,500
Cost per Mile	0.54

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**TOTAL MILEAGE COSTS** **\$1,350.00**

Equipment Maintenance/Purchases \$700.00

### SUPPLIES/MATERIALS

Rodeo (currently no cost)	0
Agridex (Supplied by DBW)	0
Supplies	\$266.00

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**TOTAL EQUIPMENT MAINTENANCE,  
PURCHASES, SUPPLIES & MATERIALS** **\$966.00**

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**GRAND TOTAL FOR 1 YEAR: \$17,042.36**

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**EXHIBIT A  
(Standard Agreement)**

**SCOPE OF WORK**

1. Contractor agrees to provide to the Department of Parks and Recreation, Division of Boating and Waterways (DBW), Water Hyacinth treatment services as described herein:

The Contractor shall initiate and carry out an effective Water Hyacinth control program on the San Joaquin River and adjacent waterways (tributaries) within the boundaries of the County of Fresno. The program shall consist of approximately 360 hours of labor for Water Hyacinth treatment, and approximately 5 hours of administration and supervision.

The treatment shall consist of topical herbicide application and other methods as necessary to effectively reduce Water Hyacinth plant growth.

2. The services shall be performed at:  
Tributaries of the San Joaquin River in the County of Fresno.
3. The services shall be provided during:  
The peak season of the Water Hyacinth plant growth, May through October. Services shall be provided Monday through Friday.
4. The project representatives during the term of this Agreement will be:

State Agency:	Department of Parks and Recreation	Contractor:	County of Fresno, Dept. of Agriculture
Section/Unit:	Division of Boating and Waterways	Section/Unit:	Weed and Vertebrate Control Unit
Attention:	Angela Llaban	Attention:	Mike Konda
Address:	1 Capitol Mall, Suite 410	Address:	1730 S. Maple Avenue
City/State/Zip Code:	Sacramento, CA 95814	City/State/Zip Code:	Fresno, CA 93702
Phone:	(916) 327-1859	Phone:	(559) 600-7510
Fax:	(916) 327-1775	Fax:	
E-mail Address:	<a href="mailto:Angela.Llaban@parks.ca.gov">Angela.Llaban@parks.ca.gov</a>	E-mail Address:	<a href="mailto:Mkonda@co.fresno.ca.us">Mkonda@co.fresno.ca.us</a>

## **SCOPE OF WORK**

### **1. Definitions**

- A. "Loaned Equipment" means boats, trailers, pumps, GPS devices, or any other equipment loaned by the Department of Parks and Recreation, Division of Boating and Waterways (DBW) to the County of Fresno for the Water Hyacinth Control Program.
- B. "Purchased Equipment" means equipment purchased with DBW funds for use in the Water Hyacinth Control Program, which shall remain the property of the DBW.

### **2. Scope of Work**

(DBW) enters into an agreement with the County of Fresno (Contractor) to treat Water Hyacinth in the San Joaquin River and its tributaries within Fresno County. The proposed work shall be as follows.

- A. No Water Hyacinth treatment shall take place until confirmed by DBW. The Biological Opinions written by the United States Fish and Wildlife Service (USFWS dated 3/13/13) and National Oceanic and Atmospheric Administration with National Marine Fisheries Service (NOAA, NMFS dated 2/27/13) are attached to this agreement as Exhibit D, Attachment A and Exhibit D, Attachment C. The Contractor will abide by all regulatory provisions governing at the time of treatment as detailed in the Biological Opinions pursuant to Section 7 of the Endangered Species Act of 1973 (ESA 12/28/73 as amended 16 U.S.C. 1531 et seq). The Contractor will be held responsible for any fines associated with violations of the provisions set forth in ESA Section 7 permits that may occur within their Water Hyacinth Control Program jurisdiction as described within the Scope of Work, part C, of this Agreement.
- B. The Contractor shall follow all regulations set forth in the provisions of the National Pollutant Discharge Elimination System (NPDES) permit which has been issued and governing at the time of treatment, to DBW by the State Water Resources Control Board. The NPDES permit (renewed 3/20/13) is incorporated into this contract by reference and may be referred to herein. The Contractor shall be held responsible for any fines associated with violations of the provisions of the NPDES permit that may occur within their Water Hyacinth Control Program jurisdiction as described within the Scope of Work, part C, of this Agreement.
- C. The Contractor shall initiate and carry out an effective Water Hyacinth Control Program on the San Joaquin River and adjacent waterways (tributaries) within the boundaries of Fresno County.
- D. The program shall consist of approximately 360 hours of Water Hyacinth treatment labor and approximately 5 hours of administration and supervision.
- E. The treatment shall consist of topical herbicide application and other methods as necessary to effectively reduce Water Hyacinth plant growth.

**COUNTY OF FRESNO,  
DEPARTMENT OF AGRICULTURE  
AGREEMENT - C1770800  
EXHIBIT A, ATTACHMENT I**

- F. DBW shall provide the Contractor, to the best of the DBW's ability, herbicides and loaned equipment. The Contractor shall maintain the loaned equipment in good working condition and repair.
- G. All property purchased with funds from the agreement shall remain the property of DBW.
- H. The Contractor agrees to repair or replace any equipment loaned or purchased under this contract if lost, stolen, or damaged.
- I. The Contractor shall take a physical inventory of any equipment purchased under this agreement and reconcile the inventory with the property records at least annually to verify the existence, current utilization, and continued need for equipment. Contractor shall keep complete and accurate records of all expenditure pertaining to the purchase of additional equipment and the operation and maintenance of DBW funded vessels; such records shall be available and open to DBW for inspection and audit by any authorized DBW representative during business hours.
- J. Property records shall be maintained by the Contractor and provided to DBW on an annual basis. Such records shall include a description of the property, manufacturer, serial number or other identification number, property location, and condition.

**3. Project Representatives**

Either party may make changes to the information above by giving the Project Representative ten (10) days written notice to the other party. Said changes shall not require an amendment to this Agreement.

**EXHIBIT B  
(Standard Agreement)**

**BUDGET DETAIL AND PAYMENT PROVISIONS**

**1. Invoicing and Payment**

- A. For services satisfactorily rendered, and upon receipt and approval of the invoices, the State agrees to compensate the Contractor for actual expenditures incurred in accordance with the rates specified in \_\_\_\_\_ Cost Sheet \_\_\_\_\_, marked Exhibit B, Attachment 1, which is attached hereto and made a part of this Agreement.
- B. Itemized invoices shall include the Agreement Number, service period covered by the invoice, and shall be submitted in triplicate not more frequently than monthly in arrears to:

California State Parks  
Division of Boating and Waterways  
Attn: Contract Analyst  
1 Capitol Mall, Suite 410  
Sacramento, CA 95814

**2. Budget Contingency Clause**

- A. It is mutually agreed that if the Budget Act of the current year and/or any subsequent years covered under this Agreement does not appropriate sufficient funds for the program, this Agreement shall be of no further force and effect. In this event, the State shall have no liability to pay any funds whatsoever to Contractor or to furnish any other considerations under this Agreement and Contractor shall not be obligated to perform any provisions of this Agreement.
- B. If funding for any fiscal year is reduced or deleted by the Budget Act for purposes of this program, the State shall have the option to either cancel this Agreement with no liability occurring to the State, or offer an agreement amendment to Contractor to reflect the reduced amount.

**3. Prompt Payment Clause**

Payment will be made in accordance with, and within the time specified in, Government Code Chapter 4.5, commencing with Section 927.

**4. Timely Submission of Final Invoice**

- A. A final undisputed invoice shall be submitted for payment no more than ninety (90) calendar days following expiration or termination date of this Agreement, unless a later or alternate deadline is agreed to in writing by the project representative. Said invoice should be clearly marked "Final Invoice," thus indicating that all payment obligations of the State under this Agreement have ceased and that no further payments are due or outstanding.
- B. The State may, at its discretion, choose not to honor any delinquent final invoice if the Contractor fails to obtain prior written State approval of an alternate final invoice submission deadline. Written State approval shall be sought from the project representative prior to the expiration or termination date of this Agreement.

**5. Travel and Per Diem**

- A. Any reimbursement for necessary traveling and per diem shall be at rates not to exceed those amounts paid to the state's represented employees under collective bargaining Agreements currently in effect. No travel outside the State of California shall be reimbursed unless prior written authorization is obtained from DBW.

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# COST SHEET

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## SUPERVISION/ADMINISTRATION

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Classification	Supervising Agricultural Standards Specialist
Hours	5
Hourly Rate	\$61.04
Labor Costs	<u>\$305.20</u>

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<b>TOTAL LABOR</b>	<b>\$14,726.36</b>

## VEHICLES

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Vehicle Mileage	2,500
Cost per Mile	0.54
<b>TOTAL MILEAGE COSTS</b>	<b>\$1,350.00</b>

Equipment Maintenance/Purchases	\$700.00
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## SUPPLIES/MATERIALS

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<b>TOTAL EQUIPMENT MAINTENANCE, PURCHASES, SUPPLIES &amp; MATERIALS</b>	<b>\$966.00</b>
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**GRAND TOTAL FOR 1 YEAR: \$17,042.36**

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EXHIBIT C

GENERAL TERMS AND CONDITIONS

1. APPROVAL: This Agreement is of no force or effect until signed by both parties and approved by the Department of General Services, if required. Contractor may not commence performance until such approval has been obtained.
2. AMENDMENT: No amendment or variation of the terms of this Agreement shall be valid unless made in writing, signed by the parties and approved as required. No oral understanding or Agreement not incorporated in the Agreement is binding on any of the parties.
3. ASSIGNMENT: This Agreement is not assignable by the Contractor, either in whole or in part, without the consent of the State in the form of a formal written amendment.
4. AUDIT: Contractor agrees that the awarding department, the Department of General Services, the Bureau of State Audits, or their designated representative shall have the right to review and to copy any records and supporting documentation pertaining to the performance of this Agreement. Contractor agrees to maintain such records for possible audit for a minimum of three (3) years after final payment, unless a longer period of records retention is stipulated. Contractor agrees to allow the auditor(s) access to such records during normal business hours and to allow interviews of any employees who might reasonably have information related to such records. Further, Contractor agrees to include a similar right of the State to audit records and interview staff in any subcontract related to performance of this Agreement. (Gov. Code §8546.7, Pub. Contract Code §10115 et seq., CCR Title 2, Section 1896).
5. INDEMNIFICATION: Contractor agrees to indemnify, defend and save harmless the State, its officers, agents and employees from any and all claims and losses accruing or resulting to any and all contractors, subcontractors, suppliers, laborers, and any other person, firm or corporation furnishing or supplying work services, materials, or supplies in connection with the performance of this Agreement, and from any and all claims and losses accruing or resulting to any person, firm or corporation who may be injured or damaged by Contractor in the performance of this Agreement.
6. DISPUTES: Contractor shall continue with the responsibilities under this Agreement during any dispute.
7. TERMINATION FOR CAUSE: The State may terminate this Agreement and be relieved of any payments should the Contractor fail to perform the requirements of this Agreement at the time and in the manner herein provided. In the event of such termination the State may proceed with the work in any manner deemed proper by the State. All costs to the State shall be deducted from any sum due the Contractor under this Agreement and the balance, if any, shall be paid to the Contractor upon demand.

8. INDEPENDENT CONTRACTOR: Contractor, and the agents and employees of Contractor, in the performance of this Agreement, shall act in an independent capacity and not as officers or employees or agents of the State.

9. RECYCLING CERTIFICATION: The Contractor shall certify in writing under penalty of perjury, the minimum, if not exact, percentage of post consumer material as defined in the Public Contract Code Section 12200, in products, materials, goods, or supplies offered or sold to the State regardless of whether the product meets the requirements of Public Contract Code Section 12209. With respect to printer or duplication cartridges that comply with the requirements of Section 12156(e), the certification required by this subdivision shall specify that the cartridges so comply (Pub. Contract Code §12205).

10. NON-DISCRIMINATION CLAUSE: During the performance of this Agreement, Contractor and its subcontractors shall not deny the contract's benefits to any person on the basis of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status. Contractor shall insure that the evaluation and treatment of employees and applicants for employment are free of such discrimination. Contractor and subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Gov. Code §12900 et seq.), the regulations promulgated thereunder (Cal. Code Regs., tit. 2, §11000 et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (Gov. Code §§11135-11139.5), and the regulations or standards adopted by the awarding state agency to implement such article. Contractor shall permit access by representatives of the Department of Fair Employment and Housing and the awarding state agency upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours' notice, to such of its books, records, accounts, and all other sources of information and its facilities as said Department or Agency shall require to ascertain compliance with this clause. Contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. (See Cal. Code Regs., tit. 2, §11105.)

Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the Agreement.

11. CERTIFICATION CLAUSES: The CONTRACTOR CERTIFICATION CLAUSES contained in the document CCC 04/2017 are hereby incorporated by reference and made a part of this Agreement by this reference as if attached hereto.

12. TIMELINESS: Time is of the essence in this Agreement.

13. COMPENSATION: The consideration to be paid Contractor, as provided herein, shall be in compensation for all of Contractor's expenses incurred in the performance hereof, including travel, per diem, and taxes, unless otherwise expressly so provided.

14. GOVERNING LAW: This contract is governed by and shall be interpreted in accordance with the laws of the State of California.

15. ANTITRUST CLAIMS: The Contractor by signing this agreement hereby certifies that if these services or goods are obtained by means of a competitive bid, the Contractor shall comply with the requirements of the Government Codes Sections set out below.

a. The Government Code Chapter on Antitrust claims contains the following definitions:

1) "Public purchase" means a purchase by means of competitive bids of goods, services, or materials by the State or any of its political subdivisions or public agencies on whose behalf the Attorney General may bring an action pursuant to subdivision (c) of Section 16750 of the Business and Professions Code.

2) "Public purchasing body" means the State or the subdivision or agency making a public purchase. Government Code Section 4550.

b. In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder. Government Code Section 4552.

c. If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery. Government Code Section 4553.

d. Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action. See Government Code Section 4554.

16. CHILD SUPPORT COMPLIANCE ACT: For any Agreement in excess of \$100,000, the contractor acknowledges in accordance with Public Contract Code 7110, that:

a. The contractor recognizes the importance of child and family support obligations and shall fully comply with all applicable state and federal laws relating to child and family support

enforcement, including, but not limited to, disclosure of information and compliance with earnings assignment orders, as provided in Chapter 8 (commencing with section 5200) of Part 5 of Division 9 of the Family Code; and

b. The contractor, to the best of its knowledge is fully complying with the earnings assignment orders of all employees and is providing the names of all new employees to the New Hire Registry maintained by the California Employment Development Department.

17. UNENFORCEABLE PROVISION: In the event that any provision of this Agreement is unenforceable or held to be unenforceable, then the parties agree that all other provisions of this Agreement have force and effect and shall not be affected thereby.

18. PRIORITY HIRING CONSIDERATIONS: If this Contract includes services in excess of \$200,000, the Contractor shall give priority consideration in filling vacancies in positions funded by the Contract to qualified recipients of aid under Welfare and Institutions Code Section 11200 in accordance with Pub. Contract Code §10353.

19. SMALL BUSINESS PARTICIPATION AND DVBE PARTICIPATION REPORTING REQUIREMENTS:

a. If for this Contract Contractor made a commitment to achieve small business participation, then Contractor must within 60 days of receiving final payment under this Contract (or within such other time period as may be specified elsewhere in this Contract) report to the awarding department the actual percentage of small business participation that was achieved. (Govt. Code § 14841.)

b. If for this Contract Contractor made a commitment to achieve disabled veteran business enterprise (DVBE) participation, then Contractor must within 60 days of receiving final payment under this Contract (or within such other time period as may be specified elsewhere in this Contract) certify in a report to the awarding department: (1) the total amount the prime Contractor received under the Contract; (2) the name and address of the DVBE(s) that participated in the performance of the Contract; (3) the amount each DVBE received from the prime Contractor; (4) that all payments under the Contract have been made to the DVBE; and (5) the actual percentage of DVBE participation that was achieved. A person or entity that knowingly provides false information shall be subject to a civil penalty for each violation. (Mil. & Vets. Code § 999.5(d); Govt. Code § 14841.)

20. LOSS LEADER:

If this contract involves the furnishing of equipment, materials, or supplies then the following statement is incorporated: It is unlawful for any person engaged in business within this state to sell or use any article or product as a "loss leader" as defined in Section 17030 of the Business and Professions Code. (PCC 10344(e).)

**EXHIBIT D — PUBLIC ENTITY  
(Standard Agreement)**

**SPECIAL TERMS AND CONDITIONS**

**1. Disputes**

Unless otherwise provided in this agreement, any dispute concerning a question of fact arising under this agreement which cannot be resolved informally shall be decided by the following two-step procedures.

Contractor must provide written notice of the particulars of such disputes to the Project Manager or his/her duly appointed representative. The Project Manager must respond in writing within ten (10) working days of receipt of the written notice of dispute. Should Contractor disagree with the Project Manager's decision, Contractor may appeal to the second level. Pending the decision on appeal, Contractor shall proceed diligently with the performance of this agreement in accordance with the Project Manager's decision. The second level appeal must indicate why the Project Manager's decision is unacceptable, attaching to it Contractor's original statement of the dispute with supporting documents, along with a copy of the Project Manager's response. The second level appeal shall be sent to the Deputy Director of Administrative Services or his/her duly appointed representative. The second level appeal must be filed within fifteen (15) working days of receipt of the Project Manager's decision. Failure to submit an appeal within the period specified shall constitute a waiver of all such right to an adjustment of this agreement. The Deputy Director or designee shall meet with Contractor to review the issues raised. A written decision signed by the Deputy Director or designee shall be returned to Contractor within fifteen (15) working days of the receipt of the appeal.

**2. Termination for Convenience**

State reserves the right to terminate this agreement subject to 30 days written notice to Contractor. Contractor may submit a written request to terminate this agreement only if State should substantially fail to perform its responsibilities as provided herein.

**3. Force Majeure**

Except for defaults of subcontractors, neither party shall be responsible for delays or failures in performance resulting from acts beyond the control of the offending party. Such acts shall include but shall not be limited to acts of God, fire, flood, earthquake, other natural disaster, nuclear accident, strike, lockout, riot, freight embargo, public regulated utility, or governmental statutes or regulations superimposed after the fact. If a delay or failure in performance by Contractor arises out of a default of its subcontractor, and if such default of its subcontractor, arises out of causes beyond the control of both Contractor and subcontractor, and without the fault or negligence of either of them, Contractor shall not be liable for damages of such delay or failure, unless the supplies or services to be furnished by subcontractor were obtainable from other sources in sufficient time to permit Contractor to meet the required performance schedule.

**4. Forced, Convict, and Indentured Labor**

No foreign-made equipment, materials, or supplies furnished to State pursuant to this agreement may be produced in whole or in part by forced labor, convict labor, or indentured labor. By submitting a bid to State or accepting a purchase order, Contractor agrees to comply with this provision of this agreement.

**5. Potential Subcontractors**

Nothing contained in this agreement or otherwise, shall create any contractual relation between State and any subcontractors, and no subcontract shall relieve Contractor of its responsibilities and obligations hereunder. Contractor agrees to be as fully responsible to State for the acts and omissions of its subcontractors and of persons either directly or indirectly employed by any of them as it is for the acts and omissions of persons directly employed by Contractor. Contractor's obligation to pay its subcontractors is an independent obligation from State's obligation to make payments to Contractor. As a result, State shall have no obligation to pay or to enforce the payment of any moneys to any subcontractor.

**6. Priority Hiring Considerations for Contracts with a Value of \$200,000**

If the resulting agreement will have a total value of \$200,000 or more, Contractor is hereby advised that it will be obligated to give priority consideration in filling vacancies in positions funded by the resulting agreement to qualified recipients of aid under Welfare and Institutions Code Section 11200. This requirement shall not interfere with or require a violation of a collective bargaining agreement, a federal affirmative action obligation for hiring disabled veterans of the Vietnam era, or nondiscrimination compliance laws of California and does not require the employment of unqualified recipients of aid.

**7. Intellectual Property**

Any works developed during and/or pursuant to this agreement by Contractor, including all related copyrights and other proprietary rights therein, as may now exist and/or which hereafter come into existence, shall belong to State upon creation, and shall continue in State's exclusive ownership upon termination of this agreement. Contractor further intends and agrees to assign to State all right, title and interest in and to such materials as well as all related copyrights and other proprietary rights therein.

Contractor agrees to cooperate with State and to execute any document or documents that may be found to be necessary to give the foregoing provisions full force and effect, including but not limited to, an assignment of copyright.

Contractor agrees not to incorporate into or make the works developed, dependent upon any original works of authorship or Intellectual Property Rights of third parties without first (a) obtaining State's prior written permission, and (b) granting to or obtaining for State a nonexclusive, royalty-free, paid-up, irrevocable, perpetual, world-wide license, to use, reproduce, sell, modify, publicly and privately display and distribute, for any purpose whatsoever, any such prior works.

**8. Contractor's Duties, Obligations and Rights**

Contractor is hereby apprised that California Public Contract Code Section 10335 through 10381 are applicable relative to Contractor's duties, obligations, and rights in performing the agreement.



## United States Department of the Interior

### FISH AND WILDLIFE SERVICE

San Francisco Bay-Delta Fish and Wildlife Office  
650 Capitol Mall, Suite 8-300  
Sacramento, California 95814



IN REPLY REFER TO:  
81410-2013-F-0005

Dr. Raymond Carruthers  
Research Leader/Ecologist  
United States Department of Agriculture  
Agriculture Research Service  
Exotic and Invasive Weed Research Unit  
800 Buchanan Street  
Albany, California 94710

**MAR 13 2013**

Subject: 2013 Water Hyacinth Control Program in the Sacramento-San Joaquin  
Delta within Eleven Counties, California

Dear Dr. Carruthers:

This letter is in response to the U.S. Department of Agriculture's Agriculture Research Service's (USDA-ARS) October 25, 2012, letter requesting consultation with the U.S. Fish and Wildlife Service (Service) on the proposed State of California Department of Boating and Waterways (CDBW) 2013-2017 Water Hyacinth Control Program (WHCP) in the Sacramento-San Joaquin Delta (Delta) and its tributaries. Your consultation initiation letter was received in our San Francisco Bay-Delta Office (BDFWO) on October 25, 2012, and your subsequent February 14, 2013, electronic mail (e-mail) was received in our office with updates to your project description. USDA-ARS requested consultation for the federally-threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (VELB) and its critical habitat, giant garter snake (*Thamnophis gigas*) (GGS), and the delta smelt (*Hypomesus transpacificus*) and its critical habitat. This response is in accordance with Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

The USDA-ARS determined that the action may affect, but is not likely to adversely affect the federally-threatened GGS and VELB and its critical habitat. The applicant proposes to implement Conservation Measures (page 21), as described in the Project Description, to avoid adverse effects to GGS and VELB and its critical habitat. The Service concurs with your determination that the project may affect, but will not likely adversely affect the federally-listed GGS or VELB as a result of the proposed action based on the applicant's strict implementation of the proposed Conservation Measures and the proposed WHCP treatment restrictions. No critical habitat has been designated for GGS, and as such none will be adversely modified or destroyed. Critical habitat has been designated for VELB on the American River in Sacramento County; however, the WHCP does not conduct operations within the area and therefore no destruction or adverse modification of VELB critical habitat is anticipated.

Dr. Raymond I. Carruthers

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On June 1, 2001, the Service issued a biological opinion (BO) for the WHCP (Service file No. 1-1-01-F-0050). This biological opinion was subsequently amended five times (Service file No.'s 1-1-02-F-0157, 1-1-03-F-0114, 1-1-04-F-0113, and 81410-2011-F-0035). This current consultation for the 2013-2017 WHCP was submitted to the Service due to changes in the project description and updates to the delta smelt status of the species that have occurred since issuance of the previous BOs and amendments.

This document hereby represents the Service's BO on the effects of CDBW's WHCP the Sacramento-San Joaquin Delta and its tributaries on the federally-threatened delta smelt and its critical habitat. This BO supersedes the Service's June 1, 2001, biological opinion and its amendments.

This biological opinion is based on the following information:

- 1) The USDA-ARS and CDBW October 25, 2012, *Water Hyacinth Control Program Biological Assessment (BA) and Supplemental Materials Binder (BA Binder)*;
- 2) The CDBW's November 20, 2009, Programmatic Environmental Impact Report Volume I, II, and III;
- 3) The CDBW's WHCP 2009, 2010, 2011, and 2012 Annual Reports;
- 4) The CDBW's February 14, 2013, e-mail titled *WHCP-Responses to Questions Raised by the Service*;
- 5) Numerous electronic mails, phone conversations, and meetings between the CDBW, USDA-ARS, National Marine Fisheries Service (NMFS), and the Service between October 2012 and March 2013; and
- 6) other information available to the service.

### CONSULTATION HISTORY

June 1, 2001	The Service issued a BO (Service file No. 1-1-01-F-0050) to the USDA-ARS. Associated amendments were written by the Service the following three years (Service file No.'s 1-1-02-F-0157, 1-1-03-F-0114, and 1-1-04-F-0113).
April 27, 2011	USDA-ARS issued a letter requesting reinstitution of formal consultation for the WHCP.

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June 30, 2011	The Service issued a letter to USDA-ARS for the WHCP requesting additional information regarding potential effects. The Service determined the WHCP may continue to operate under the Service's May 21, 2004, biological opinion (Service file number 1-1-04-F-0149) for the 2011 treatment season.
October 19, 2011	USDA-ARS issued a letter requesting to extend the WHCP to November 30, 2011.
October 31, 2011	The Service issued a letter stating that no extension was required as long as the WHCP was operating as the project was described within the latest May 21, 2004, amended biological opinion (Service File No. 1-1-04-F-0113).
January 18, 2012	The Service met with CDBW, USDA-ARS, and NMFS to discuss the proposed 2012 WHCP and the project's federal nexus.
March 5, 2012	The USDA-ARS issued a letter requesting reinitiation of formal consultation.
March 23, 2012	The USDA-ARS provided additional information to the Service responding to the Service's June 30, 2011, request for more information.
March 30, 2012	The Service met with CDBW, USDA-ARS, and NMFS to further discuss the 2012 WHCP.
December 2011 through June 2012	The Service, the USDA-ARS and the CDBW exchanged e-mail communications regarding the 2012 project description.
October 25, 2012	The Service received a letter from USDA requesting formal ESA section 7 consultation on the 2013-2017 WHCP. The Service also received a BA and a BA Binder prepared by USDA and CDBW for the consultation.
December 12, 2012	The Service requested a meeting to discuss numerous updates to the 2013-2017 WHCP project description.
January 3, 2013	The Service received a copy of information regarding changes to the project description that had been provided to the National Marine Fisheries Service (NMFS) by the USDA-ARS on January 3, 2013.

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January 16, 2013                   The Service held a meeting with USDA-ARS, CDBW and the Newpoint Group at the BDFWO to discuss 2013-2017 WHCP project description changes.

January 2013 to                   The Service, the USDA-ARS, and the CDBW  
March 1, 2013                   communications regarding the 2013-2017 WHCP project description.

## **BIOLOGICAL OPINION**

### **Description of the proposed action**

The WHCP is an aquatic weed program designed to control the growth and spread of the non-native invasive plant, water hyacinth (*Eichhornia crasipes*), in the Delta and its tributaries. Water hyacinth forms dense mats that interfere with navigation, recreation, irrigation, power generation, and native aquatic flora and fauna. These mats competitively exclude native submersed and floating-leaved plants which are part of the habitat used by listed species and their forage base. Low oxygen conditions develop beneath water hyacinth mats and the dense floating mats impede water flow and create good breeding conditions for mosquitoes (CALFED, ERP Vol. 1, 2000).

The USDA-ARS serves as the Federal nexus for the WHCP which is managed by the CDBW. The proposed program consists of an integrated and adaptive approach, emphasizing chemical treatment, supported by hand-picking, herding, mechanical removal, and continued assessment of biological controls, adjusting over time, as treatment methods, technology, and environmental factors change.

Selected primary program herbicides will be 2,4-Dichlorophenoxyacetic acid, dimethylamine (DMA) salt, or 2,4-D) and glyphosate, with 2,4-D being used for the majority of treatments. Beginning in 2013, WHCP proposes to add two new herbicides that have recently been approved by the California Department of Pesticide Regulation (CDPR) for water hyacinth treatment in aquatic environments: penoxsulam and imazamox. In addition, WHCP had proposed to utilize a third new herbicide, imazapyr, but it was rescinded because it has not been approved by CDPR for use on water hyacinth. CDBW applies herbicides with an adjuvant to increase adhesion to water hyacinth leaves. WHCP proposes to utilize the adjuvant Agridex and the vegetable oil-based adjuvant, Competitor.

In addition to herbicide treatments, the WHCP proposes to utilize hand-picking, herding, and mechanical removal. These approaches can help reduce the need for herbicides. Hand-picking would primarily be utilized to reduce plant biomass in nursery areas. Herding would be used in order to push water hyacinth mats (1) into main channels where it would flow naturally out of the Delta and die in the more saline water of San Francisco Bay; or (2) toward mechanical removal sites. The WHCP proposes to utilize two mechanical removal methods: (1) use of specialized mechanical equipment with conveyors to physically remove plants, and (2) use of small excavators sited on concrete boat ramps to scoop plants into trucks/trailers for disposal. In addition, the USDA-ARS, CDBW, and their partners initially proposed biological control methods, but withdrew them from the proposed action.

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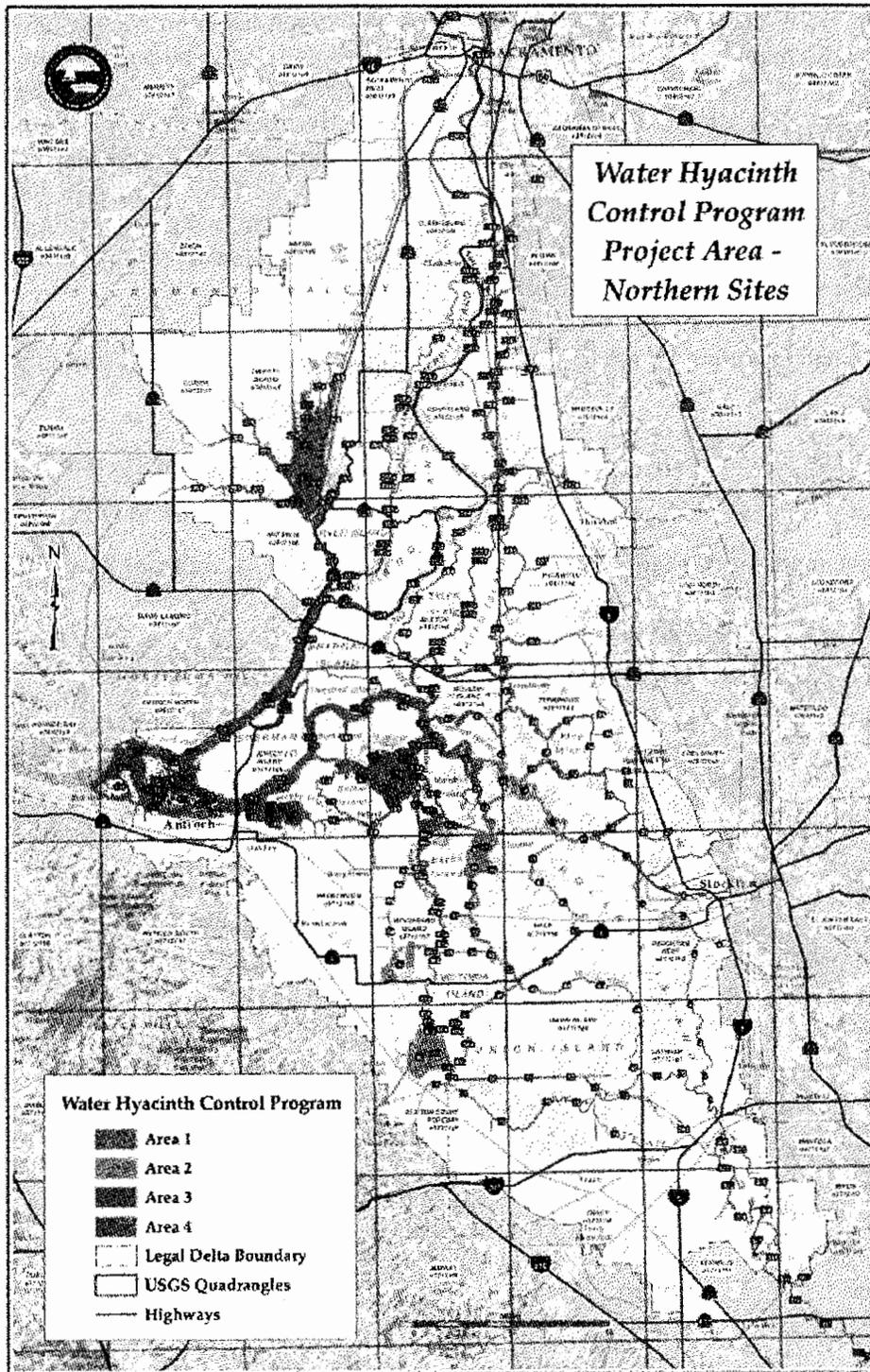
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*Action Area*

USDA-ARS and CDBW propose to apply herbicide products and physical removal methods to control water hyacinth in the Delta (See Figure 1; Treatment Areas 1, 2, 3, and a portion of 4) and the San Joaquin River (SJR; See Figure 2; Treatment Area a portion of 3 and 4) waterways for 5 years (2013-2017). Figures 1 and 2 below illustrate the WHCP treatment Areas 1, 2, 3, and 4 and are referred to as such throughout this document. There are approximately 350 treatment sites with water hyacinth mats that average between one and two miles in length. Only waterways within any given treatment site are actually part of the action area, and in any given treatment season water hyacinth is growing, and treated in, only a portion of the 350 total treatment sites. The general boundaries for the treatment area are as follows:

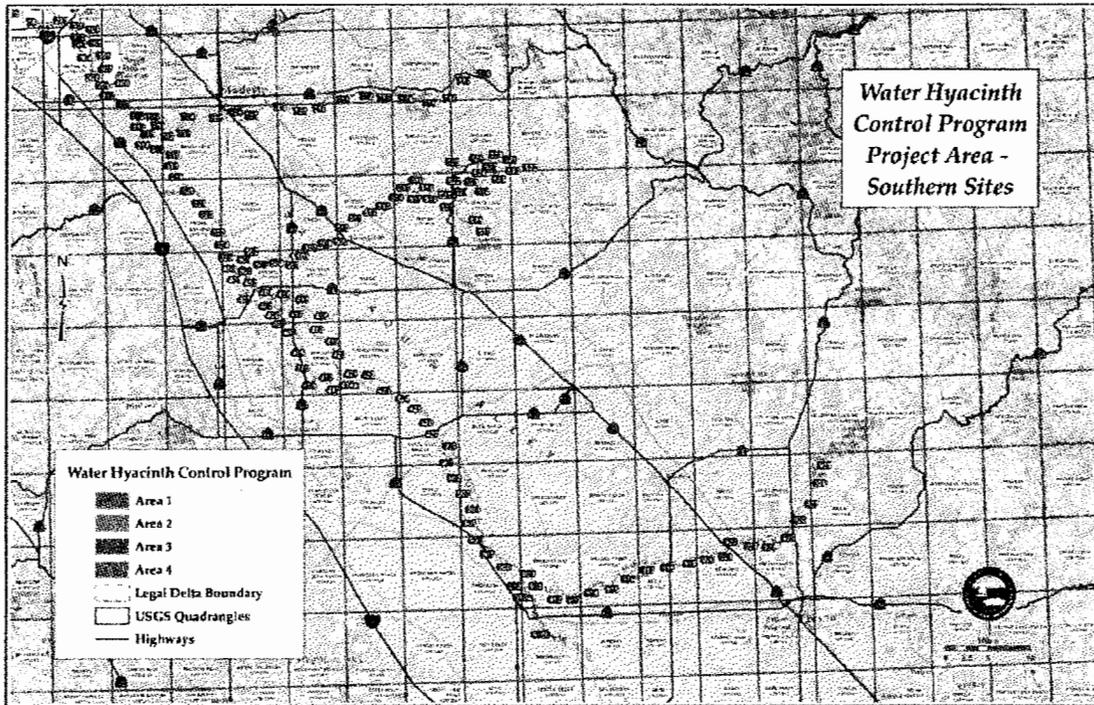
- West up to and including Sherman Island at the confluence of the Sacramento and San Joaquin Rivers;
- West up to the Sacramento Northern Railroad to include water bodies north of the southern confluence of the Sacramento River and Sacramento River Deep Water Ship Channel;
- North to the northern confluence of the Sacramento River and Sacramento River Deep Water Ship Channel, plus waters within Lake Natoma;
- South along the San Joaquin River to Mendota, just east of Fresno;
- East along the San Joaquin River to Friant Dam on Millerton Lake;
- East along the Tuolumne River to LaGrange Reservoir below Don Pedro Reservoir; and
- East along the Merced River to Merced Falls, below Lake McClure.

Figure 1: WHCP Project – Treatment Areas # 1, 2, 3, and a portion of 4



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**Figure 2: WHCP Project – Treatment Area: a portion of #3 and #4**

In any given year, WHCP will treat only a portion of the total treatment sites. Table 1 below provides the acres treated over 29 years of the WHCP. The highest treatment area was 2,770 acres in 2004 and the lowest was 166 acres in 1985, accounting for 4.1% and 0.2%, respectively, of the total waterway area (~67,800 acres) including the Delta and the San Joaquin River basin. In 2013, CDBW may treat up to 5,000 acres of water hyacinth mats within the 350 treatment sites. From years 2014 to 2017 CDBW may treat up to 3,500 acres of water hyacinth mats within the 350 treatment sites. However, the action area is expected to encompass a greater area than the actual treatment area due to water movement resulting from flow and tidal influences.

Multiple treatments within a treatment site may be necessary because many sites in the Delta cannot be treated during the ideal early growth phase due to the potential presence of listed fish species. In addition, some larger sites may have more water hyacinth than can be treated at one time in order to reduce DO (DO) impacts. These sites will be treated in more than one application.

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**Table 1: Treatment area from 1983 to 2011**

<b>Year</b>	<b>Treatment area (acre)</b>	<b>Year</b>	<b>Treatment area (acre)</b>
1983	507	1998	2,434
1984	244	1999	521
1985	166	2000	-
1986	227	2001	1,013
1987	384	2002	1,854
1988	633	2003	2,222
1989	849	2004	2,770
1990	699	2005	2,208
1991	350	2006	2,446
1992	798	2007	1,137
1993	1,506	2008	421
1994	2,743	2009	705
1995	1,826	2010	1,024
1996	2,051	2011	787
1997	1,907		

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### Project Activities

Prior to the start of each treatment season, CDBW will conduct environmental awareness training for all field crew members. The training includes: species identification and impact avoidance guidelines; protocol for identification and protection of valley elderberry shrubs; protocol for identification and protection of delta smelt, Chinook salmon, steelhead, green sturgeon, and associated protected habitats; and protocol for take of protected species, if any. In addition, field crew members also will be trained on use and calibration of spray equipment and the WHCP Operations Management Plan.

The WHCP will implement pre- and post-season surveys to identify locations and coverage of water hyacinth, and supplement these formal surveys with mid-season evaluations of water hyacinth coverage. Starting in February, and again in October and November, field crews will conduct visual surveys of all treatment sites. For each site, crews will record the extent of water hyacinth coverage (acres and percent coverage), and status of water hyacinth at the site.

In the February survey, field crews will identify problem areas such as those with the greatest impact on navigation, public safety, nursery areas, and sites close to pumps or other structures in the southern-most portion of the northern sites as well as the southern sites. Treatment crews will also identify crops adjacent to treatment sites in order to help select the appropriate herbicide for treatment. Crews will validate field survey information with data from the prioritization process and note any changes. This survey information will be used to help prioritize treatment locations at the start of the treatment season, and to measure efficacy of water hyacinth treatments at the end of the season. Following the prioritization and site selection, USDA-ARS and CDBW will identify likely treatment sites and acres prior to each treatment season and will provide a list of these sites to the Service. Based on the extent of water hyacinth infestation, only a portion of any given site may be treated to comply with herbicide label requirements.

During the treatment season, as crews are working throughout the Delta, they will continue to monitor and record water hyacinth coverage by site. This ongoing survey will assist the management team in identifying mid-season adjustments to prioritizing treatment sites and determining treatment effectiveness.

Each year USDA and CDBW will prepare an annual report for the WHCP and submit it to the Service. This annual report will summarize infestation levels, treatment acreage and types, amount of herbicide use, materials and methods, water quality monitoring results (including herbicide concentration and dissolved oxygen (DO), and daily treatment logs.

### Chemical Treatment

The WHCP proposes to use four herbicides 2,4-D, glyphosate, penoxulam, and imazamox to control water hyacinth. All herbicides will be applied with an adjuvant, either Agridex or Competitor. Two of these herbicides, 2,4-D and glyphosate, have been used since the inception of the WHCP. Penoxulum and imazamox are new to the WHCP and have received approval from the

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United States Environmental Protection Agency (USEPA). Treatment timelines and Areas proposed for each of the herbicides and adjuvants can be found in the *Conservation Measures*. The utilization of additional herbicides on the treatment of water hyacinth reduces the potential for target species to develop resistance. While there are no indications of water hyacinth resistance to date, some terrestrial species of weeds have developed resistance to glyphosate (Powles 2008) or acetolactate synthase (ALS) inhibitors (Wisconsin Department of Natural Resources 2012). Resistance is an important consideration in use of any herbicide over a long period of time. In terrestrial applications, some plants have become resistant to glyphosate or the ALS inhibitors after many (over ten) years of use. Resistance is not necessarily the same across terrestrial and aquatic plants, and generally is species specific. However, because WHCP is a long-term control program, it will be prudent to increase the portfolio of herbicide active ingredients and of non-herbicide treatment options in order to reduce the potential for resistance. Rotating treatments after several years among herbicides with different modes of action reduces the potential for a plant to develop resistance. USDA-ARS, WHCP environmental scientists and Pest Control Advisors will evaluate water hyacinth response to program herbicides over time to identify potential resistance problems.

Crews will conduct treatments with hand-held sprayers applied from aluminum airboats or aluminum outboard motor boats. The work boats will be equipped with direct metering of herbicides, adjuvants, and water pump systems. The crews will spray the chemical mixture directly onto the plants utilizing pump-driven hand-held spray nozzles. The pump will mix calibrated amounts of herbicide, adjuvant, and water. The WHCP will apply the chemicals at the herbicide label-specified rates. Treatment crews will follow specific requirements, as described, to account for wind, DO, drinking water intakes, agricultural intakes, and total acres treated. Treatment crews will follow all label requirements, and implement the new Fish Passage Protocol (to ensure that migratory fish are not impacted by the WHCP).

WHCP will only treat those sites that have water hyacinth infestations, treating only the water hyacinth plants within those sites. WHCP may also be limited by time and resource constraints. Within a given treatment location, WHCP will treat according to current herbicide label requirements to limit potential for decaying plants to result in low DO levels.

Treatment sites within the Delta range from 6.5 acres to 1,707 acres in size, with an average of 219 acres. Thus, there may be several different water hyacinth infestations spread out within a site that require treatment. In these cases, WHCP will treat all water hyacinth mats in the site as time and resources allow. Repeat treatments may utilize a different herbicide, depending on conditions at the site.

When determining whether a given mat of water hyacinth will be treated again, WHCP crews will utilize the following guidelines:

- 1) Only one treatment will occur if after the herbicide has had time to take effect, the initial treatment was effective in killing the majority of water hyacinth plants at that site.

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- 2) A second treatment will occur if buffer strips for fish passage were left untreated. In this case, CBDW will return to treat the remainder of the site (new or previously untreated plants) after the specified time between treatments (per herbicide requirements).
- 3) A second treatment of previously treated water hyacinth will occur if the first treatment was not effective in killing the plants. In this case, CBDW will not conduct the second treatment until the specified time period, per label directions.
- 4) The actual number of locations and numbered treatment sites that will be treated more than once depends on factors such as herbicide efficiency, growth of the water hyacinth plants and tidal movement that cannot be easily predicted. WHCP will seek to minimize the number of times that a given water hyacinth mat will be treated and will follow herbicide labels regarding total number of applications allowed.

Daily treatments occur Monday through Thursday when weather, wind-speed, and other environmental conditions are favorable for treatment to be maximized. On any given treatment day, treatment acres per day are limited by: (1) the number of crews available; (2) travel time to reach the site; (3) time required to set-up, conduct monitoring, and treat a site; (4) the amount of water hyacinth growing at a particular site; (5) the herbicide label restrictions; (6) fish passage protocols; and (7) weather and tide conditions. The crew can treat, on average, between 5 and 16 acres based on historical data from 2007 through 2011.

#### *Herbicides used in WHCP*

##### 2,4-D

2,4-D is a systemic herbicide specific to broadleaf plants. The active ingredient in this phenoxy herbicide is 2, 4-Dichlorophenoxyacetic acid dimethylamine salt. 2,4-D is soluble in water and chemically stable. 2,4-D is absorbed through the leaves and takes approximately four to six hours to enter the phloem of the plant where it mimics plant regulating hormones leading to abnormal growth patterns and death of the plant. 2,4-D has a relatively short half-life and is rather immobile in the soil. Breakdown in soil and groundwater: 2, 4-D has low soil persistence. The half-life in soil is less than 7 days (Wauchope *et al.* 1992). Soil microbes are primarily responsible for its disappearance (Howard 1991). Despite its short half-life in soil and in aquatic environments, the compound has been detected in groundwater supplies in at least five States and in Canada (Howard 1991). Monitoring data indicates that concentrations of 2,4-D have been detected in ground, surface, and finished drinking water (EPA 2005).

Decomposition of herbicides in water depends on a number of characteristics, including: water quality, sediments in the water, temperature, and chemical properties of the herbicide. A review of 34 research papers concerning the persistence of 2,4-D in water under both laboratory and field conditions concluded that (1) under laboratory conditions, 2,4-D in water decomposed in periods of hours to days; and (2) under some warm water field conditions, 2,4-D has consistently been

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shown to be reduced to non-detectable levels in closed water bodies in approximately one month; and (3) persistence of 2,4-D at extremely low levels may be encouraged by water movements in lakes, reservoirs, and streams (Gren 1983).

The chemical 2,4-D breaks down due to photodecomposition or by algal or bacterial decomposition (ESA/Madrone 1984). The aqueous half-life of 2,4-D (time in which one-half of the material is degraded) in a set of pools was 10 to 11 days. In a study with natural waters, 2,4-D half-life ranged from 0.5 to 6.6 days (HSDB 2001). Walters (1999) reported an aqueous photolysis half-life for 2,4-D, at 25C, of 13.0 days, and an aqueous aerobic half-life of 15.0 days. Breakdown in water: In aquatic environments, microorganisms readily degrade 2, 4-D. Rates of breakdown increase with increased nutrients, sediment load, and dissolved organic carbon. Under oxygenated conditions the half-life is one to several weeks (Howard 1991).

For treating water hyacinth, 2, 4-D will applied at a rate of between two and four quarts per acre, per label specifications. This is equivalent to 1.9 to 3.8 pounds of active ingredient per acre. It will be applied using a broadcast spray method.

For the majority of sites treated with 2,4-D, it will be preferable to conduct spot treatments directly onto water hyacinth leaves. For sites that are heavily vegetated, buffer strips will be created and another treatment will occur, if needed, after the treated vegetation has decayed. Treatment crews may return to a site to spray locations within a site that were not previously treated, or to retreat regrowth in previously treated plants only after plants killed in the initial treatment have decayed or floated away, no sooner than 21 days.

### Glyphosate

Glyphosate is a broad spectrum, non-selective, systemic herbicide. The active ingredient is glyphosate isopropylamine salt. It is water soluble and mixes readily with water and non-ionic surfactants. Glyphosate moves through the plant from the foliage to the root system. Glyphosate prevents the synthesis of certain amino acids essential for plant survival. Visible effects on the plant occur within 3 or more weeks and include gradual wilting and yellowing of the plant, advancing to complete browning.

Glyphosate is moderately persistent in soil, with an estimated average half-life of 47 days (Weed Science Society 1994; Wauchope *et al.* 1992). Reported field half-life range from 1 to 174 days (Wauchope *et al.* 1992). It is strongly adsorbed to most soils, even those with lower organic and clay content (Wauchope *et al.* 1992 and Weed Science Society 1994). Thus, even though it is highly soluble in water, field and laboratory studies show it does not leach appreciably, and has low potential for runoff (except as adsorbed to colloidal matter) (Wauchope *et al.* 1992). One estimate indicated that less than 2 percent of the applied chemical is lost to runoff (Malik *et al.* 1989). Microbes are primarily responsible for the breakdown of the product, and volatilization or photodegradation losses will be negligible (Weed Science Society 1994).

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Breakdown in water: In water, glyphosate is strongly adsorbed to suspended organic and mineral matter and is broken down primarily by microorganisms (Schuette 1998). Its half-life in pond water ranges from 35 to 63 days (Schuette 1999).

Breakdown in vegetation: Glyphosate may be translocated throughout the plant, including to the roots. It is extensively metabolized by some plants, while remaining intact in others (Kidd and James 1991).

For treating water hyacinth, glyphosate will be applied at a rate of three quarts per acre, per label requirements. This will be equivalent to 3 pounds active ingredient per acre. Glyphosate will be applied via a broadcast sprayer. The majority of the sites treated with glyphosate will be spot treatments. For the sites that are heavily vegetated, buffer strips will be created, and another treatment will occur, if needed.

The herbicide label requirements for glyphosate have no restrictions for use of treated water for irrigation, recreation, or domestic purposes. The herbicide label specifies that glyphosate is not to be applied within 0.5 miles of an active potable water intake; or intakes must be turned off for a minimum of 48 hours after the application, or until glyphosate concentrations are less than 0.7 ppm. When treating large infestations, the label recommends treating the area in strips to avoid oxygen depletion

#### Penoxsulam

Penoxsulam (2-(2,2-difluoroethoxy)-N-(5,8-dimethoxyl[1,2,4] triazolo [1,5-c] pyrimidin-2-yl)-6-trifluoromethyl)benzenesulfonamide) received USEPA approval through the reduced risk program for use on aquatic weeds from the USEPA in 2007 and from the California DPR in 2009. Penoxsulam was initially approved for use on rice crops by USEPA in 2004. Penoxsulam is a broad spectrum systemic herbicide in the triazolopyrimidine sulfonamide family. This herbicide inhibits the enzyme acetolactate synthase (ALS), which regulates the production of three essential amino acids: valine, leucine, and isoleucine (Washington DOE 2012).

ALS inhibitors such as penoxsulam slowly starve plants of these amino acids, eventually killing the plants by halting DNA synthesis. These biochemical pathways are not present in animals. Plants absorb penoxsulam through leaves, shoots, and roots. The herbicide affects new growth more rapidly than older plant tissue. Symptoms following treatment with penoxsulam include immediate growth inhibition, a chlorotic growing point with reddening, and slow plant death over a period of 60 to 120 days (Washington DOE 2012). Madsen and Wersal (2008) found that four weeks after treatment with 1.4 oz/acre, up to the maximum rate of 5.6 oz/acre, penoxsulam (with a surfactant) provided 95 percent control of water hyacinth in 100-gallon outdoor tanks. Langeland et al. (2009) identified penoxsulam as providing excellent control for water hyacinth in Florida.

Penoxsulam has low to moderate water solubility, and is very mobile in soil. The organic carbon sorption coefficient,  $K_{oc}$ , of penoxsulam is between 13 and 305 in soil (indicating weak adsorption), with higher adsorption in sediment,  $K_{oc} = 1,130$  (USEPA 2007). Penoxsulam

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follows two complex degradation pathways, and degrades into eleven major and two minor degradates, listed in Table 3-10, on the next page (USEPA 2007). None of these metabolites or degradates have been identified as having a higher toxicity potential than penoxsulam (Washington DOE 2012).

There was some concern in the first review of penoxsulam (USEPA 2004) that some of the major degradates of penoxsulam might pose phytotoxicity concerns; however, additional testing found no observable injury by the eleven metabolites to pre-emergent seeds, and that only two caused injury to seedlings at high-levels (USEPA 2007).

In water, penoxsulam breaks down primarily by photolysis, with some microbial degradation. Water depth, water clarity, plant density, and season of application can influence photolytic degradation. Penoxsulam breaks down faster in higher water clarity and lower plant density. The water solubility of penoxsulam increases in more alkaline conditions. The half-life of penoxsulam in water ranges from 1.5 to 14 days (USEPA 2007). The total system half-life of penoxsulam is 16 to 38 days (Washington DOE 2012). In sediment, penoxsulam is expected to degrade rapidly through anaerobic degradation (USEPA 2007). Penoxsulam is adsorbed by soil and has low to moderate leaching potential in most soil types, where it is broken down by microbial degradation (The Dow Chemical Company 2008). However, California DPR has identified penoxsulam (along with many other herbicides including 2,4-D and glyphosate) as having the potential to pollute ground water. Penoxsulam has low vapor pressure, and will not dissipate by volatilization.

For treating water hyacinth, penoxsulam will be applied at between 2.0 to 5.6 ounces per acre, per label requirements, with higher rates for denser plants and plants not at their peak growing phase. This will be equivalent to between 0.03125 and 0.0875 pounds of active ingredient per acre. Penoxsulam will be applied with a surfactant (at concentrations on the surfactant label), with a spray volume in accordance to label specifications.

There are no label restrictions for penoxsulam regarding DO, as the slow-acting nature of this herbicide should have minimal impact on DO levels (Washington DOE 2012). However, WHCP will maintain existing monitoring measures related to DO to evaluate potential reductions in DO.

Waters treated with penoxsulam will not to be used for food crop irrigation until concentrations are determined to be equal to, or less than, 1 ppb. Water samples will be collected using Enzyme-Linked Immunoassay (ELISA) or other approved analytical methods. There are no restrictions on consumption of treated water for potable use or by livestock, pets, or other animals, and no restrictions on the use of treated water for recreational use, including swimming and fishing. Penoxsulam will be used with a surfactant, and applied with a coarse high flow spray nozzle to avoid drift. Penoxsulam will not be applied when wind speeds are below 2 mph, or above 10 mph.

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## Imazamox

Imazamox is a relatively new aquatic herbicide active ingredient. The chemical structure of imazamox is illustrated in Figure 3-12, left. The aquatic formulation of imazamox, Clearcast<sup>®</sup>, received USEPA approval through the reduced risk program in 2008 (SERA 2010). The WHCP will initially utilize this imazamox active ingredient product.

CDPR approved imazamox for aquatic use in August, 2012. Imazamox was approved for terrestrial use by the USEPA in 1997, and by the California DPR, in 2002. Clearcast consists of 12.1 percent solution of the ammonium salt of imazamox (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid). It is in the imidazolinone herbicide family, along with imazapyr. The mode of action is similar to penoxsulam and imazapyr, inhibiting the acetolactate synthase (ALS) enzyme, blocking the synthesis of three essential amino acids, leucine, isoleucine, and valine (Washington DOE 2012). Imazamox is a relatively fast-acting systemic herbicide. It is rapidly absorbed into the foliage and translocated throughout the plant by phloem and xylem tissues (Washington DOE 2012).

Imazamox inhibits plant growth within the first 24 hours, with visual symptoms appearing about one week after treatment. Symptoms include yellowing leaves and general discoloration. Water hyacinth plants are dead within six weeks after treatment (Burns 2009). In one greenhouse study, Clearcast was more effective at controlling water hyacinth within five weeks (94 percent control) than Habitat<sup>®</sup> (imazapyr) (79 percent control), but slightly less effective than glyphosate (99 percent control). However, Clearcast and Habitat required less than 25 percent as much active ingredient as glyphosate treatment (Emerine et al. 2010). Langeland et al. (2009) identify imazamox as excellent in controlling water hyacinth in Florida.

Imazamox is highly soluble in water, and is mobile to highly mobile in soil (Washington DOE 2012; USEPA 2008). The organic carbon sorption coefficient,  $K_{oc}$ , of imazamox is between 5 and 143 (indicating weak adsorption). Volatilization of imazamox is not significant (USEPA 1997). Imazamox has a low potential for bioaccumulation (Washington DOE 2012).

The primary method of degradation of imazamox in surface water is photolytic (Washington DOE 2012). Photolytic degradation is influenced by water depth, water clarity, and season, and continues via microbial action to carbon dioxide. The half-life in water ranges from five to fifteen days (Washington DOE 2012). CDPR identified imazamox as having the potential to pollute groundwater due to its high water solubility; however, in well-lit waters, imazamox breaks down quickly (Washington DOE 2012). US EPA concluded that even if imazamox persists in dark or turbid waters it is unlikely to present a risk to fish, invertebrates, birds, or mammals (Washington DOE 2012).

Imazamox is moderately persistent in soil, degrading aerobically to a non-herbicidal metabolite which is immobile or moderately mobile in soil (USEPA 1997). The primary metabolite is a demethylated parent chemical with intact ring structures and two carboxylic acid groups. A secondary metabolite is a demethylated, decarboxylated parent with intact rings and one

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carboxylic acid group (USEPA 2008). Leaching of imazamox in field studies was very limited, and microbial breakdown products under aerobic soil conditions are not herbicidal. The range of half-lives in terrestrial field dissipation studies was fifteen to 130 days, with typical half-lives ranging from 35 to 50 days (USEPA 1997; USEPA 2008). Imazamox is unlikely to accumulate in sediments.

For treating water hyacinth, imazamox will be applied at a rate of 16 to 64 ounces per acre, per label requirements. This is equivalent to 0.125 to 0.5 pounds active ingredient per acre. Imazamox is most effective when applied to actively growing plants. Imazamox will be applied with an adjuvant at rate of one quart per 100 gallons of solution.

There are no label restrictions regarding DO; however, CDBW will follow the same monitoring approaches as for other herbicides to evaluate potential for low DO levels to impact endangered species. Waters treated with imazamox will not be used for irrigation until concentrations are less than 50 ppb. The label requires a 24 hour period after treatment to irrigate from still and quiescent waters. There are no wait restrictions for irrigation when imazamox is applied to flowing waters at a rate of less than or equal to 4 quarts (64 ounces) per acre to waters with an average depth of at least four feet. There are no restrictions on livestock watering, swimming, fishing, domestic use, or use of treated water for agricultural sprays (SePRO 2010). To reduce drift, imazamox will be used with a surfactant, and applied in a course spray with the nozzle height at approximately no more than four feet above the plant canopy. Imazamox will not be applied in a temperature inversion, or when wind speeds are less than 2 miles per hour or greater than 10 miles per hour.

As imazamox will be a new WHCP herbicide, there are no prior test data regarding actual herbicide concentrations following water hyacinth treatment. The WHCP will conduct monitoring at the initial imazamox treatment sites to develop a baseline for expected herbicide concentrations in treatment sites and receiving waters following treatment.

#### *Adjuvant used in the WHCP*

The WHCP will utilize adjuvants with herbicides to ensure contact and translocation of herbicides. The WHCP will not utilize polyethoxylated tallow amine (POEA) surfactants, which are known to be toxic to amphibians, or nonylphenoloethoxylate (NPE) surfactants, which are known to be toxic to fish and some invertebrates. The WHCP will utilize two adjuvants. Agridex<sup>®</sup>, a crop oil concentrate adjuvant, has been used for several years by WHCP. Competitor<sup>®</sup>, a vegetable oil based adjuvant, will be incorporated into WHCP.

#### *Agri-dex*

Agri-dex (the active ingredients are Paraffin Base Petroleum Oil/Polyoxyethylate Polyol Fatty Acid Esters) is a non-ionic blend of surfactants and spray oil that is designed for use with a broad range of pesticides where oil concentrate adjuvant is recommended. Agri-Dex<sup>®</sup> improves pesticide application by modifying the wetting and deposition characteristics of the spray

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solution, resulting in a more even and uniform spray deposit. It will be used with all three herbicides at a rate of approximately one to four pints per 100 gallons.

### Competitor

Competitor is a modified vegetable oil containing a non-ionic emulsifier system. It may be used as an adjuvant with aquatically labeled pesticides. The active ingredients in Competitor are ethyl oleate, sorbitan alkylpolyethoxylate ester, and dialkyl polyoxyethylene glycol. These ingredients make up 98 percent by weight, with the remaining 2 percent constituents that are ineffective as spray adjuvant. Competitor will be used at a rate of one to four pints per acre (to a maximum of 1 percent volume/ volume ratio).

### Mechanical Control Methods

#### *Handpicking*

Hand-picking of water hyacinth will be conducted primarily when or where chemical treatment cannot be made, and may occur throughout the year. As treatment crews survey for water hyacinth, they will conduct hand-picking in selected areas. The goals of the hand-picking aspect of the program are to aid in the control of water hyacinth and reduce impacts of chemical application by clearing areas that are not accessible to chemical treatment, subject to high infestation, nurseries, and within emergent vegetation. Crews will follow specific hand-picking protocols to ensure the protection of water quality and special status species. Reflecting a typical season of hand-picking, between October 15, 2007, and April 1, 2008, treatment crews collected over 4,000 thirty-gallon barrels of water hyacinth. Once collected, water hyacinth will be deposited on at authorized disposal sites, to decompose.

#### *Herding*

Herding refers to the moving of water hyacinth mats by pushing or pulling mats from one location to another. Mats will be moved to removal locations or to the main channel. Once in a main channel, the water hyacinth will flow out of the Delta, into saline waters and die. Water hyacinth cannot survive in waters of greater than 2 ppt to 2.5 ppt saline water (brackish water).

For herding water hyacinth out of the Delta, field supervisors will take into account tides, storm events, and dam releases to select appropriate days and times for herding to take place. Crews will not herd in areas where physical damage to emergent, native vegetation is likely to occur such as among stands of cattails (*Typha* spp.), *Phragmites* spp., bulrushes (*Scirpus* spp.), or native cordgrass (*Spartina foliosa*). In addition, the total amount of water hyacinth herded in one area will be limited to avoid impeding navigation. Due to timing and logistical limitations of herding activities, this method may not be used as frequently as handpicking.

*Mechanical Removal*

The WHCP will utilize two different mechanical removal approaches. The first approach will be to park a small excavator and dump truck on a concrete boat ramp and mechanically lift water hyacinth from the waterway surrounding the ramp. Crews will support the excavation by herding water hyacinth that is outside of the excavator's reach closer to the equipment. This mechanical removal approach will be used only in limited locations when water hyacinth growth is concentrated near a boat ramp. There may be relatively few locations within the Delta that are appropriate for excavation.

The second approach will utilize mechanical equipment designed specifically to safely remove aquatic weeds from waterways. This mechanical equipment utilizes cutters and conveyors to physically remove the plant from the water, and onto the bed of the equipment. The equipment will collect and unload vegetation using a conveyor system on a boom, adjustable to the appropriate cutting height (two to three feet below the surface for water hyacinth). Cutter bars will collect material and bring it aboard the vessel using the conveyor; when the vessel has reached capacity (between 2,000 and 15,000 pounds of plant material), the cut plant material will be offloaded to a dump truck parked at a nearby boat ramp to offload water hyacinth. Water hyacinth will be disposed of at an authorized location, typically utilizing nearby farm fields. Mechanical removal can be costly, it will be used to supplement chemical treatment and when immediate removal of weeds is required. Mechanical removal will primarily be utilized to remove dense mats of water hyacinth in locations where chemical treatment must be avoided, such as sites with many valley elderberry shrubs along the shoreline. WHCP environmental scientists will consult the IEP database and survey mechanical removal sites immediately prior to weed removal to ensure that no listed species are present. If listed species are present, mechanical removal operations at that site will be postponed. Similar mechanical equipment is regularly used to control water hyacinth in Florida and other Southeastern states.

The WHCP will implement an operation protocol similar to the protocol for chemical treatment prior to conducting mechanical removal. WHCP environmental scientists will check IEP monitoring data to ensure that salmon species are not present at the removal site. In addition, the equipment operator will utilize the same Environmental Checklist to evaluate presence of listed species or sensitive habitats. If listed species or sensitive habitats are present, the operator will not conduct mechanical removal at that site.

The WHCP has not utilized this method of mechanical removal in prior years. Studies of mechanical removal conducted during 2003 and 2004 in the Delta by the San Francisco Estuary Institute (SFEI) (Greenfield et al 2007; Spencer et al 2005; Greenfield and McNabb, 2005) raised concerns about the potential for water hyacinth plant cuttings from mechanical removal to grow and spread within the Delta.

### WHCP Monitoring Program

The CDBW, with assistance from USDA-ARS and California Department of Food and Agriculture (CDFA), conducts extensive monitoring for the WHCP. The WHCP will conduct extensive monitoring for the program. The WHCP will be responsible for collecting water quality monitoring data, as well as collecting water samples for chemical residue testing.

Based on NPDES permit requirements, WHCP will follow a monitoring protocol. This protocol has historically fulfilled requirements of the Regional Water Quality Control Board, NOAA Fisheries, and USFWS. At each monitoring site, WHCP's environmental scientists will take samples immediately pre-application (upstream and adjacent to the water hyacinth mat), and immediately post-application (downstream of the treatment area). WHCP environmental scientists will also take samples one week following treatment (upstream, adjacent to, and downstream of the treatment area).

At each sampling event, environmental scientists will take samples from the following six locations:

- 1) Pre-treatment, in site
- 2) Pre-treatment, control
- 3) Immediately post-treatment, downstream
- 4) Within 7 days, in site
- 5) Within 7 days, downstream
- 6) Within 7 days, control

The WHCP will select monitoring sites that reflect a mix of water types (tidal, riverine, and tidal dead-end), herbicides, and different habitat types. The WHCP will revise the monitoring approach to comply with the new NPDES General Permit, as described below.

At each monitoring site, WHCP environmental scientists will monitor DO, turbidity, pH, and several other water quality measures. WHCP environmental scientists will collect water in bottles, packed in ice, and submit them to a Certified Analytical Laboratory to measure chemical residue levels.

Coordination between treatment crews and monitoring crews will be very structured. Treatment and monitoring plans will be established in advance. Before any treatment or monitoring, crews will confer to make sure both crews know what sites will be treated and monitored on that day. The treatment crew will stand by until the monitoring crew completes the pre-treatment sampling, at which time the monitoring crew will give the treatment crew the "all clear" to begin treatment. The treatment crew will contact the monitoring crew as soon as treatment is complete so post-treatment monitoring can begin as required. Treatment and monitoring crews will be in separate vessels. Monitoring vessels will not carry herbicide to minimize any contamination that might occur.

Environmental scientists plan to also conduct special monitoring of DO to determine the impact of water hyacinth and the WHCP on DO levels. For this study, crews will measure DO to evaluate the impact of water hyacinth and water hyacinth treatments on DO.

WHCP treatment crews will conduct daily monitoring, in addition to the extensive monitoring to be conducted by WHCP environmental scientists. Treatment crews will monitor and report pre- and post-treatment DO, wind speed, temperature, acres treated, quantity of herbicide and adjuvant, presence of elderberry shrubs or other species of concern, and coordinates of treatment location. The table below lists monitoring requirements for WHCP environmental scientists and WHCP treatment crews.

**Table 2: WHCP Environmental Monitoring Requirements**

Treatment Crews (for each site treated)	Environmental Scientists (for each sample event)
1. Water temperature (°C)	1. Water temperature (°C)
2. Dissolved oxygen (DO, mg/L or parts per million (ppm))	2. Dissolved oxygen (DO, mg/L or ppm)
3. Wind speed (mph)	3. Turbidity (NTU)
4. Coordinates of treatment location	4. pH
5. Presence of elderberry shrubs	5. Salinity (ppt)
6. Presence of species of concern	6. Specific conductance (mS/cm)
7. Acres treated	7. Water depth (feet)
8. Quantity of herbicide and adjuvant	8. Tide cycle
	9. Water samples (pre-treatment, post-treatment, control; submitted to a Certified Analytical Laboratory)

The State Water Quality Control Board is updating the NPDES General Permit, with a draft for public comment released on June 27, 2012, and a final version for Board approval expected in spring 2013. A copy of the draft NPDES General Permit is provided in the BA Binder. The new General Permit requires a sampling frequency of six application events per year for each environmental setting (flowing water and non-flowing water), per herbicide. Glyphosate will require sampling for only one application event per year, based on the low herbicide levels found in prior year sampling.

Once WHCP has provided the SWRCB with results from six consecutive application events showing concentrations that are less than the receiving water limitation/trigger for an active ingredient in a specific environmental setting, WHCP sampling shall be reduced to one application event per year for that active ingredient in that environmental setting. The Table above, provides the receiving water limits and monitoring triggers for the four potential WHCP herbicides. These maximum limitations are all above the calculated maximum concentrations for 2,4-D, glyphosate, penoxsulam, and imazamox and can be found in Appendix 1.

**Conservation Measures**

The CDBW proposes that this action may result in incidental take of delta smelt. Additionally, GGS and VELB, federally listed species, occur within the project area. The Service has determined GGS and VELB may be affected, but are not likely to be adversely affected by the project based on avoidance measures and the applicant's proposed conservation measures for GGS and VELB, which have been included below. CDBW proposes the following conservation measures be implemented into the project:

- 1) Personnel involved with the WHCP will participate in a worker environmental awareness program taught by a Service-approved biologist. Under this program, workers will be informed about the presence of delta smelt, GGS, VELB, and its associated habitat, and that unlawful take of the animal or destruction of its habitat is a violation of the Act. Prior to chemical application activities, a qualified biologist approved by the Service will instruct all personnel about:
  - a. Species identification and adverse effect avoidance/minimization guidelines for delta smelt, GGS, and VELB;
  - b. The life history of the delta smelt, GGS and VELB;
  - c. The importance of delta smelt migratory routes, the importance of irrigation canals, marshes/wetlands, and seasonally flooded areas to GGS, the importance of elderberry shrubs as habitat for VELB and maps marking these areas will be created for WHCP personnel; and
  - d. All terms and conditions of this biological opinion for protection, avoidance and minimization of adverse effects to protected species under the Act.
- 2) All herbicide applications will be made according to registered pesticide label specifications, California code of regulations, and NPDES guidelines.
- 3) Herbicide application near special status species and their associated habitat to include sensitive riparian and wetland habitat; and other biologically important resources will be avoided.
- 4) All treatment crews will implement best management practices to minimize the risk of spilling herbicides.

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CDBW proposes the following avoidance and minimization measures to reduce possible effects to delta smelt and its critical habitat in the project areas:

- 1) USDA-ARS and CDBW will conduct a DO monitoring study to evaluate the ongoing impacts of water hyacinth and water hyacinth treatment on DO. During the 2013 treatment season, USDA-ARS and CDBW will place stationary logging DO meters at up to three pair locations (under a water hyacinth mat and at an adjacent open water site). Meters will be left in place for several weeks, including at least one week prior to treatment, and three weeks post-treatment. The DO meters will log DO and temperature every one-half hour during the entire period. Data will be summarized graphically and in a written report. The study will include, at a minimum, two sites with different characteristics, for example, one site in a dead-end slough, and one site with stronger tidal influence.
- 2) USDA-ARS will first coordinate with the Service to develop, and then implement a toxicological study plan relating to the effects of imazamox and penoxsulam on delta smelt, larvae, and eggs. The study will be approved by the Service and completed prior to the utilization of these herbicides in Areas 1 and 2.
- 3) Area 1 will be managed by the WHCP as follows:
  - a. For WHCP treatment sites located in Area 1, the usage of the herbicides 2,4-D and Glyphosate, as well as the adjuvant Agri-dex, will be limited to the period between June 1 and November 30 to avoid and minimize adverse effects to delta smelt and/or their critical habitat.
- 4) Areas 2, 3, and 4 will be managed by the WHCP as follows:
  - a. CDBW will begin conducting regular field surveys in late-February to identify re-growing water hyacinth (seen as re-greening of winter stunted plants). Surveys will focus on back-water and dead end locations and other known nursery areas. CDBW will document the locations and photograph the sites with areas of more than 100 square feet of re-growing water hyacinth.
  - b. A CDBW environmental scientist will compare these surveyed locations to the most recent state and federal fish monitoring data.
  - c. Between March 1 and July 1, A CDBW environmental scientist will prepare a weekly summary list for the Service's primary contact. If the Service has concerns or issue, the Service will contact DCBW. The information provided to the Service will include:



- c. If DO levels in an area to be treated area at a level considered to be detrimental to fish species prior to treatment (below 3 mg/liter), the CDBW may treat the entire area (without the 3 area strips or buffer strips), therefore allowing the DO levels to increase to beneficial use levels once the water hyacinth is controlled.
  - d. For each treatment site and herbicide application, CDBW staff shall follow herbicide label requirements, as specified, to reduce the potential for low DO.
  - e. When follow-up herbicide applications of previously treated plants are required, CBDW staff shall follow herbicide label requirements, as specified, regarding the number of treatments and time between treatments.
- 6) The WHCP will operate under the regulations imposed by the NPDES. The WHCP will operate within the numeric limits of DO concentrations within the legal boundaries of the Delta, which are listed below:
- a. 7.0 mg/l in the Sacramento River (below the I Street Bridge) and in all Delta waters west of the Antioch Bridge;
  - b. 6.0 mg/l in the San Joaquin river (between Turner Cut and Stockton), September 1 through November 30; and
  - c. 5.0 mg/l in all other Delta Waters.

CDBW proposes the following avoidance and minimization measures to reduce possible effects to GGS in the project areas:

- 1) Treatment crews will be provided electronic mapping tools that identify previously surveyed and sensitive areas for GGS.
- 2) Disturbance of upland GGS habitat will be conducted between May 1 and October 1. This is the "active season" for GGS and direct effects are lessened, because GGS are actively moving and avoiding danger.
- 3) Mechanical removal of water hyacinth in sensitive GGS habitat, or areas where GGS has been sighted in the past, will only be conducted outside of the May 1 and October 1 active GGS season.

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- 4) The mechanical harvester will maintain a speed of 2 to 2 ½ knots in areas outside of sensitive GGS habitat, or areas where GGS has been sighted in the past, during the active season, making it likely if GGS were to be in the area, they would be able to move out of the way.
- 5) The mechanical harvester will stop and/or reverse the harvester if a snake is seen within water hyacinth during removal.
- 6) All water hyacinth collected by handpicking or mechanical removal outside of the active season (May 1- October 1) for GGS will be disposed of at an approved disposal facility to ensure no hibernating GGS are buried under piles of collected water hyacinth.

CDBW proposes the following avoidance and minimization measures to reduce possible effects to VELB in the project areas:

- 1) For most treatment sites, CDBW will maintain a 100 foot buffer between treatment sites and shoreline elderberry shrubs.
- 2) Currently numbered treatment sites with relatively large numbers of valley elderberry shrubs include: 10, 11, 46, 47, 48, 99, 234, 511, 529, 707, 708, and 710. At some of these sites, the 100 foot buffer requirement may preclude CDBW's ability to treat water hyacinth. In those cases, CDBW will utilize a 50 foot buffer between treatment sites and valley elderberry shrubs. However, when utilizing the 50 foot buffer, CDBW will only treat when winds are less than 3 mph. This will further minimize potential for drift.
- 3) All herbicide application will occur downwind of elderberry shrubs.
- 4) When utilizing the 100 foot buffer, no WHCP herbicide application will occur if the wind speed is greater than 10 mph, or 7 mph in Contra Costa County.
- 5) A coarse droplet size spray will be utilized to avoid the potential for drift.
- 6) Although it is unlikely that herbicide treatments will affect elderberry shrubs based on conservation measures implemented, pre- and post-treatment surveys of elderberry bushes will be conducted on an annual basis.

## Status of the Species/Environmental Baseline

### Delta Smelt

The Service proposed to list the delta smelt (*Hypomesus transpacificus*) as threatened with proposed critical habitat on October 3, 1991 (56 FR 50075). The Service listed the delta smelt as threatened on March 5, 1993 (58 FR 12854), and designated critical habitat for this species on December 19, 1994 (59 FR 65256). The delta smelt was one of eight fish species addressed in the *Recovery Plan for the Sacramento–San Joaquin Delta Native Fishes* (Service 1995). This recovery plan is currently under revision. A 5-year status review of the delta smelt was completed on March 31, 2004 (Service 2004). The 2004 review affirmed the need to retain the delta smelt as a threatened species. A 12-month finding on a petition to reclassify the delta smelt was completed on April 7, 2010 (75 FR 17667). After reviewing all available scientific and commercial information, the Service determined that re-classifying the delta smelt from a threatened to an endangered species was warranted but precluded by other higher priority listing actions (Service 2010).

### Distribution

The delta smelt is endemic to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta) in California, and is restricted to the area from San Pablo Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties (Moyle 2002). Their range extends from San Pablo Bay upstream to Verona on the Sacramento River and Mossdale on the San Joaquin River. The delta smelt was formerly considered to be one of the most common pelagic fish in the upper Sacramento-San Joaquin Estuary.

### Description

Live delta smelt are nearly translucent with a steely-blue sheen to their sides and have been characterized to have a pronounced odor reminiscent of cucumber (Moyle 2002). Although delta smelt have been recorded to reach lengths of up to 120 mm (4.7 in) (Moyle 2002), mean fork length of the delta smelt from 1975 - 1991 was measured to be  $64.1 \pm 0.1$  mm. Since then, catch data from 1992 - 2004 showed mean fork length decreased to  $54.1 \pm .01$  mm (Bennett 2005; Sweetnam 1999). Delta smelt are also identifiable by their relatively large eye to head size. The eye can occupy approximately 25-30 percent of their head length (Moyle 2002). Delta smelt have a small, translucent adipose fin located between the dorsal and caudal fins. Occasionally one chromatophore (a small dark spot) may be found between the mandibles, but most often there is none (Moyle 2002).

Delta smelt are small slender bodied fish within the Osmeridae family of fishes (smelts) (Moyle 2002). The delta smelt is one of six species currently recognized in the *Hypomesus* genus (Bennett 2005). Genetic analyses have confirmed that *H. transpacificus* presently exists as a single intermixing population (Stanley et al. 1995; Trenham et al. 1998; Fisch et al. 2011). Within the genus, delta smelt is most closely related to surf smelt (*H. pretiosus*), a species

common along the western coast of North America. Despite morphological similarities, the delta smelt is less-closely related to the wakasagi (*H. nipponensis*), an anadromous western Pacific species introduced to Central Valley reservoirs in 1959, and may be seasonally sympatric with delta smelt in the estuary (Trenham et al. 1998). Allozyme studies have demonstrated that wakasagi and delta smelt are genetically distinct and presumably derived from different marine ancestors (Stanley et al. 1995). Genetic introgression among *H. transpacificus* and *H. nipponensis* is low.

## Life History and Biology

### *Adults: Spawning*

Adult delta smelt spawn during the late winter and spring months, with most spawning occurring during April through mid-May (Moyle 2002). Spawning occurs primarily in sloughs and shallow edge areas in the Delta. Delta smelt spawning has also been recorded in Suisun Marsh and the Napa River (Moyle 2002). Most spawning occurs at temperatures between 12-18°C. Although spawning may occur at temperatures up to 22°C, hatching success of the larvae is very low (Bennett 2005). Fecundity of females ranges from about 1,200 to 2,600 eggs, and is correlated with female size (Moyle 2002). Moyle et al. (1992) considered delta smelt fecundity to be “relatively low.” However, based on Winemiller and Rose (1992), delta smelt fecundity is fairly high for a fish its size. In captivity, females survive after spawning and develop a second clutch of eggs (Mager et al. 2004); field collections of ovaries containing eggs of different size and stage indicate that this also occurs in the wild (Adib-Samii 2008). Captive delta smelt can spawn up to 4-5 times. While most adults do not survive to spawn a second season, a few (<5 percent) do (Moyle 2002; Bennett 2005). Those that do survive are typically larger (90-110 mm Standard Length [sdl]) females that may contribute disproportionately to the population’s egg supply (Moyle 2002 and references therein). Two-year-old females may have 3-6 times as many ova as first year spawners.

Most of what is known about delta smelt spawning habitat in the wild is inferred from the location of spent females and young larvae captured in the California Department of Fish and Game Spring Kodiak Trawl (SKT) and 20-mm survey, respectively. In the laboratory, delta smelt spawned at night (Baskerville-Bridges et al. 2000; Mager et al. 2004). Other smelts, including marine beach spawning species and estuarine populations and the landlocked Lake Washington longfin smelt, are secretive spawners, entering spawning areas during the night and leaving before dawn. If this behavior is exhibited by delta smelt, then delta smelt distribution based on the SKT, which is conducted during daylight hours in offshore habitats, may reflect general regions of spawning activity, but not actual spawning sites.

Delta smelt spawning has only been directly observed in the laboratory and eggs have not been found in the wild. Consequently, what is known about the mechanics of delta smelt spawning is derived from laboratory observations and observations of related smelt species. Delta smelt eggs are 1 mm diameter and are adhesive and negatively buoyant (Moyle 1976, 2002; Mager et al. 2004; Wang 1986, 2007). Laboratory observations indicate that delta smelt are broadcast

spawners, discharging eggs and milt close to the bottom over substrates of sand and/or pebble in current (DWR and Reclamation 1994; Brown and Kimmerer 2002; Lindberg et al. 2003; Wang 2007). Spawning over gravel or sand can also aid in the oxygenation of delta smelt eggs. Eggs that may have been laid in silt or muddy substrates might get buried or smothered, preventing their oxygenation from water flow (Lindberg pers. comm. 2011). The eggs of surf smelts and other beach spawning smelts adhere to sand particles, which keeps them negatively buoyant but not immobile, as the sand may move (“tumble”) with water currents and turbulence (Hay 2007). It is not known whether delta smelt eggs “tumble incubate” in the wild, but tumbling of eggs may moderately disperse them, which might reduce predation risk within a localized area.

The locations in the Delta where newly hatched larvae are present, most likely indicates spawning occurrence. The 20-mm trawl has captured small (~5 mm sdl) larvae in Cache Slough, the lower Sacramento River, San Joaquin River, and at the confluence of these two rivers (e.g., 20-mm trawl survey 1 in 2005). Larger larvae and juveniles (size > 23 mm sdl), which are more efficiently sampled by the 20-mm trawl gear, have been captured in Cache Slough (Sacramento River) and the Sacramento Deep Water Channel in July (e.g. 20-mm trawl survey 9 in 2008). Because they are small fish inhabiting pelagic habitats with strong tidal and river currents, delta smelt larval distribution depends on both the spawning area from which they originate and the effect of transport processes caused by flows. Larval distribution is further affected by water salinity and temperature. Hydrodynamic simulations reveal that tidal action and other factors may cause substantial mixing of water with variable salinity and temperature among regions of the Delta (Monson et al 2007). This could result in rapid dispersion of larvae away from spawning sites.

The timing of spawning may affect delta smelt population dynamics. Lindberg (2011) has suggested that smelt larvae that hatch early, around late February, have an advantage over larvae hatched during late spawning in May. Early season larvae have a longer growing season and may be able to grow larger faster during more favorable habitat conditions in the late winter and early spring. An early growing season may result in higher survivorship and a stronger spawning capability for that generation. Larvae hatched later in the season have a shorter growing season which effectively reduces survivorship and spawning success for the following spawning season.

Sampling of larval delta smelt in the Bay-Delta in 1989 and 1990 suggested that spawning occurred in the Sacramento River; in Georgiana, Prospect, Beaver, Hog, and Sycamore sloughs; in the San Joaquin River adjacent to Bradford Island and Fisherman’s Cut; and possibly other areas (Wang 1991). However, in recent years, the densest concentrations of both spawners and larvae have been recorded in the Cache Slough/Sacramento Deepwater Ship Channel complex in the North Delta. Some delta smelt spawning occurs in Napa River, Suisun Bay and Suisun Marsh during wetter years (Sweetnam 1999; Wang 1991; Hobbs et al. 2007). Early stage larval delta smelt have also been recorded in Montezuma Slough near Suisun Bay (Wang 1986).

### *Larval Development*

Mager et al. (2004) reported that embryonic development to hatching takes 11-13 days at 14-16° C for delta smelt, and Baskerville-Bridges et al. (2000) reported hatching of delta smelt eggs after 8-10 days at temperatures between 15-17° C. Lindberg et al. (2003) reported high hatching rates of delta smelt eggs in the laboratory at 15° C, and Wang (2007) reported high hatching rates at temperatures between 14-17° C. Hatching success peaks near 15° C (Bennett 2005) and swim bladder inflation occurring at 60-70 days post-hatch at 16-17° C (Mager et al. 2004). At hatching and during the succeeding three days, larvae are buoyant, swim actively near the water surface, and do not react to bright direct light (Mager et al. 2004). As development continues, newly hatched delta smelt become semi-buoyant and sink in stagnant water. However, larvae are unlikely to encounter stagnant water in the wild.

Growth rates of wild-caught delta smelt larvae are faster than laboratory-cultured individuals. Mager et al. (2004) reported growth rates of captive-raised delta smelt reared at near-optimum temperatures (16°C-17°C). Their fish were about 12 mm long after 40 days and about 20 mm long after 70 days. In contrast, analyses of otoliths indicated that wild delta smelt larvae were 15-25 mm, or nearly twice as long at 40 days of age (Bennett 2005). By 70 days, most wild fish were 30-40 mm long and beyond the larval stage. This suggests there is strong selective pressure for rapid larval growth in nature, a situation that is typical for fish in general (Houde 1987). The food available to larval fishes is constrained by mouth gape and status of fin development. Larval delta smelt cannot capture as many kinds of prey as larger individuals, but all life stages have small gapes that limit their range of potential prey. Prey availability is also constrained by habitat use, which affects what types of prey are encountered. Larval delta smelt are visual feeders. They find and select individual prey organisms and their ability to see prey in the water is enhanced by turbidity (Baskerville-Bridges et al. 2004). Thus, delta smelt diets are largely comprised of small crustacea that inhabit the estuary's turbid, low-salinity, open-water habitats (i.e., zooplankton). Larval delta smelt have particularly restricted diets (Nobriga 2002). They do not feed on the full array of zooplankton with which they co-occur; they mainly consume three copepods, *Eurytemora affinis*, *Pseudodiaptomus forbesi*, and freshwater species of the family Cyclopidae. Further, the diets of first-feeding delta smelt larvae are largely restricted to the larval stages of these copepods; older, larger life stages of the copepods are increasingly targeted as the delta smelt larvae grow, their gape increases, and they become stronger swimmers.

In the laboratory, a turbid environment (>25 Nephelometric Turbidity Units [NTU]) was necessary to elicit a first feeding response (Baskerville-Bridges et al. 2000; Baskerville-Bridges 2004). Successful feeding seems to depend on a high density of food organisms and turbidity, and increases with stronger light conditions (Baskerville-Bridges et al. 2000; Mager et al. 2004; Baskerville-Bridges et al. 2004). Laboratory-cultured delta smelt larvae have generally been fed rotifers at first-feeding (Baskerville-Bridges et al. 2004; Mager et al. 2004). However, rotifers rarely occur in the guts of wild delta smelt larvae (Nobriga 2002). The most common first prey of wild delta smelt larvae is the larval stages of several copepod species. These copepod 'nauplii' are larger and have more calories than rotifers. This difference in diet may enable the faster growth rates observed in wild-caught larvae.

The triggers for and duration of delta smelt larval movement from spawning areas to rearing areas are not known. Hay (2007) noted that eulachon larvae are probably flushed into estuaries from upstream spawning areas within the first day after hatching, but downstream movement of delta smelt larvae occurs much later. Most larvae gradually move downstream toward the two parts per thousand (ppt) isohaline (X2). X2 is scaled as the distance in kilometers from the Golden Gate Bridge (Jassby et al. 1995).

At all life stages, delta smelt are found in greatest abundance in the water column and usually not in close association with the shoreline. They inhabit open, surface waters of the Delta and Suisun Bay, where they presumably aggregate in loose schools where conditions are favorable (Moyle 2002). In years of moderate to high Delta outflow (above normal to wet water years), delta smelt larvae are abundant in the Napa River, Suisun Bay and Montezuma Slough, but the degree to which these larvae are produced by locally spawning fish versus the degree to which they originate upstream and are transported by tidal currents to the bay and marsh is uncertain.

### *Juveniles*

Young-of-the-year delta smelt rear in the low salinity zone (LSZ) from late spring through fall and early winter. Once in the rearing area growth is rapid, and juvenile fish are 40-50 mm sdl long by early August (Erkkila et al. 1950; Ganssle 1966; Radtke 1966). They reach adult size (55-70 mm sdl) by early fall (Moyle 2002). Delta smelt growth during the fall months slows considerably (only 3-9 mm total), presumably because most of the energy ingested is being directed towards gonadal development (Erkkila et al. 1950; Radtke 1966).

### *Delta Smelt Population Dynamics and Abundance Trends*

Channelization, conversion of Delta islands to agriculture, and water operations have substantially changed the physical appearance, water salinity, water clarity, and hydrology of the Delta. As a consequence of these changes, most life stages of the delta smelt are now distributed across a smaller area than historically (Arthur et al. 1996; Feyrer et al. 2007). Wang (1991) noted in a 1989 and 1990 study of delta smelt larval distribution that, in general, the San Joaquin River was used more intensively for spawning than the Sacramento River. Nobriga et al. (2008) found that delta smelt capture probabilities in the TNS are highest at specific conductance levels of 1,000 to 5,000  $\mu\text{S cm}^{-1}$  (approximately 0.6 to 3.0 practical salinity unit [psu]). Similarly, Feyrer et al. (2007) found a decreasing relationship between abundance of delta smelt in the FMWT and specific conductance during September through December. The location of the LSZ and changes in delta smelt habitat quality in the San Francisco Estuary can be indexed by changes in X2. The LSZ historically had the highest primary productivity and is where zooplankton populations (on which delta smelt feed) were historically most dense (Knutson and Orsi 1983; Orsi and Mecum 1986). However, this has not always been true since the invasion of the overbite clam (Kimmerer and Orsi 1996). The abundance of many local aquatic species has tended to increase in years when winter-spring outflow was high and X2 was pushed seaward (Jassby et al. 1995), implying that the quantity and quality (overall suitability) of estuarine habitat increases in years when

outflows are high. However, delta smelt is not one of the species whose abundance has statistically covaried with winter-spring freshwater flows (Stevens and Miller 1983; Moyle et al. 1992; Kimmerer 2002a; Bennett 2005).

The distribution of juvenile delta smelt has also changed over the last several decades. During the years 1970 through 1978, delta smelt catches in the TNS survey declined rapidly to zero in the Central and South Delta and have remained near zero since. A similar shift in FMWT catches occurred after 1981 (Arthur et al. 1996). This portion of the Delta has also had a long-term trend increase in water clarity during July through December (Arthur et al. 1996; Feyrer et al. 2007; Nobriga et al. 2008).

The California Department of Fish and Wildlife (CDFW) has conducted several long-term monitoring surveys that have been used to index the relative abundance of delta smelt. The 20-mm Survey has been conducted every year since 1995. This survey targets late-stage delta smelt larvae. Most sampling has occurred April-June. The Summer Townet Survey (TNS) has been conducted nearly every year since 1959. This survey targets 38-mm striped bass, but collects similar-sized juvenile delta smelt. Most sampling has occurred June-August. The Fall Midwater Trawl Survey (FMWT) has been conducted nearly every year since 1967. This survey also targets age-0 striped bass, but collects delta smelt > 40 mm in length. The FMWT samples monthly, September-December. The relative abundance index data and maps of the sampling stations used in these surveys are available at <http://www.dfg.ca.gov/delta/>. The methods that underlie the surveys have been described previously (Stevens and Miller 1983; Moyle and others 1992; Dege and Brown 2004). The delta smelt catch data and relative abundance indices derived from these sampling programs have been used in numerous publications (e.g., Stevens and Miller 1983; Moyle and others 1992; Jassby and others 1995; Kimmerer 2002b; Dege and Brown 2004; Bennett 2005; Feyrer and others 2007; Sommer and others 2007; Kimmerer and others 2008; Newman 2008; Nobriga and others 2008; Kimmerer and others 2009; Mac Nally and others 2010; Thomson and others 2010; Feyrer and others 2011; Maunder and Deriso 2011). These abundance index time series document the long-term decline of the delta smelt.

Early statistical assessments of delta smelt population dynamics concluded that at best, the relative abundance of the adult delta smelt population had only a very weak influence on subsequent juvenile abundance (Sweetnam and Stevens 1993). Thus, early attempts to describe abundance variation in delta smelt ignored stock-recruit effects and researchers looked for environmental variables that were directly correlated with interannual abundance variation (e.g., Stevens and Miller 1983; Moyle and others 1992; Sweetnam and Stevens 1993; Herbold 1994; Jassby and others 1995). Because delta smelt live in a habitat that varies in size and quality with Delta outflow, the authors cited above searched for a linkage between Delta outflow (or X2) and the TNS and FMWT indices. Generally, these analyses did not find strong support for an outflow-abundance linkage. These analyses led to a prevailing conceptual model that multiple interacting factors had caused the delta smelt decline (Moyle and others 1992; Bennett and Moyle 1996; Bennett 2005). It has also recently been noted that delta smelt's FMWT index is

partly influenced by concurrent environmental conditions (Feyrer and others 2007; 2011). This may be a partial explanation for why few analyses could consistently link springtime environmental conditions to delta smelt's fall index.

It is now recognized that delta smelt abundance plays an important role in subsequent abundance (Bennett 2005; Maunder and Deriso 2011). Bennett (2005) assessed (1) the influence of adult stock as indexed by the FMWT versus the next generation of juveniles indexed by the following calendar year's TNS; (2) the influence of the juvenile stock indexed by the TNS versus the subsequent adult stock indexed a few months later in the FMWT; (3) the influence of the FMWT on the following year's FMWT and on the FMWT two years later, and (4) he did the same for the TNS data. He concluded that (1) two-year-old delta smelt might play an important role in delta smelt population dynamics, (2) it was not clear whether juvenile production was a density-independent or density-dependent function of adult abundance, and (3) adult production was a density-dependent function of juvenile abundance and the carrying capacity of the estuary to support this life-stage transition had declined over time. These conclusions are also supported by Maunder and Deriso (2011).

The concept of density-dependence<sup>1</sup> and how it has affected the delta smelt is important because it may be used as a reason not to protect particular life stages from sources of mortality. Bennett (2005) concluded it was (statistically) unclear whether density-dependence occurs between generations. He also noted that the delta smelt indices strongly suggest that density-dependence has occurred, at least over the long-term, during the juvenile stage. The uncertainty about density-dependence between generations results because statistical assessments of the relationship between the adult stock and the next generation of recruits (juveniles) result in similar fits for linear (density-independent) and nonlinear (density-dependent) relationships (Bennett 2005; Maunder and Deriso 2011).

One reason for this is that delta smelt population dynamics may have changed over time. Previous papers have reported a delta smelt step-decline during 1981-1982 (Kimmerer 2002b; Thomson et al. 2010). Prior to this decline, the stock-recruit data are consistent with "Ricker" type density-dependence where increasing adult abundance resulted in decreased juvenile abundance. Since the decline, recruitment has been positively and essentially linearly related to prior adult abundance, suggesting that reproduction has been basically density-independent for about the past 30 years. This means that since the early 1980s, more adults translates into more juveniles and fewer adults translates into fewer juveniles without being 'compensated for' by density-dependence. In contrast to the transition among generations, the weight of scientific evidence strongly supports the hypothesis that, at least over the history of Interagency Ecological Program fish monitoring, delta smelt has experienced density-dependence during the juvenile stage of its life cycle, i.e., between the summer and fall (Bennett 2005; Maunder and Deriso 2011). This has been inferred because, statistically, the FMWT index does not increase linearly

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<sup>1</sup> Density-dependence refers to situations where vital rates like growth or survival change as a population's density changes (Rose et al. 2001). When vital rates do not vary with population density, they are considered to be density-independent. Density-dependence occurs in populations when one or more factors is in limited supply or when crowding results in predator aggregation or faster disease transmission.

with increases in the summer townet index. Rather, the best-fitting relationships between the summer townet index and the FMWT index show that the FMWT indices approach an asymptote as the summer townet increases or possibly even declines at the highest summer townet indices. From a species conservation perspective, the most relevant aspect of this juvenile density dependence is that the carrying capacity of the estuary for delta smelt has declined (Bennett 2005). Thus, the delta smelt population decline has occurred for two basic reasons. First, the compensatory density-dependence that historically enabled juvenile abundance to rebound from low adult numbers stopped happening. This change had occurred by the early 1980s as described above. The reason is still not known, but the consequence of the change is that for the past several decades, adult abundance drives juvenile production in a largely density-independent manner. Thus, if numbers of adults or adult fecundity decline, juvenile production will also decline (Kimmerer 2011). Second, because juvenile carrying capacity has declined, juvenile production hits a 'ceiling' at a lower abundance than it once did. This limits adult abundance and possibly per capita fecundity, which cycles around and limits the abundance of the next generation of juveniles. The mechanism causing carrying capacity to decline is likely due to the long-term accumulation of deleterious habitat changes – both physical and biological – during the summer-fall (Bennett and others 2008; Feyrer and others 2007; 2010; Maunder and Deriso 2011).

## Stressors

### *Habitat*

The existing physical appearance and hydrodynamics of the Delta have changed substantially from the environment in which native fish species like delta smelt evolved. The Delta once consisted of tidal marshes with networks of diffuse dendritic channels connected to floodplains of wetlands and upland areas (Moyle 2002). The in-Delta channels were further connected to drainages of larger and smaller rivers and creeks entering the Delta from the upland areas. In the absence of upstream reservoirs, freshwater inflow from smaller rivers and creeks and the Sacramento and San Joaquin Rivers were highly seasonal and more strongly and reliably affected by precipitation patterns than they are today. Consequently, variation in hydrology, salinity, turbidity, and other characteristics of the Delta aquatic ecosystem was greater in the past than it is today (Kimmerer 2002a). For instance, in the early 1900s, the location of maximum salinity intrusion into the Delta during dry periods varied from Chipps Island in the lower Delta to Stockton along the San Joaquin River and Merritt Island in the Sacramento River. Operations of upstream reservoirs have reduced spring flows while releases of water for Delta water export and increased flood control storage have increased late summer and fall inflows (Knowles 2002), though Delta outflows have been tightly constrained during late summer-fall for several decades. The following is a brief description of the changes that have occurred to delta smelt's habitat that are relevant to the environmental baseline for this consultation.

*Changes to the LSZ*

There have been documented changes to the delta smelt's low-salinity zone habitat that have led to present-day, baseline habitat conditions. The close association of delta smelt with the San Francisco estuary LSZ has been known for many years (Stevens and Miller 1983; Moyle et al. 1992). Peterson (2003) developed a conceptual model that hypothesized how, "stationary and dynamic components of estuarine habitats" interacted to influence fisheries production in tidal river estuaries. Peterson's model suggests that when the dynamic and static aspects of estuarine habitat sufficiently overlap, foraging, growth, density, and survival are all high, and that enables fish production to outpace losses to predators. The result is high levels of successful recruitment of new individuals. The model also hypothesizes that when the dynamic and static aspects of an estuarine habitat do not sufficiently overlap, foraging, growth, density, and survival are impaired such that losses to predators increase and recruitment of new individuals decreases. This model was developed specifically for species spawned in marine environments that were subsequently transported into estuaries. However, the concept of X2, which was developed in the San Francisco estuary to describe how freshwater flow affected estuarine habitat (Jassby et al. 1995), played a role in the intellectual development of Peterson's model. The Peterson model also provides a useful framework to conceptualize delta smelt's LSZ habitat.

Currently available information indicates that delta smelt habitat is most suitable for the fish when low-salinity water is near 20°C, highly turbid, oxygen saturated, low in contaminants, supports high densities of calanoid copepods and mysid shrimp (Moyle et al. 1992; Lott 1998; Nobriga 2002), and occurs over comparatively static 'landscapes' that support sandy beaches and bathymetric variation that enables the fish and their prey to aggregate (Kimmerer et al. 2002; Bennett et al. 2002; Hobbs et al. 2006). Almost every component listed above has been degraded over time (see below). The Service has determined that this accumulation of habitat change is the fundamental reason or mechanism that has caused delta smelt to decline.

*Alterations to estuarine bathymetry and salinity distribution (~ 1850-present)*

The position of the LSZ, where delta smelt rear, has changed over the years. The first major change in the LSZ was the conversion of the landscape over which tides oscillate and river flows vary (Moyle et al. 2010). The ancestral Delta was a large tidal marsh-floodplain habitat totally approximately 700,000 acres. Most of the historic wetlands were diked and reclaimed for agriculture or other human uses by 1920 (Atwater et al. 1979). Channels were dredged deep (~12 m) to accommodate shipping traffic from the Pacific Ocean and San Francisco Bay to ports in Sacramento and Stockton. These changes left Suisun Bay and the confluence of the Sacramento-San Joaquin Rivers as the largest and most bathymetrically variable places in the LSZ. This region remained a highly productive nursery for many decades (Stevens and Miller 1983; Moyle et al. 1992; Jassby et al. 1995). However, the deepened channels created to support shipping and flood control, requires more freshwater outflow to maintain the LSZ in the large Suisun Bay and River confluence than was once required (Gartrell 2010). The construction of the CVP and SWP not only provided water supply for urban, agricultural and industrial users, but also provided water needed to combat salinity intrusion into the Delta, which was observed by the early 20<sup>th</sup>

century. California's demand for freshwater (keeps) continues to increase, thus seasonal salinity intrusion perpetually reduces the temporal overlap of the LSZ (indexed by X2) within the Suisun Bay (region), especially in the fall (Feyrer et al. 2007; 2011). Consequently, the second major habitat change in the Delta has been in the frequency with which the LSZ is maintained in Suisun Bay for any given amount of precipitation. There was a step-decline in the LSZ in 1977 from which it has never recovered for more than a few years at a time. Based on model forecasts of climate change and water demand, this trend is expected to continue (Feyrer et al. 2011).

Summer and fall environmental quality has decreased overall in the Delta because outflows are lower and water transparency is higher. These changes may be due to increased upstream water diversions for flooding rice fields (Kawakami et al. 2008). The confluence of the Sacramento and San Joaquin Rivers has, as a result, become increasingly important as a rearing location for delta smelt, with physical environmental conditions constricting the species range to a relatively narrow area (Feyrer et al. 2007; Nobriga et al. 2008). This has increased the likelihood that most of the juvenile population is exposed to chronic and cyclic environmental stressors, or catastrophic events. For instance, all seven delta smelt collected during the September 2007 FMWT survey were captured at statistically significantly higher salinities than what would be expected based upon historical distribution data generated by Feyrer et al. (2007). During the same year, the annual bloom of toxic cyanobacteria (*Microcystis aeruginosa*) spread far downstream to the west Delta and beyond during the summer (Peggy Lehman, pers comm). This has been suggested as an explanation for the anomaly in the distribution of delta smelt relative to water salinity levels (Reclamation 2008).

### *Turbidity*

From 1999 to present, the Delta experienced a change in estuarine turbidity that culminated in an estuary-wide step-decline in 1999 (Schoellhamer 2011). For decades, the turbidity of the modified estuary had been sustained by very large sediment deposits resulting mainly from gold mining in the latter 19<sup>th</sup> century. Sediments continued to accumulate into the mid-20<sup>th</sup> century, keeping the water relatively turbid even as sediment loads from the Sacramento River basin declined due to dam and levee construction (Wright and Schoellhamer 2004). The flushing of the sediment deposits may also have made the estuary deeper overall and thus a less suitable nursery from the 'static' bathymetric perspective (Schroeter 2008).

Delta smelt associate with highly turbid waters; there is a negative correlation between the frequency of delta smelt occurrence in survey trawls during summer, fall and early winter and water clarity. For example, the likelihood of delta smelt occurrence in trawls at a given sampling station decreases with increasing Secchi depth at the stations (Feyrer et al. 2007, Nobriga et al. 2008). This is very consistent with behavioral observations of captive delta smelt (Nobriga and Herbold 2008). Few daylight trawls catch delta smelt at Secchi depths over one half meter and capture probabilities for delta smelt are highest at 0.40 m depth or less. Turbid waters are thought to increase foraging efficiency (Baskerville-Bridges et al. 2004) and reduce the risk of predation for delta smelt.

### *Temperature*

Temperature also affects delta smelt distribution. Swanson and Cech (1995) and Swanson et al. (2000) indicate delta smelt tolerate temperatures (<8° C to >25° C), however warmer water temperatures >25° C restrict their distribution more than colder water temperatures (Nobriga and Herbold 2008). Delta smelt of all sizes are found in the main channels of the Delta and Suisun Marsh and the open waters of Suisun Bay where the waters are well oxygenated and temperatures are usually less than 25° C in summer (Nobriga et al. 2008). Currently, delta smelt are subjected to thermally stressful temperatures every summer, and all available regional climate change projections predict central California will be warmer still in the coming decades (Dettinger 2005). We expect warmer estuary temperatures to be yet another significant conservation challenge based on climate change models. Warmer water temperatures would increase delta smelt mortality and constrict suitable habitat throughout the Delta during the summer months. Higher temperatures would shrink delta smelt distribution into the fall, limiting their presence to Suisun Bay and in waters with less than optimal salinities (Brown et al. unpublished data 2011). Water temperatures are presently above 20°C for most of the summer in core habitat areas, sometimes even exceeding the nominal lethal limit of 25°C for short periods. Coldwater fishes begin to have behavioral impairments (Marine and Cech 2004) and lose competitive abilities (Taniguchi et al. 1998) prior to reaching their thermal tolerance limits. Thus, the estuary can already be considered thermally stressful to delta smelt and can only become more so if temperatures warm in the coming decades.

### *Foraging Ecology*

Delta smelt feed primarily on small planktonic crustaceans, and occasionally on insect larvae (Moyle 2002). Juvenile-stage delta smelt prey upon copepods, cladocerans, amphipods, and insect larvae (Moyle 2002). Historically, the main prey of delta smelt was the euryhaline copepod *Eurytemora affinis* and the euryhaline mysid *Neomysis mercedis*. The slightly larger *Pseudodiaptomus forbesi* has replaced *E. affinis* as a major prey source of delta smelt since its introduction into the Bay-Delta, especially in summer, when it replaces *E. affinis* in the plankton community (Moyle 2002). Another smaller copepod, *Limnoithona tetraspina*, which was introduced to the Bay-Delta in the mid-1990s, is now one of the most abundant copepods in the LSZ, but not abundant in delta smelt diets. *Acartiella sinensis*, a calanoid copepod species that invaded the Delta at the same time as *L. tetraspina*, also occurs at high densities in Suisun Bay and in the western Delta over the last decade. Delta smelt eat these newer copepods, but *Pseudodiaptomus* remains their dominant prey (Baxter et al. 2008).

River flows influence estuarine salinity gradients and water residence times and thereby affect both habitat suitability for benthos and the transport of pelagic plankton upon which delta smelt feed. High tributary flow leads to lower residence time of water in the Delta, which generally results in lower plankton biomass (Kimmerer 2004). In contrast, higher residence times, which result from low tributary flows, can result in higher plankton biomass but water diversions, overbite clam grazing (Jassby et al. 2002) and possibly contaminants (Baxter et al. 2008) remove a lot of plankton biomass when residence times are high. These factors all affect food availability

for planktivorous fishes that utilize the zooplankton in Delta channels. Delta smelt cannot occupy much of the Delta anymore during the summer (Nobriga et al. 2008). Thus, there is the potential for mismatches between regions of high zooplankton abundance in the Delta and delta smelt distribution now that the overbite clam has decimated LSZ zooplankton densities.

The delta smelt compete with and are prey for several native and introduced fish species in the Delta. The introduced Mississippi silverside may prey on delta smelt eggs and/or larvae and compete for copepod prey (Bennett and Moyle 1995; Bennett 2005). Young striped bass also use the LSZ for rearing and may compete for copepod prey and eat delta smelt. Centrarchid fishes and coded wire tagged Chinook salmon smolts released in the Delta for survival experiments since the early 1980s may potentially also prey on larval delta smelt (Brandes and McLain 2001; Nobriga and Chotkowski 2000). Studies during the early 1960s found delta smelt were only an occasional prey fish for striped bass, black crappie and white catfish (Turner and Kelley 1966). However, delta smelt were a comparatively rare fish even then, so it is not surprising they were a rare prey. Striped bass appear to have switched to piscivorous feeding habits at smaller sizes than they historically did, following severe declines in the abundance of mysid shrimp (Feyrer et al. 2003). Nobriga and Feyrer (2008) showed that Mississippi silverside, which is similar in size to delta smelt, was only eaten by subadult striped bass less than 400 mm fork length. While largemouth bass are not pelagic, they have been shown to consume some pelagic fishes (Nobriga and Feyrer 2007).

#### Other Stressors

##### *Aquatic Macrophytes*

For many decades, the Delta's waterways were turbid and growth of submerged plants was apparently unremarkable. That began to change in the mid-1980s, when the Delta was invaded by the non-native plant, *Egeria densa*, a fast-growing aquatic macrophyte that has now taken hold in many shallow habitats throughout the Delta (Brown and Michniuk 2007; Hestir 2010). *Egeria densa* and other non-native species of submerged aquatic vegetation (SAV) grow most rapidly in the summer and late fall when water temperatures are warm ( $> 20^{\circ}\text{C}$ ) and outflow is relatively low (Hestir 2010). The large canopies formed by these plants have physical and biological consequences for the ecosystem (Kimmerer et al. 2008). First, the dense nature of SAV promotes sedimentation of particulate matter from the water column which increases water transparency. Increased water transparency leads to a loss of habitat for delta smelt (Feyrer et al. 2007; Nobriga et al. 2008). Second, dense SAV canopies provide habitat for a suite of non-native fishes that occupy the littoral and shallow habitats of the Delta, displacing native fishes (Nobriga et al. 2005; Brown and Michniuk 2007). Finally, the rise in SAV colonization over the last three decades has led to a shift in the dominant trophic pathways that fuel fish production in the Delta. Until the latter 1980s, the food web of most fishes was often dominated by mysid shrimp (Feyrer et al. 2003) that were subsidized by phytoplankton food sources (Rast and Sutton 1989). Now, most littoral and demersal fishes of the Delta have diets dominated by the epibenthic amphipods that eat SAV detritus or the epiphytic algae attached to SAV (Grimaldo et al. 2009).

*Egeria densa* and other non-native submerged aquatic vegetation (e.g., *Myriophyllum spicatum*) can affect delta smelt in direct and indirect ways. Directly, submerged aquatic vegetation can overwhelm littoral habitats (inter-tidal shoals and beaches) where delta smelt may spawn making them unsuitable for spawning. Indirectly, submerged aquatic vegetation decreases turbidity (by trapping suspended sediment) which has contributed to a decrease in both juvenile and adult smelt habitat (Feyrer et al. 2007; Nobriga et al. 2008). Increased water transparency may delay feeding and may also make delta smelt more susceptible to predation pressure.

### *Predators*

Delta smelt is a rare fish and has been a rare fish (compared to other species) for at least the past several decades (Nobriga and Herbold 2008). Therefore, it has also been rare in examinations of predator stomach contents. Delta smelt were occasional prey fish for striped bass, black crappie and white catfish in the early 1960s (Turner and Kelley 1966) but went undetected in a recent study of predator stomach contents (Nobriga and Feyrer 2007). Striped bass are likely the primary predator of juvenile and adult delta smelt given their spatial overlap in pelagic habitats. Despite major declines in age-0 abundance, there remains much more biomass of striped bass in the upper estuary than delta smelt. This means it is not possible for delta smelt to support any significant proportion of the striped bass population. It is unknown whether incidental predation by striped bass (and other lesser predators) represents a substantial source of mortality for delta smelt.

Nothing is known about the historic predators of delta smelt or their possible influence on delta smelt population dynamics. Fish eggs and larvae can be opportunistically preyed upon by many invertebrate and vertebrate animals. There has always been a very long list of potential predators of delta smelt's eggs and larvae. The eggs and newly-hatched larvae of delta smelt are thought to be prey for Mississippi silversides in littoral habitats (Bennett 2005). Other potential predators of eggs and larvae of smelt in littoral habitats are yellowfin goby, centrarchids, and Chinook salmon. Potential native predators of juvenile and adult delta smelt would also have included numerous bird and fish species and this may be reflected in delta smelt's annual life-history. Annual fish species, also known as "opportunistic strategists", are adapted to high mortality rates in the adult stage (Winemiller and Rose 1992). This high mortality is usually due to predation or highly unpredictable environmental conditions, both of which could have characterized the ancestral niche of delta smelt.

The introduction of striped bass into the San Francisco Estuary in 1879 added a permanently resident, large piscivorous fish to the low-salinity zone. The LSZ is a habitat not known to have had an equivalent predator prior to the establishment of striped bass (Moyle 2002). Striped bass likely changed predation rates on delta smelt, but there are no data available to confirm this hypothesis. For many decades the estuary supported higher striped bass and delta smelt numbers than it does currently (Moyle 2002). This is evidence that delta smelt is able to successfully coexist with striped bass.

The current influence of striped bass and other predators on delta smelt population dynamics is unknown, mainly because predator effects on rare prey are extremely difficult to quantify. Delta smelt were observed in the stomach contents of striped bass and other fishes in the 1960s (Stevens 1963; Turner and Kelley 1966), but have not been in more recent studies (Feyrer et al. 2003; Nobriga and Feyrer 2007). Predation is a common source of density-dependent mortality in fish populations (Rose et al. 2001). Thus, it is possible that predation was a mechanism that historically generated the density-dependence observable in delta smelt population dynamics that has been noted by Bennett (2005) and Maunder and Deriso (2011). As is the case with other fishes, the vulnerability of delta smelt to predators may be influenced primarily by habitat suitability. It is widely documented that pelagic fishes, including many smelt species, experience lower predation risks under turbid water conditions (Thetmeyer and Kils 1995; Utne-Palm 2002; Horpilla et al. 2004.). Growth rates, a result of feeding success plus water temperature, are also well known to affect fishes' cumulative vulnerability to predation (Sogard 1997).

### *Competition*

It has been hypothesized that delta smelt are adversely affected by competition from other introduced fish species that use overlapping habitats, including Mississippi silversides, (Bennett and Moyle 1995) striped bass, and wakasagi (Sweetnam 1999). Laboratory studies show that delta smelt growth is inhibited when reared with Mississippi silversides (Bennett 2005) but there is no empirical evidence to support the conclusion that competition between these species is a factor that influences the abundance of delta smelt in the wild. There is some speculation that the overbite clam competes with delta smelt for copepod nauplii (Nobriga and Herbold 2008). It is unknown how intensively overbite clam grazing and delta smelt directly compete for food, but overbite clam consumption of shared prey resources does have other ecosystem consequences that appear to have affected delta smelt indirectly.

### *Microcystis*

Large blooms of toxic blue-green alga, *Microcystis aeruginosa*, were first detected in the Delta during the summer of 1999 (Lehman et al. 2005). Since then, *M. aeruginosa* has bloomed each year, forming large colonies throughout most of the Delta and increasingly down into eastern Suisun Bay. Blooms typically occur between late spring and early fall (peak in the summer) when temperatures are above 20 °C. *Microcystis aeruginosa* can produce natural toxins that pose animal and human health risks if contacted or ingested directly. Preliminary evidence indicates that the toxins produced by local blooms are not toxic to fishes at current concentrations. However, it appears that *M. aeruginosa* is toxic to copepods that delta smelt eat (Ali Ger 2008 pers comm). In addition, *M. aeruginosa* could out-compete diatoms for light and nutrients. Diatoms are a rich food source for zooplankton in the Delta (Mueller-Solger et al. 2002). Studies are underway to determine if zooplankton production is compromised during *M. aeruginosa* blooms to an extent that is likely to adversely affect delta smelt. *Microcystis* blooms may also decrease DO to lethal levels for fish (Saiki et al. 1992), although delta smelt do not strongly overlap the densest *Microcystis* concentrations, so DO is not likely a problem. *Microcystis* blooms are a symptom of eutrophication and high ammonia to nitrate ratios in the water.

### *Contaminants*

Contaminants can change ecosystem functions and productivity through numerous pathways. However, contaminant loading and its ecosystem effects within the Delta are not well understood. Although a number of contaminant issues were first investigated during the Pelagic Organism Decline (POD) years, concern over contaminants in the Delta is not new. There are long-standing concerns related to mercury and selenium levels in the watershed, Delta, and San Francisco Bay (Linville et al. 2002; Davis et al. 2003). Phytoplankton growth rate may, at times, be inhibited by high concentrations of herbicides (Edmunds et al. 1999). New evidence indicates that phytoplankton growth rate is chronically inhibited by ammonium concentrations in and upstream of Suisun Bay (Wilkerson et al. 2006, Dugdale et al. 2007). Contaminant-related toxicity to invertebrates has been noted in water and sediments from the Delta and associated watersheds (e.g., Kuivila and Foe 1995, Giddings et al. 2000, Werner et al. 2000, Weston et al. 2004). Undiluted drainwater from agricultural drains in the San Joaquin River watershed can be acutely toxic (quickly lethal) to fish and have chronic effects on growth (Saiki 1998). Evidence for mortality of young striped bass due to discharge of agricultural drainage water containing rice herbicides into the Sacramento River (Bailey et al. 1994) led to new regulations for water discharges. Bioassays using caged Sacramento sucker (*Catostomus occidentalis*) have revealed deoxyribonucleic acid strand breakage associated with runoff events in the watershed and Delta (Whitehead et al. 2004). Kuivila and Moon (2004) found that peak densities of larval and juvenile delta smelt sometimes coincided in time and space with elevated concentrations of dissolved pesticides in the spring. These periods of co-occurrence lasted for up to 2-3 weeks, but concentrations of individual pesticides were low and much less than would be expected to cause acute mortality. However, the effects of exposure to the complex mixtures of pesticides actually present are unknown.

Current science suggests a possible link between contaminants and POD, may be the effects of contaminant exposure on prey items, resulting in an indirect effect on the survival of POD species (Johnson et al. 2010). The POD investigators initiated several studies beginning in 2005 to address the possible role of contaminants and disease in the declines of Delta fish and other aquatic species. Their primary study consists of twice-monthly monitoring of ambient water toxicity at fifteen sites in the Delta and Suisun Bay. In 2005 and 2006, standard bioassays using the amphipod *Hyalella azteca* had low (<5 percent) frequency of occurrence of toxicity (Werner et al. 2008). The results indicated that 2007, a dry year, showed a higher incidence of toxic events than in the previous (wetter) year, 2006 (Werner et al. 2010). Parallel testing with the addition of piperonyl butoxide, an enzyme inhibitor, indicated that both organophosphate and pyrethroid pesticides may have contributed to the pulses of toxicity. Most of the tests that were positive for *H. azteca* toxicity have come from water samples from the lower Sacramento River. Pyrethroids are of particular interest because use of these insecticides has increased within the Delta watershed (Amweg et al. 2005, Oros and Werner 2005) as use of some organophosphate insecticides has declined. Urban source waters have shown toxicity to *H. azteca* with high mortality rates and swimming impairment in fishes due to pyrethroid pesticides (Weston and Lydy 2010). Toxicity of sediment-bound pyrethroids to macroinvertebrates has also been

observed in small, agriculture-dominated watersheds tributary to the Delta (Weston et al. 2004, 2005). The association of delta smelt spawning with turbid winter runoff and the association of pesticides including pyrethroids with sediment is of potential concern.

In conjunction with the POD investigation, larval delta smelt bioassays were conducted simultaneously with a subset of the invertebrate bioassays. The water samples for these tests were collected from six sites within the Delta during May-August of 2006 and 2007. Results from 2006 indicate that delta smelt are highly sensitive to high levels of ammonia, low turbidity, and low salinity. There is some preliminary indication that reduced survival may be due to disease organisms (Werner et al. 2008). No significant mortality of larval delta smelt was found in the 2006 bioassays, but there were two instances of significant mortality in June and July of 2007. In both cases, the water samples were collected from sites along the Sacramento River and had relatively low turbidity and salinity levels and moderate levels of ammonia. It is also important to note that no significant *H. azteca* mortality was detected in these water samples. While the *H. azteca* tests are very useful for detecting biologically relevant levels of water column toxicity for zooplankton, interpretation of the *H. azteca* test results with respect to fish should proceed with great caution. The relevance of the bioassay results to field conditions remains to be determined. Werner et al. (2010) conducted *in situ* testing in the laboratory and compared contaminant sensitivity of delta smelt to common bioassay organisms, including *H. azteca*. The investigations included contaminants commonly observed in the Delta, such as organophosphate and pyrethroid insecticides, copper, and total ammonia. In the laboratory, delta smelt were 1.8 to >11 times more sensitive than fathead minnow to ammonia, copper, and all insecticides tested (except permethrin). The invertebrates tested were more sensitive to contaminants than delta smelt or fathead minnows. *Eurytemora affinis* and *Ceriodaphnia dubia* were the most sensitive to total ammonia. *C. dubia* was the most sensitive to copper and organophosphates pesticides. *H. azteca* was the most sensitive test organism to pyrethroids. Toxicity was not detected for the Sacramento River at Hood or the San Joaquin River at Rough and Ready Island during the 2009 *in situ* testing period. Delta smelt survival was low in treatment and control waters. Werner et al. (2010) concluded that larval smelt may be too sensitive to salinity, temperature and transport stress for *in situ* exposures and recommended using surrogate species in future tests.

Persistent confinement of the spawning population of delta smelt to the Sacramento River increases the likelihood that a substantial portion of the spawners will be affected by a catastrophic event or localized chronic threat. For instance, large volumes of highly concentrated ammonia released into the Sacramento River from the Sacramento Regional County Sanitation District may affect embryo survival or inhibit prey production. Further, agricultural fields in the Yolo Bypass and surrounding areas are regularly sprayed by pesticides, and water samples taken from Cache Slough sometimes exhibited toxicity to *H. azteca* (Werner et al. 2008; 2010). The thresholds of toxicity for delta smelt for most of the known contaminants have not been determined, but the exposure to a combination of different compounds increases the likelihood of adverse effects. The extent to which delta smelt larvae are exposed to contaminants varies with

flow entering the Delta. Flow pulses during spawning increase exposure to many pesticides (Kuivila and Moon 2004) but decrease ammonia concentrations entering the Delta from wastewater treatment plants.

The POD investigations into potential contaminant effects also include the use of biomarkers that have been used previously to evaluate toxic effects on POD fishes (Bennett et al. 1995, Bennett 2005). The results to date have been mixed. A pathogen survey of 105 adult delta smelt, sampled from January through May, at several sites in the Delta, found that disease did not appear to overtly influence the health of the surveyed population for that year (Foott and Bigelow 2010). Histopathological and viral evaluation of young longfin smelt collected in 2006 indicated no histological abnormalities associated with exposure to toxics or disease (Foott and Stone 2007). There was also no evidence of viral infections or high parasite loads. Similarly, young threadfin shad showed no histological evidence of contaminant effects or of viral infections (Foott and Stone 2007). Parasites were noted in threadfin shad gills at a high frequency but the infections were not considered severe. Both longfin smelt and threadfin shad were considered healthy in 2006. Adult delta smelt collected from the Delta during the winter of 2005 also were considered healthy, showing little histopathological evidence for starvation or disease (Teh 2007). However, there was some evidence of low frequency endocrine disruption. In 2005, nine of 144 (six percent) of adult delta smelt males sampled were intersex, having immature oocytes in their testes (Teh 2007). Bennett (2005) reported that about 10% of the delta smelt analyzed for histopathological anomalies in 1999-2000 showed evidence of deleterious contaminant exposure. In contrast, 30%-60% of these fish had liver glycogen depletion consistent with food limitation. In contrast, preliminary histopathological analyses have found evidence of significant disease in other species and for POD species collected from other areas of the estuary. Massive intestinal infections with an unidentified myxosporean were found in yellowfin goby (*Acanthogobius flavimanus*) collected from Suisun Marsh. Severe viral infection was also found in Mississippi silverside and juvenile delta smelt collected from Suisun Bay during summer 2005. Lastly, preliminary evidence suggests that contaminants and disease may impair survival of age-0 striped bass. Baxter et al. (2008) found high occurrence and severity of parasitic infections, inflammatory conditions, and muscle degeneration in young striped bass collected in 2005; levels were lower in 2006. Several biomarkers of contaminant exposure including P450 activity (i.e., detoxification enzymes in liver), acetylcholinesterase activity (i.e., enzyme activity in brain), and vitellogenin induction (i.e., presence of egg yolk protein in blood of males) were also reported from striped bass collected in 2006 (Ostrach 2008). Delta smelt can also be exposed to other toxic substances. Recent toxicological research has provided dose-response curves for several contaminants (Connon et al. 2009; 2011; in review). This research has also shown that gene expression changes and impairment of delta smelt swimming performance occur at contaminant concentrations lower than levels that cause mortality.

### **Summary of Delta Smelt Status and Environmental Baseline**

In summary, delta smelt's LSZ ecosystem has been changing and has changed very rapidly on several occasions during the past several decades. First, suitable land area was reduced, then water diversions increased, then the temporal overlap of low-salinity water with the best

remaining landscape was reduced, then the food web began dramatically changing, then the turbidity delta smelt are assumed to use to see their food as larvae (Baskerville-Bridges et al. 2004) and use to hide from predators at later life stages (sensu Gregory and Levings 1998) lessened. Water temperatures are expected to rise (Dettinger 2005), which can only generate greater areas of stressful or even lethal temperature conditions for longer periods. Modeled future conditions suggest difficult conservation challenges and choices lie ahead (Feyrer et al. 2011; Brown et al. unpublished data 2011).

### **Status of the Delta Smelt Critical Habitat**

The Status of Critical Habitat and Environmental Baseline sections are combined into one section in this document. The Service designated critical habitat for the delta smelt on December 19, 1994 (Service 1994). The geographic area encompassed by the designation includes all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma sloughs; and the existing contiguous waters contained within the legal Delta (as defined in section 12220 of the California Water Code) (Service 1994).

### **Conservation Role of Delta Smelt Critical Habitat**

The Service's primary objective in designating critical habitat was to identify the key components of delta smelt habitat that support successful spawning, larval and juvenile transport, rearing, and adult migration. Delta smelt are endemic to the Bay-Delta and the vast majority only live one year. Thus, regardless of annual hydrology, the Delta must provide suitable habitat all year, every year. Different regions of the Delta provide different habitat conditions for different life stages, but those habitat conditions must be present when needed, and have sufficient connectivity to provide migratory pathways and the flow of energy, materials and organisms among the habitat components. The entire Delta and Suisun Bay are designated as critical habitat; over the course of a year, the entire habitat is occupied.

### **Description of the Primary Constituent Elements**

In designating critical habitat for the delta smelt, the Service identified the following primary constituent elements essential to the conservation of the species:

*Primary Constituent Element 1:* Physical habitat" is defined as the structural components of habitat. Because delta smelt is a pelagic fish, spawning substrate is the only known important structural component of habitat. It is possible that depth variation is an important structural characteristic of pelagic habitat that helps fish maintain position within the estuary's LSZ (Bennett et al. 2002; Hobbs et al. 2006).

*Primary Constituent Element 2:* “Water” is defined as water of suitable quality to support various delta smelt life stages with the abiotic elements that allow for survival and reproduction. Delta smelt inhabit open waters of the Delta and Suisun Bay. Certain conditions of temperature, turbidity, and food availability characterize suitable pelagic habitat for delta smelt and are discussed in detail in the Status of the Species/Environmental Baseline section, above. Factors such as high entrainment risk and contaminant exposure can degrade this PCE even when the basic water quality is consistent with suitable habitat.

*Primary Constituent Element 3:* “River flow” is defined as transport flow to facilitate spawning migrations and transport of offspring to LSZ rearing habitats. River flow includes both inflow to and outflow from the Delta, both of which influence the movement of migrating adult, larval, and juvenile delta smelt. Inflow, outflow, and Old and Middle Rivers flow influence the vulnerability of delta smelt larvae, juveniles, and adults to entrainment at Banks and Jones (refer to Status of the Species/Environmental Baseline section, above). River flow interacts with the fourth primary constituent element, salinity, by influencing the extent and location of the highly productive LSZ where delta smelt rear.

*Primary Constituent Element 4:* “Salinity” is defined as the LSZ nursery habitat. The LSZ is where freshwater transitions into brackish water; the LSZ is defined as 0.5-6.0 psu (parts per thousand salinity; (Kimmerer 2004). The 2 psu isohaline is a specific point within the LSZ where the average daily salinity at the bottom of the water is 2 psu (Jassby et al. 1995). By local convention the location of the LSZ is described in terms of the distance from the 2 psu isohaline to the Golden Gate Bridge (X2); X2 is an indicator of habitat suitability for many San Francisco Estuary organisms and is associated with variance in abundance of diverse components of the ecosystem (Jassby et al. 1995; Kimmerer 2002). The LSZ expands and moves downstream when river flows into the estuary are high. Similarly, it contracts and moves upstream when river flows are low. During the past 40 years, monthly average X2 has varied from as far downstream as San Pablo Bay (45 km) to as far upstream as Rio Vista on the Sacramento River (95 km). At all times of year, the location of X2 influences both the area and quality of habitat available for delta smelt to successfully complete their life cycle. In general, delta smelt habitat quality and surface area are greater when X2 is located in Suisun Bay. Both habitat quality and quantity diminish the more frequently and further the LSZ moves upstream, toward the confluence.

### **Overview of Delta Smelt Habitat and the Primary Constituent Elements**

As previously described in the Status of the Species/Environmental Baseline section, delta smelt live their entire lives in the tidally-influenced fresh- and brackish waters of the San Francisco Estuary (Moyle 2002). Delta smelt are an open-water, or pelagic, species. They do not associate strongly with structure. They may use nearshore habitats for spawning (PCE #1), but free-swimming life stages mainly occupy offshore waters (PCE #2). Thus, the distribution of the population is strongly influenced by river flows through the estuary (PCE #3) because the quantity of fresh water flowing through the estuary changes the amount and location of suitable low-salinity, open-water habitat (PCE #4). This is true for all life stages. During periods of high river flow into the estuary, delta smelt distribution can transiently extend as far west as the Napa

River and San Pablo Bay. Delta smelt distribution is highly constricted near the Sacramento-San Joaquin river confluence during periods of low river flow into the estuary (Feyrer et al. 2007). In the 1994 designation of critical habitat, the best available science held that the delta smelt population was responding to variation in spring X2. In the intervening 14 years, the scientific understanding of delta smelt habitat has improved. The current understanding is that X2 and the combined water flows of the Old River and Middle River both must be considered to manage entrainment and that X2 indexes important habitat characteristics throughout the year.

#### Alterations to Estuarine Bathymetry PCE # 1 (~ 1850-present)

The first major change in the LSZ was the conversion of the landscape over which tides oscillate and river flows vary (Nichols et al. 1986). The ancestral Delta was a large tidal marsh-floodplain habitat totaling approximately 300,000 acres. Most of the wetlands were diked and reclaimed for agriculture or other human use by the 1920s. The physical habitat modifications of the Delta and Suisun Bay were mostly due to land reclamation and urbanization. Water conveyance projects and river channelization have had some influence on the regional physical habitat by armoring levees with riprap, building conveyance channels like the Delta Cross Channel, storage reservoirs like Clifton Court Forebay, and by building and operating temporary barriers in the south Delta and permanent gates and water distribution systems in Suisun Marsh.

In the 1930s to 1960s, the shipping channels were dredged deeper (~12 m) to accommodate shipping traffic from the Pacific Ocean and San Francisco Bay to ports in Sacramento and Stockton. These changes left Suisun Bay and the Sacramento-San Joaquin river confluence region as the largest and most bathymetrically variable places in the LSZ. This region remained a highly productive nursery for many decades (Stevens and Miller 1983; Moyle et al. 1992; Jassby et al. 1995). However, the deeper landscape created to support shipping and flood control requires more freshwater outflow to maintain the LSZ in the large Suisun Bay/river confluence region than was once required (Gartrell 2010).

Seasonal salinity intrusion reduces the temporal overlap of the LSZ (indexed by X2) with the Suisun Bay region, especially in the fall (Feyrer et al. 2007, 2010). Thus, the second major change has been in the frequency with which the LSZ is maintained in Suisun Bay for any given amount of precipitation (DFG 2010). This metric showed a step-decline in 1977 from which it has never recovered for more than a few years at a time. Based on model forecasts of climate change and water demand, this trend is expected to continue (Feyrer et al. 2011). As such this alteration of PCE # 1 also affects the other PCEs, particularly PCE # 4. The major landscape factor affecting this interaction was the dredging of shipping channels.

Spawning delta smelt require all four PCEs, but spawners and embryos are the life stage that is believed to most require a specific structural component of habitat. Spawning delta smelt require sandy or small gravel substrates for egg deposition (Bennett 2005). The major invasive species effect on physical habitat is the dense growth of submerged aquatic vegetation in the Delta (described in more detail below). These plants carpet large areas in parts of the Delta such as Frank's Tract. The vegetation beds act as mechanical filters removing turbidity and possibly

other water quality components as the tides and river flows move water over them (Hestir 2010). Thus, the proliferation of submerged aquatic plants has likely also reduced the area of nearshore habitat suitable for delta smelt spawning.

#### Alterations to Water (PCE # 2)

PCE # 2 is primarily referring to a few key water quality components (other than salinity) that influence spawning and rearing habitat suitability for delta smelt. Research to date indicates that water quality conditions are more important than physical habitat conditions for predicting where delta smelt occur (Feyrer et al. 2007; Nobriga et al. 2008) – probably because delta smelt is a pelagic fish except during its egg/embryo stage. However, the interaction of water quality and bathymetry is thought to generally affect estuarine habitat suitability (Peterson 2003) and there is evidence that delta smelt habitat is optimized when appropriate water quality conditions overlap the Suisun Bay region (Moyle et al. 1992; Hobbs et al. 2006; Feyrer et al. 2011). This is discussed further in the section about PCE # 4 (salinity).

#### *Reduced turbidity (1999-present)*

The next major change was a change in estuarine turbidity that culminated in an estuary-wide step-decline in 1999 (Schoellhamer 2011). For decades, the turbidity of the modified estuary had been sustained by very large sediment deposits resulting mainly from gold mining in the latter 19<sup>th</sup> century. The sediments continued to accumulate into the mid-20<sup>th</sup> century, keeping the water relatively turbid even as sediment loads from the Sacramento River basin declined due to dam and levee construction (Wright and Schoellhamer 2004). The flushing of the sediment deposits may also have made the estuary deeper overall and thus a less suitable nursery from the ‘static’ bathymetric perspective (Schroeter 2008). Delta smelt larvae require turbidity to initiate feeding (Baskerville-Bridges et al. 2004), and as explained above, older fish are thought to use turbidity as cover from predators. Thus, turbidity is an aspect of PCE # 2 which is a necessary water quality aspect of delta smelt’s critical habitat.

Dams and armored levees have contributed to the long-term decline in sediment load to the estuary (Wright and Schoellhamer 2004) and to the clearing of estuary water. This is a long-term effect that stemmed from building and maintaining infrastructure. Opportunities to substantively address this change are limited due to the extreme Central Valley flood and water supply risks that would result from decommissioning dams or removing levees.

#### Alterations of River Flows PCE # 3

This PCE refers to the transport flows that help guide young delta smelt from spawning habitats to rearing habitats, and to flows that guide adult delta smelt from rearing habitats to spawning habitats. Delta outflow also has some influence on delta smelt’s supporting food web (Jassby et al. 2002; Kimmerer 2002) and it affects abiotic habitat suitability as well (Feyrer et al. 2007; 2011). The latter is expanded upon in the discussion of PCE # 4. The environmental driver with the strongest influence on PCE # 3 is highly dependent on the time-scale being considered. The

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tide has the largest influence on flow velocities and directions in delta smelt's critical habitat at very short timescales (minutes to days), whereas interannual variation in precipitation and runoff has the largest influence on flows into and through the Delta at very long timescales (years to decades), and sometimes at shorter time scales (days to weeks) during major storm events. Changes to flow regimes can have the largest influence on PCE #3 at timescales of weeks to seasons. This is particularly true during periods of low natural inflow, for instance during the fall and during droughts, and in the south Delta where Old and Middle River flows are often managed using changes in export flow rates.

#### Salinity PCE # 4

The core delta smelt habitat, is the LSZ (Moyle et al. 1992; Bennett 2005). The LSZ is where freshwater transitions into brackish water, and is defined as the area of the estuary where salinity ranges from 0.5-6.0 psu (parts per thousand salinity; Kimmerer 2004). This area is always moving due to tidal and river flow variation. Larval delta smelt tend to reside somewhat landward (upstream) of X2 (Dege and Brown 2004), but the center of juvenile distribution tends to be very near X2 until the fish start making spawning migrations in the winter (Feyrer et al. 2011; Sommer et al. 2011). Because of this association between the distribution of salinity in the estuary and the distribution of the delta smelt population, the tidal and river flows that comprise

PCE # 3 affect PCE # 4.

The expansion and contraction of the LSZ affects the areal extent of abiotic habitat for delta smelt, both during spring (Kimmerer et al. 2009) and fall (Feyrer et al. 2007, 2011). In the spring, most delta smelt are larvae or young juveniles and the LSZ is typically maintained over the expansive Suisun Bay region. Thus, abiotic habitat "limitation" is unlikely and no consistent influence of spring X2 variation on later stage abundance estimates has been reported to date (Jassby et al. 1995; Bennett 2005; Kimmerer et al. 2009). Historical maxima in juvenile abundance according to CDFW's TNS occurred in low outflow years when abiotic habitat area was comparatively low (Kimmerer 2002; Kimmerer et al. 2009).

In contrast, during fall delta smelt are late stage juveniles and for the past decade or more, the LSZ has been persistently constricted by low Delta outflow. Fall habitat conditions affect delta smelt distribution and the concurrent FMWT abundance index (Feyrer et al. 2007, 2011). However, the quantitative life cycle models developed to date have not found evidence for a year over year effect of fall LSZ location on delta smelt population dynamics (Mac Nally et al. 2010; Thompson et al. 2010; Deriso 2011).

It is now recognized that some delta smelt occur year-around in the Cache Slough region including the Sacramento River Deep Water Shipping Channel and Liberty Island (Kimmerer 2011; Miller 2011; Sommer et al. 2011). The latter has been a consistently available habitat only since 1997. This region is often lower in salinity than 0.6 psu – the lower formal limit of the LSZ as defined by Kimmerer (2004). Delta smelt likely use it because it is one of the most turbid habitats remaining in the Delta (Nobriga et al. 2005). A recent population genetic study found no

evidence that delta smelt inhabiting this region are unique compared to delta smelt using the LSZ-proper (Fisch et al. 2011), therefore it is likely that individual delta smelt migrate between the LSZ and the Cache Slough region. This is consistent with the high summer water temperatures observed there, which might compel individual delta smelt to seek out cooler habitats within and outside the Cache Slough region.

### **Cumulative Effects**

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section, because they require separate consultation pursuant to section 7 of the Act.

Within the action area, non-Federal diversions of water (e.g., municipal and industrial uses, as well as diversions through intakes serving numerous small, private agricultural lands) are ongoing and likely to continue into the foreseeable future. These non-federal diversions are not likely to entrain very many delta smelt based on the results of a study by Nobriga et al. (2004). Nobriga et al. (2004) reasoned that the littoral location and low-flow operational characteristics of these diversions reduced their risk of entraining delta smelt. A study of the Morrow Island Distribution System by DWR produced similar results, with one demersal species and one species that associates with structural environmental features together accounting for 97-98 percent of entrainment; only one delta smelt was observed to be entrained during the two years of the study (DWR 2007). Although these non-federal diversions do not appear to entrain large numbers of delta smelt, they are a source of entrainment for delta smelt.

State or local levee maintenance may also destroy or adversely affect delta smelt spawning or rearing habitat and interfere with natural, long term spawning habitat-maintaining processes. Operation of flow-through cooling systems on the Mirant electrical power generating plants that draw water from and discharge into the action area may also adversely affect delta smelt in the form of entrainment and locally increased water temperatures.

Adverse effects to delta smelt and its critical habitat may result from point and non-point source chemical contaminant discharges within the action area. These contaminants include, but are not limited to ammonia and free ammonium ion, numerous pesticides and herbicides, and oil and gasoline product discharges. Oil and gasoline product discharges may be introduced into Delta waterways from shipping and boating activities and from urban activities and runoff. Implicated as potential stressors of delta smelt, these contaminants may adversely affect fish reproductive success and survival rates.

Other future, non-Federal actions within the action area that are likely to occur and may adversely affect delta smelt and its critical habitat include: the dumping of domestic and industrial garbage that decreases water quality; construction and maintenance of golf courses that reduce habitat and introduce pesticides and herbicides into the aquatic environment; oil and gas development and production that may affect aquatic habitat and may introduce pollutants into the

water; agricultural activities, including burning or removal of vegetation on levees that reduce riparian and wetland habitats that contribute to the quality of habitat used by delta smelt; and livestock grazing activities that may degrade or reduce riparian and wetland habitats that contribute to the quantity and quality of habitat used by delta smelt.

### *Climate Change*

The global average temperature has risen by approximately 0.6 degrees centigrade during the 20th Century (International Panel on Climate Change 2001, 2007; Adger et al 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (International Panel on Climate Change 2001, 2007; Adger et al. 2007), and that it is "very likely" that it is largely due to increasing concentrations of greenhouse gases (carbon dioxide, methane, nitrous oxide, and others) in the global atmosphere from burning fossil fuels and other human activities (Cayan et al. 2005, EPA Global Warming webpage <http://yosemite.epa.gov>; Adger et al. 2007). Eleven of the twelve years between 1995 and 2006 rank among the twelve warmest years since global temperatures began in 1850 (Adger et al. 2007). The warming trend over the last fifty years is nearly twice that for the last 100 years (Adger et al. 2007).

Under a high emissions scenario, the International Panel on Climate Change estimates that global temperatures will rise another four degrees centigrade by the end of this Century; even under a low emissions growth scenario, the International Panel on Climate Change estimates that the global temperature will go up another 1.8 degrees centigrade (International Panel on Climate Change 2001). The increase in global average temperatures affects certain areas more than others. The western United States, in general, is experiencing more warming than the rest of the Nation, with the 11 western states averaging 1.7 degrees Fahrenheit warmer temperatures than this region's average over the 20<sup>th</sup> Century (Saunders et al. 2008). California, in particular, will suffer significant consequences as a result of global warming (California Climate Action Team 2006).

In California, reduced snowpack will cause more winter flooding and summer drought, as well as higher temperatures in lakes and coastal areas. The incidence of wildfires in California will also increase and the amount of increase is highly dependent upon the extent of global warming. No less certain than the fact of global warming itself is the fact that global warming, unchecked, will harm biodiversity generally and cause the extinction of large numbers of species. If the global mean temperatures exceed a warming of two to three degrees centigrade above pre-industrial levels, twenty to thirty percent of plant and animal species will face an increasingly high risk of extinction (International Panel on Climate Change 2001, 2007).

The mechanisms by which global warming may push already imperiled species closer or over the edge of extinction are multiple. Global warming increases the frequency of extreme weather events, such as heat waves, droughts, and storms (International Panel on Climate Change 2001, 2007; California Climate Action Team 2006; Lenihan et al. 2003). Extreme weather events may cause mortality of individuals and significantly influence which species will remain extant or occur in natural habitats. Where populations are isolated, a changing climate may result in local extinctions, with range shifts precluded by lack of habitats.

The delta smelt is an obligate, aquatic species and its population could be negatively affected by climate change. Through the use of models and evidence of planetary warming due to greenhouse gasses, science can predict the possible ecological changes that might occur in the San Francisco Bay-Delta ecosystem in future years (Cloern et al. 2011). Dramatic weather changes could result in an increased frequency of drought within the legal Delta, increased air temperatures, reduced suitable aquatic habitat (Cloern et al. 2011) and also reduced native prey populations. Reductions in freshwater outflow can shift X2 upstream, where habitat conditions are less suitable. Shifts in X2 may have negative consequences for delta smelt breeding and survival. Conversely, climate change may lead to years where heavy rainfall and snow melt is common, causing more frequent flood events and sea level rise that may lead to drastic changes in water salinity levels appropriate for delta smelt survival.

There is currently no quantitative analysis of how ongoing climate change is currently affecting delta smelt and the Delta ecosystem. Climate change could have caused shifts in the timing of flows and water temperatures in the Delta which could lead to a change in the timing of migration of adult and juvenile delta smelt.

#### **Effects of the Proposed Action**

CDBW proposes to continue to utilize 2,4-D and Glyphosate along with the adjuvant Agri-dex during the 2013-2017 WHCP. Application of the adjuvant and these herbicides onto water hyacinth mats in the Delta may pose direct and indirect effects to delta smelt and its critical habitat. Although, based on toxicological studies conducted, it is anticipated that any direct effects to delta smelt are likely to be low.

CDBW proposes to begin utilizing penoxsulam and imazamox and the adjuvant Competitor only in Areas 3 and 4 between March 1 and November 30 for the 2013-2017 WHCP. Application of the adjuvant and the herbicides onto water hyacinth mats within the Delta may pose direct and indirect effects to delta smelt and its critical habitat. In Areas 3 and 4 it is anticipated that any direct effects to delta smelt are likely to be low because the herbicides will be applied where delta smelt habitat is considered to be of poor quality and the occurrence of delta smelt in those areas is low.

However, because of the timing and location of its use, it is anticipated that any direct effects to delta smelt are likely to be low.

No permanent effects to delta smelt critical habitat are likely to occur as a result of WHCP operations. Temporary effects to critical habitat include habitat loss caused by decreased DO levels (due to decaying water hyacinth), and decreases in the abundance of aquatic invertebrates that form the prey base of the delta smelt. Decreased DO below 5 mg/L could result in behavioral avoidance or physiological stress by adult delta smelt, or egg/larval mortality.

*2,4-D and Glyphosate*

Acute toxicological studies conducted on delta smelt were performed by CDFW-Aquatic Toxicology Laboratory. The results demonstrated that the environmental concentrations which would result from WHCP activities were less than toxicity thresholds for larval delta smelt (DFG 2004). Toxicological data and field studies suggest that 2,4-D, glyphosate, and Agri-Dex present low mortality risk to delta smelt.

Xie (2005) conducted monitoring of 2,4-D in a field application setting on juvenile rainbow trout which are used as surrogates for delta smelt because they are an established cold-water fish used for toxicity testing. The study observed no acute toxicity to juvenile rainbow trout but observed vitellogenin-induction levels higher than controls in laboratory exposures. The increased production of vitellogenin, an egg yolk precursor, indicates that 2,4-D could cause endocrine disruption at EPA-permitted application rates (Xie 2005). The estrogenic activity of 2,4-D is concerning as the metabolic consequences of increase in unneeded egg yolk precursor production in females or the production of any egg yolk precursors in males is unknown. Endocrine disruption could alter the development, growth or reproduction of delta smelt. No additional studies have further linked 2,4-D to endocrine disruption in aquatic species since Xie (2005). The extent to which individual delta smelt may be affected by 2, 4-D in this manner or whether such effects would have population level consequences cannot be determined with currently available scientific information.

Indirect ecosystem level effects from broad spectrum herbicide application include; decreased productivity for food web production within lower trophic levels, increased areas with low DO, and multiple chemical exposures to delta smelt at low doses. Although studies of 2,4-D, glyphosate, and Agri-Dex have not shown individual pronounced toxicological effects on delta smelt, or their eggs or larvae, it is not clear how these herbicides will interact when combined with other contaminants present within the delta. In the spring and summer months, there are several sources of pesticides within the Delta including external and within-delta inputs (Kuivila and Moon 2004). Interactions between pesticides, herbicides, and other contaminants within the Delta may cause harm to delta smelt and/or their food web. Zooplankton is a key food source for delta smelt. Richards *et al.* (2004) linked reduced zooplankton diversity within the Delta to increased contaminants, which could be an important factor in the decrease of delta smelt populations (Kuivila and Foe 1995).

Most delta smelt spawning occurs from April through mid-May (Moyle 2002) with larvae development coinciding with the proposed April 1 start date of WHCP herbicide treatments within the delta. Contaminants and physiochemical stressors (i.e. low DO levels or high carbon dioxide levels) can deteriorate the health of delta smelt leaving them more vulnerable to harm and/or harassment caused by predation and disease, particularly during their development, as larval and juvenile smelt are more sensitive to environmental stressors than adult delta smelt (Teh 2007). Environmental stressors such as decreased levels of DO caused by decaying water hyacinth following herbicide treatment, can particularly affect delta smelt eggs and larvae. Delta

smelt larvae are semi-buoyant and subject to hydrology and could be directed by river flows into areas of low DO which could cause direct mortality, harm and/or harassment to the larvae.

#### *Penoxsulam and Imazamox*

The newly proposed herbicides penoxsulam and imazamox included for the 2013-2017 WHCP program have only recently been registered in California. Because the herbicides are newly registered, little or no independent toxicity data is available other than that generally produced during the registration process. Due to recent registration, very little additional toxicological data is available. Longer aqueous half-lives and increased mobility for penoxsulam and imazamox as compared to 2,4-D and glyphosate suggest the potential for increased aquatic environmental risk. Immunofunction and endocrine effects from exposures are also unknown. Concerns about potential risks may be addressed by bioassays on delta smelt. Proposed future toxicity tests will clarify the risk of penoxsulam and imazamox on larval and adult delta smelt from their use. Prior to the proposed future toxicity tests being conducted on delta smelt, the WHCP is proposing to only utilize penoxsulam and imazamox in Areas 3 and 4 from March 1 to November 30 when delta smelt are unlikely to be present in the area to further reduce any possible risks to delta smelt.

Acute toxicology data for the newly registered penoxsulam and imazamox are available only from the EPA pesticide registration process and thus very few peer reviewed studies are available. Toxicity tests on other fishes showed penoxsulam and imazamox to be practically nontoxic with LC50's above 100 mg/L. Penoxsulam and imazamox have bluegill EC50's of >103 and >120 mg/L which are lower in comparison to 2,4-D and Glyphosate, 2600 and >1000 mg/L respectively, indicative of higher toxicity (Fairchild 2011). Despite higher toxicities, the reduced environmental risk of penoxsulam and imazamox comes from the reduced application volume required during treatment. The EPA's Ecological Risk Assessment for penoxsulam found that for two fish species, risk did not exceed concern levels for aquatic organisms or endangered species (USEPA 2007). No EPA Ecological Risk Assessment has been conducted for imazamox. Acute or chronic data on the effects of exposures of penoxsulam or imazamox on delta smelt are not yet available.

The registration toxicity data for standard toxicity when testing fish species suggests that environmental concentrations from the WHCP activities with the proposed chemicals would be less than the toxicity thresholds. Although toxicity thresholds for these two herbicides are lower than for 2,4-D or glyphosate (implying they are more toxic), risk from their use is reduced because the WHCP proposes to apply them at lower concentrations than the existing program herbicides. This available data suggest that there would be no effect on delta smelt from their use.

#### *Adjuvants: Agri-Dex and Competitor*

Acute toxicity studies by the Washington State University have indicated that Agri-Dex® (the active ingredients are Paraffin Base Petroleum Oil/Polyoxyethylate Polyol Fatty Acid Esters)

is practically non-toxic and is significantly less toxic to rainbow trout than the previously used adjuvant R-11® (Smith et al. 2004). Competitor®, a vegetable oil-based adjuvant, is slightly toxic with a rainbow trout LC50 of 95 mg/L (WSDA 2005) as compared to >1000 mg/L for Agridex with similar application rates.

### **Conclusion**

After reviewing the current status of the delta smelt and its critical habitat, the environmental baseline for the project action area, the effects of the proposed project, the applicant's proposed conservation measures, and cumulative effects, it is the Service's opinion that the WHCP, as proposed, is not likely to jeopardize the continued existence of the delta smelt or result in the destruction or adverse modification of its critical habitat. This determination was based on the temporary nature of the effects proposed, WHCP treatment restrictions, the applicant's proposed conservation measures, and the non-toxicity of 2,4-D, glyphosate and Agri-dex® at the levels used in the 2013-2017 WHCP.

### **INCIDENTAL TAKE STATEMENT**

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are nondiscretionary for listed species in this biological opinion and must be implemented by USDA-ARS so they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. USDA-ARS has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Federal agency (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

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**Amount or Extent of Take***Delta Smelt*

The Service anticipates that incidental take of delta smelt in the form of harassment, harm, and mortality may occur. However, take is expected to be low. The Service anticipates difficulty in detecting take and cannot provide precise numbers of delta smelt that could be harassed, harmed, or killed by 2013-2017 WHCP operations. Delta smelt have a relatively small body size and they are relatively cryptic. Their presence in the Delta coincides with relatively turbid conditions, and their presence in aquatic vegetation makes them difficult to detect. Accordingly, the Service is quantifying take incidental to the project as all delta smelt located within the acres of water where hyacinth mats are being treated within the Delta and upland tributaries.

The Service anticipates that annually from March 1 to November 30 during the years of 2014 to 2017 as much as 3,500 acres (5,000 acres for the 2013 treatment season only) of water hyacinth mats located within the Delta which is designated as delta smelt critical habitat could be temporarily impacted as a result of chemical control of water hyacinth. Delta smelt distribution will shift throughout the year, depending on timing and life stage. As such, it can be assumed that not all of the 3,500 acres of water hyacinth mats within the Delta will have delta smelt occurring within the area during the time of application. Numerous sites within the WHCP treatment area are situated outside of delta smelt range (Areas 3 and 4) and/or are in areas that do not contain essential PCE's of delta smelt critical habitat. Additional sites are located outside of areas where delta smelt are likely to be found or in areas considered low quality delta smelt habitat due to low flow and/or low DO levels. The Service anticipates that in 2013 from March 1 to November 30, as much as 5,000 acres of water hyacinth mats located within the Delta which is designated as delta smelt critical habitat could be temporarily impacted as a result of chemical control of the water hyacinth.

The Service concludes that all delta smelt inhabiting areas surrounding up to 5,000 acres of water hyacinth mats in 2013, and as much as 3,500 acres of water hyacinth mats annually from 2014 to 2017, within delta smelt habitat may be harassed, harmed or killed by the temporary modification and degradation of habitat as a result of WHCP operations. This is the maximum acreage of water hyacinth mats that could potentially be treated through the proposed action. However, the Service believes that the actual acres of water hyacinth mats within habitat that could support delta smelt subject to WHCP operational activities will be less than the maximum acreage estimated above and that actual take in the form of harassment, harm or mortality will be minimal.

The Service has made this determination based on the applicant's proposed Conservation Measures, the number of treatment areas that do not contain essential PCE's for delta smelt or are considered to be of low quality habitat to delta smelt (caused by existing DO levels and slow or no flow, or are outside of delta smelt range), and delta smelt's varied distribution throughout the year which reduces the probability they would occur near or within the area at the time of treatment.

Upon implementation of the following reasonable and prudent measures, incidental take associated with WHCP operations in the form of harm, harassment, the USDA-ARS and CDBW will become exempt from the prohibitions described under section 9 of the Act.

### **Effect of the Take**

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the delta smelt. We base this determination on the temporary nature of the effects, proposed WHCP treatment restrictions, and the non-toxicity of 2,4-D, Glyphosate, and Agri-dex® at the levels used in habitat containing PCE's of delta smelt (within Areas 1 and 2) of the WHCP. Areas 3 and 4 are considered to be located outside of delta smelt range and the habitat does not contain PCE's for delta smelt. Therefore the WHCP treatment in areas 3 and 4 is not expected to have effect on delta smelt. Delta smelt critical habitat will not be adversely modified or destroyed by the proposed action.

### **Reasonable and Prudent Measures**

The following reasonable and prudent measures are necessary and appropriate to minimize the effects of the WHCP project to the delta smelt:

1. The USDA-ARS shall ensure CDBW complies with this biological opinion.
2. The USDA-ARS shall ensure CDBW minimizes effects to delta smelt and its critical habitat.

### **Terms and Conditions**

In order to be exempt from the prohibitions of section 9 of the Act, the USDA-ARS shall ensure CDBW complies with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

- 1) The following terms and conditions implement Reasonable and Prudent Measure Number One (1) and Two (2):
  - a. The USDA-ARS shall ensure CDBW implements the Conservation Measures proposed by CDBW and as described in the Project Description (page 21) of this biological opinion.

### **Reporting Requirements**

The Service is to be notified immediately of the finding of any listed species or any unanticipated take or suspected take of species addressed in this opinion. Injured delta smelt must be cared for by a qualified person such as the Service-approved biologist. Dead individuals of this species

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shall be placed in a zip-lock® plastic bag or jar with appropriate preservative solution containing a piece of paper with the date, time, location where the animal was found, and who found it written in permanent ink. The plastic bag should be placed in a freezer in a secure location. The Service and CDFW must be notified within twenty-four (24) hours of discovery of death or injury to delta smelt or GGS that occurs due to project related activities or is observed at the project site. The notification must include the date, time, and location of the incident or of the finding of a dead or injured animal and be clearly indicated on a USGS 7.5 minute quadrangle and other maps at a finer scale. The Service contacts are Kim S. Turner, Assistant Field Supervisor, at telephone (916) 930-5604 and Dan Crum, Resident Agent-in-Charge of the Service's Law Enforcement Division, at telephone (916) 414-6660. The CDFW contact person is Andrea Boertien, Environmental Scientist, at telephone (209) 942-6070.

The USDA-ARS and the CDBW will submit to the Service an annual project review and monitoring report by January 31<sup>st</sup> annually. The annual report will detail the following:

- a. The date, time and number of times an individual site was treated;
- b. Amount and type of chemical used at each site;
- c. Treatment methods utilized throughout the year;
- d. Whether listed species or its habitat were present;
- e. All environmental scientist and treatment crew monitoring results; and
- f. Results of the 2013 DO Monitoring Study.

The USDA-ARS and the CDBW will submit to the Service weekly field surveys beginning in late February to identify re-growing water hyacinth compared with the location of the most recent state and Federal fish monitoring data.

In addition, upon completion of toxicological testing of the herbicides imazamox and penoxsulam on delta smelt, all reporting, methodologies, and results will be provided to the Service.

Unless new information reveals effects of the proposed action may affect listed species to an extent not considered in this document or a new species or critical habitat is designated that may be affected by the proposed action, no further action pursuant to the Act is necessary. Any actions or proposed actions that are modified in a manner that causes an effect to listed species or critical habitat that was not considered in this consultation will require re-initiation.

### **CONSERVATION RECOMMENDATIONS**

Section 7(a)(1) of Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

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1. The Service recommends CDBW and USDA-ARS work to increase public awareness of potential threats to proper ecosystem function by exotic species introductions such as water hyacinth and increase public awareness of the importance of native flora and fauna of the Delta and its tributaries.
2. The Service recommends CDBW and USDA-ARS work to assist the Service in implementing recovery actions identified in the recovery plans for the valley elderberry longhorn beetle, GGS, and Sacramento-San Joaquin Delta native fishes.

To be kept informed of actions minimizing or avoiding adverse effects or benefiting listed and proposed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

#### REINITIATION - CLOSING STATEMENT

This concludes formal consultation with USDA-ARS for the proposed 2013-2017WHCP. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the proposed action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion; or (4) a new species or critical habitat is designated that may be affected by the proposed action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

Please address any questions or concerns regarding this response to Tiffany Heitz, Fish and Wildlife Biologist, at [Tiffany\\_Heitz@fws.gov](mailto:Tiffany_Heitz@fws.gov) or (916) 930-5627. Please refer to Service file number 81410-2013-F-0005 in any future correspondence regarding this project.

Sincerely,



Michael Chotkowski  
Field Supervisor

cc: NMFS, Garwin Yip  
DFW, Jim Starr  
CDBW, Director

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### Appendix 1

#### Calculated\* Maximum Concentrations of 2,4-D, Immediately Following WHCP Treatment

Concentration of:	2,4-D (Active Ingredient)
1. Chemical directly out of spray nozzle	2,300 ppm
2. Chemical in 1 meter deep water, @ 100% water contact	0.43 ppm
3. Chemical in 2 meter deep water, @ 100% water contact	0.21 ppm
4. Chemical in 1 meter deep water, @ 20% water contact	85 ppb
5. Chemical in 2 meter deep water, @ 20% water contact	43 ppb

\*The concentrations above are based on the pounds of active ingredient in maximum specified application rate per acre, and an appropriate dilution factor based on the volume of water in the tank mix, or within one or two meter-acres.

#### Calculated\* Maximum Concentrations of Glyphosate Immediately Following WHCP Treatment

Concentration of:	Glyphosate(Active Ingredient)
1. Chemical directly out of spray nozzle	3,600 ppm
2. Chemical in 1 meter deep water, @ 100% water contact	0.34 ppm
3. Chemical in 2 meter deep water, @ 100% water contact	0.17 ppm
4. Chemical in 1 meter deep water, @ 20% water contact	67 ppb
5. Chemical in 2 meter deep water, @ 20% water contact	34 ppb

\*The concentrations above are based on the pounds of active ingredient in maximum specified application rate per acre, and an appropriate dilution factor based on the volume of water in the tank mix, or within one or two meter-acres.

#### Calculated\* Maximum Concentrations of Penoxsulam Immediately Following WHCP Treatment

Concentration of:	Penoxsulam(Active Ingredient)
1. Chemical directly out of spray nozzle	105 ppm
2. Chemical in 1 meter deep water, @ 100% water contact	9.8 ppb
3. Chemical in 2 meter deep water, @ 100% water contact	4.9 ppb
4. Chemical in 1 meter deep water, @ 20% water contact	2 ppb
5. Chemical in 2 meter deep water, @ 20% water contact	1 ppb

\*The concentrations above are based on the pounds of active ingredient in maximum specified application rate per acre, and an appropriate dilution factor based on the volume of water in the tank mix, or within one or two meter-acres.

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## Calculated\* Maximum Concentrations of Imazamox Immediately Following WHCP Treatment

Concentration of:	Imazamox(Active Ingredient)
1.Chemical directly out of spray nozzle	600 ppm
2.Chemical in 1 meter deep water, @ 100% water contact	56 ppb
3.Chemical in 2 meter deep water, @ 100% water contact	28 ppb
4.Chemical in 1 meter deep water, @ 20% water contact	11.2 ppb
5.Chemical in 2 meter deep water, @ 20% water contact	5.6 ppb

\*The concentrations above are based on the pounds of active ingredient in maximum specified application rate per acre, and an appropriate dilution factor based on the volume of water in the tank mix, or within one or two meter-acres.

## Calculated\* Maximum Concentrations of Agridex Immediately Following WHCP Treatment

Concentration of:	Agridex (Active Ingredient)
1.Chemical directly out of spray nozzle	5,000 ppm
2.Chemical in 1 meter deep water, @ 100% water contact	1.24 ppb
3.Chemical in 2 meter deep water, @ 100% water contact	0.62 ppb
4.Chemical in 1 meter deep water, @ 20% water contact	0.25 ppb
5.Chemical in 2 meter deep water, @ 20% water contact	0.12 ppb

\*The concentrations above are based on the pounds of active ingredient in maximum specified application rate per acre, and an appropriate dilution factor based on the volume of water in the tank mix, or within one or two meter-acres.

## Calculated\* Maximum Concentrations of Competitor Immediately Following WHCP Treatment

Concentration of:	Competitor (Active Ingredient)
1.Chemical directly out of spray nozzle	5,000 ppm
2.Chemical in 1 meter deep water, @ 100% water contact	1.24 ppb
3.Chemical in 2 meter deep water, @ 100% water contact	0.62 ppb
4.Chemical in 1 meter deep water, @ 20% water contact	0.25 ppb
5.Chemical in 2 meter deep water, @ 20% water contact	0.12 ppb

\*The concentrations above are based on the pounds of active ingredient in maximum specified application rate per acre, and an appropriate dilution factor based on the volume of water in the tank mix, or within one or two meter-acres.

**STATE WATER RESOURCES CONTROL BOARD****1001 I Street, Sacramento, California 95814**[http://www.waterboards.ca.gov/water\\_issues/programs/npdes/aquatic.shtml](http://www.waterboards.ca.gov/water_issues/programs/npdes/aquatic.shtml)**WATER QUALITY ORDER NO. 2013-0002-DWQ  
GENERAL PERMIT NO. CAG990005****STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
(NPDES) PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES TO WATERS OF  
THE UNITED STATES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATIONS**

The following Dischargers may apply for coverage under this General Permit in compliance with the waste discharge requirements as set forth in this General Permit:

**Table 1. Discharger Information**

<b>Dischargers</b>	Any entity that discharges residual algaecides and aquatic herbicide and their degradation byproducts to waters of the United States* from algae and aquatic weed control applications.
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**Table 2. Administrative Information**

This General Permit was adopted by the State Water Resources Control Board (hereinafter State Water Board) on:	<b>March 5, 2013</b>
This General Permit shall become effective on:	<b>December 1, 2013</b>
This General Permit shall expire on:	<b>November 30, 2018</b>
The U.S. Environmental Protection Agency (U.S. EPA) and the State Water Board have classified this discharge as a <b>minor</b> discharge.	

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this General Permit with all attachments is a full, true, and correct copy of the General Permit adopted by the State Water Board on March 5, 2013.

AYE: Vice Chair Frances Spivy-Weber  
Board Member Tam M. Doduc  
Board Member Steven Moore  
Board Member Felicia Marcus

NAY: None

ABSENT: None

ABSTAIN: Chairman Charles R. Hoppin

  
\_\_\_\_\_  
Jeanine Townsend  
Clerk to the Board

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## I. DISCHARGE INFORMATION

Pesticide formulations may include “active ingredients”<sup>\*</sup> and “inert ingredients.”<sup>\*</sup> Adjuvants<sup>\*</sup> or surfactants may be added to the ingredients in the application equipment used in delivery of the pesticide. As part of the registration process of pesticides for use in California, U.S. EPA and the California Department of Pesticide Regulation (DPR) evaluate data submitted by registrants to ensure that a product used according to label instructions will cause no harm or adverse impact on non-target organisms that cannot be reduced or mitigated with protective measures or use restrictions. The Clean Water Act (CWA) section 301(a) broadly prohibits the discharge of any pollutant to waters of the United States, except in compliance with an NPDES permit. Residual pesticides<sup>\*</sup> discharged into surface waters constitute pollutants within the meaning of the CWA even if the discharge is in compliance with the registration requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Therefore, coverage under an NPDES permit is required.

The discharge of algaecides and aquatic herbicides and their residues to surface waters for algae and aquatic weed control throughout the State of California may pose a threat to existing and potential beneficial uses of waters of the United States if not properly controlled and regulated.

This General Permit regulates the discharge of aquatic pesticides<sup>\*</sup> (algaecides and aquatic herbicides) used for algae and aquatic weed control to waters of the United States. These are algaecides and aquatic herbicides with registration labels that explicitly allow direct application to water bodies.

## II. PERMIT COVERAGE AND APPLICATION REQUIREMENTS

### A. General Permit Coverage

Except for discharges on tribal lands that are regulated by a federal permit, this General Permit covers the point source<sup>\*</sup> discharge to waters of the United States of residues resulting from pesticide applications using products containing 2,4-D, acrolein, copper, diquat, endothall, fluridone, glyphosate, imazamox, imazapyr, penoxsulam, sodium carbonate peroxyhydrate, and triclopyr-based algaecides and aquatic herbicides, and adjuvants containing ingredients represented by the surrogate nonylphenol. This General Permit covers only discharges of algaecides, and aquatic herbicides that are currently registered for use in California, or that become registered for use and contain the above-listed active ingredients and ingredients represented by the surrogate of nonylphenol.

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<sup>\*</sup> An asterisk means the term is defined in Attachment A. This applies to all sections of this General permit.

This General Permit does not cover agricultural storm water discharges or return flows from irrigated agriculture because these discharges are not defined as "point sources" and do not require coverage under an NPDES permit. This General Permit also does not cover other indirect or nonpoint source discharges from applications of algaecides and aquatic herbicides, including discharges of pesticides to land that may be conveyed in storm water or irrigation runoff.

As shown in Table 1, this General Permit becomes effective on December 1, 2013. To obtain coverage under this General Permit on or after that date, Dischargers must submit their application for coverage as set forth in Section II.C below, at least 90 days prior to their first pesticide application.

## **B. Discharger**

A Discharger under this General Permit includes any entity involved in the application of algaecides and aquatic herbicides that results in a discharge of algaecides and aquatic herbicides and their residues and degradation byproducts to waters of the United States, and meets either or both of the following two criteria:

The entity has control over the financing for or the decision to perform algaecide and aquatic herbicide applications that result in discharges, including the ability to modify those decisions; or

The entity has day-to-day control of algaecide and aquatic herbicide applications or performs activities that are necessary to ensure compliance with this General Permit. For example, the entity is authorized to direct workers to carry out activities required by this General Permit or perform such activities themselves.

## **C. General Permit Application**

To obtain authorization under this General Permit, Dischargers must submit to the State Water Board a complete application that consists of the following:

1. A Notice of Intent (NOI) shown as Attachment E, signed in accordance with the signatory requirements of the Standard Provisions in Attachment B;
2. An application fee. A fee is required only for new Dischargers. Dischargers enrolled under Order No. 2004-0009-DWQ and applying for coverage under this Permit will be billed during the regular billing cycle; and
3. An Aquatic Pesticide\* Application Plan (APAP).

Within 90 days of receipt of an application, the State Water Board's Deputy Director of the Division of Water Quality (Deputy Director) will either issue a Notice of Applicability (NOA) or deny the application. The NOA will specify the permitted algaecide and aquatic herbicide active ingredients that may be used, and any region-specific conditions and requirements not stated in this General Permit. Any such region-specific conditions and requirements shall be enforceable. The Discharger is authorized to discharge starting on the date of the NOA.

Alternatively, the Deputy Director or a Regional Water Board Executive Officer may issue a Notice of Exclusion (NOE),<sup>1</sup> which either terminates the permit coverage or requires submittal of an application for an individual permit or alternative general permit.

#### **D. Fees**

The fee for enrollment under this General Permit shall be based on section 2200(b)(9) category 3 of title 23, California Code of Regulations, which is available at [http://www.waterboards.ca.gov/resources/fees/docs/fy1112fee\\_schdl\\_npdes\\_prmt.pdf](http://www.waterboards.ca.gov/resources/fees/docs/fy1112fee_schdl_npdes_prmt.pdf) and is payable to the State Water Board.

#### **E. Terminating Coverage**

To terminate permit coverage, a Discharger must submit a complete and accurate Notice of Termination (NOT) provided in Attachment F. The Discharger's authorization to discharge under this General Permit terminates on the day of the coverage termination letter issued by the Deputy Director. Prior to the termination effective date, the Discharger is subject to the terms and conditions of this General Permit and is responsible for submitting the annual fee and all reports associated with this General Permit.

A Discharger must submit an NOT when one of the following conditions occurs:

1. A new operator has taken over responsibility of the Discharger's algae or aquatic weed control activities covered under an existing NOA;
2. The Discharger has ceased all discharges from the application of algaecides and aquatic herbicide for which it obtained General Permit coverage and does not expect to discharge during the remainder of this General Permit term; or
3. The Discharger has obtained coverage under an individual permit or an alternative general permit for all discharges required to be covered by an NPDES permit.

### **III. FINDINGS**

The Fact Sheet (Attachment D), which contains the background information and rationale for the requirements in this General Permit, is hereby incorporated into this General Permit and constitutes its findings. All other attachments (A, B, C, and E through G) are also incorporated into this General Permit.

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<sup>1</sup> An NOE is a one-page notice that indicates and justifies why the Discharger or proposed Discharger is not eligible for coverage under this General Permit and states the reason why. This justification can include, but is not limited to, necessity to comply with a total maximum daily load or to protect sensitive water bodies. The NOE can also indicate that the coverage is denied if feasible alternatives to the selected pesticide application project are not analyzed.

THEREFORE, IT IS HEREBY ORDERED that this General Permit supersedes Order No. 2004-0009-DWQ except for enforcement purposes, and in order to meet the provisions contained in division 7 of the Water Code (commencing with §13000) and regulations adopted thereunder, and the provisions of the CWA and regulations and guidelines adopted thereunder, the Discharger shall comply with the requirements in this Order.

#### **IV. DISCHARGE PROHIBITIONS**

- A. The discharge of residual algaecides and aquatic herbicides in a manner different from that described in this General Permit is prohibited.
- B. The discharge of residual algaecides and aquatic herbicides shall not create a nuisance as defined in section 13050 of the California Water Code.
- C. The discharge shall not cause, have a reasonable potential to cause, or contribute to an in-stream excursion above any applicable standard or criterion promulgated by U.S. EPA pursuant to section 303 of the CWA, or water quality objective adopted by the State or Regional Water Boards.
- D. All pesticides are prohibited from the waters of the Lahontan Region (Region 6). The use of this permit is invalid in the Lahontan Region unless the discharger has requested a prohibition exemption from the Lahontan Water Board and the Lahontan Water Board has granted an exemption for the use of algaecides or aquatic herbicides.

#### **V. EFFLUENT LIMITATIONS**

- A. The discharge of residual algaecides and aquatic herbicides must meet applicable water quality standards; and
- B. Dischargers shall implement Best Management Practices (BMPs) when applying aquatic algaecides and aquatic herbicides. The BMPs must be provided in the APAP which is described in Section VIII.C below.

#### **VI. RECEIVING WATER LIMITATIONS**

The discharge shall not result in any of the following:

- A. The discharge of residual algaecides and aquatic herbicides shall not cause or contribute to an exceedance of the following limitations in the receiving water:\*

**Table 3. Receiving Water Limitations**

Constituent/ Parameter	BENEFICIAL USE <sup>1</sup>			All Designations	Basis
	MUN, µg/L	WARM or COLD, µg/L	Other than MUN, WARM, or COLD, µg/L		
2,4-D	70				U.S. EPA MCL
Acrolein <sup>2</sup>	320	21	780		U.S. EPA Water Quality Criteria, 1986.
Copper <sup>2</sup>				Dissolved Freshwater <sup>3</sup> Copper Chronic = $0.960 \exp\{0.8545 [\ln(\text{hardness}^4)] - 1.702\}$ <sup>5,6</sup>  Dissolved saltwater <sup>3</sup> Copper Chronic = $0.83 \exp\{0.8545 [\ln(\text{hardness}^4)] - 1.702\}$ <sup>5,6</sup>	California Toxics Rule
Diquat	20				U.S. EPA MCL
Endothall	100				U.S. EPA MCL
Fluridone	560				U.S. EPA Integrated Risk Information System
Glyphosate	700				U.S. EPA MCL
Nonylphenol				Freshwater Chronic Criterion = 6.6 µg/L  Saltwater Chronic Criterion = 1.7 µg/L	U.S. EPA National Recommended Ambient Water Quality Criteria
Toxicity	Algaecide and aquatic herbicide applications shall not cause or contribute to toxicity in receiving water(s).				Regional Water Boards' Basin Plans

Notes:

1. See Regional Water Boards' Water Quality Control Plans (Basin Plans) for beneficial use definitions.
2. Public entities and mutual water companies\* listed in Attachment G are not required to meet these limitations in receiving waters during the exception period described in the APAP and Section VIII.C.10 below.
3. For waters in which the salinity is equal to or less than 1 part per thousand 95% or more of the time, the freshwater criteria apply. For waters in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, saltwater criteria apply. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable criteria are the more stringent of the freshwater or saltwater criteria.
4. For freshwater aquatic life criteria, waters with a hardness 400 mg/L or less as calcium carbonate, the actual ambient hardness of surface water shall be used. For waters with a hardness of over 400 mg/L as calcium carbonate, a hardness of 400 mg/L as calcium carbonate shall be used with a default Water-Effect Ratio of 1.
5. Values should be rounded to two significant figures.
6. This limitation does not apply to the Sacramento River and its tributaries above the State Highway 32 Bridge at Hamilton City. See Table III-1 of the Basin Plan for the Sacramento and San Joaquin River Basins for copper limitation.

**B. Dissolved Oxygen.** Dissolved oxygen to be below the Regional Water Board Basin Plans' dissolved oxygen objectives for the receiving water.

**C. Floating Material.** Floating material to be present in the amounts that cause nuisance or adversely affect beneficial uses.

- D. **Settleable Substances.** Settleable substances to be present in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.
- E. **Suspended Material.** Suspended material to be present in concentrations that cause nuisance or adversely affect beneficial uses.
- F. **Taste and Odors.** Taste- or odor-producing substances to be present in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses or domestic or municipal water supplies.
- G. **Toxic Pollutants.** Toxic pollutants to be present in the water column, sediments, or biota in concentrations that adversely affect beneficial uses; that produce detrimental response in human, plant, animal, or aquatic life; or that bioaccumulate in aquatic resources at levels which are harmful to human health.
- H. **Color.** Esthetically undesirable discoloration.
- I. **Aquatic Communities.** Aquatic communities and populations, including vertebrates, invertebrates, and non-target plant species to be degraded.

**VII. RECEIVING WATER MONITORING TRIGGERS**

In the absence of Receiving Water Limitations, the Receiving Water Monitoring Triggers shown in Table 4 below will be used to assess compliance with the narrative receiving water toxicity limitation. However, exceeding the monitoring trigger does not constitute a violation of this General Permit as long as the Discharger performs the following actions: (1) initiates additional investigations for the cause of the exceedance; (2) implements additional BMPs to reduce the algacide and aquatic herbicide residue concentration to be below the monitoring triggers in future applications; and (3) evaluates the appropriateness of using alternative products.

**Table 4. Receiving Water Monitoring Triggers**

Ingredient	Unit	Instantaneous Maximum Monitoring Trigger	Basis
Imazapyr	mg/L	11.2	U.S. EPA Office of Pesticides <i>Ecotoxicity Database</i>
Triclopyr Triethylamine	mg/L	13.0	U.S. EPA Office of Pesticides <i>Ecotoxicity Database</i>

**VIII. AQUATIC PESTICIDE USE REQUIREMENTS**

**A. Application Schedule**

The Discharger shall provide a phone number or other specific contact information to all persons who request the Discharger's application schedule. The Discharger shall provide the requester with the most current application schedule and inform the requester if the schedule is subject to change. Information may be made available by electronic means, including posting prominently on a well-known website.

## **B. Public Notice Requirements**

Every calendar year, at least 15 days prior to the first application of algaecide or aquatic herbicide, the Discharger shall notify potentially affected public agencies. The Discharger shall post the notification on its website if available. The notification shall include the following information:

1. A statement of the discharger's intent to apply algaecide or aquatic herbicide(s);
2. Name of algaecide and aquatic herbicide(s);
3. Purpose of use;
4. General time period and locations of expected use;
5. Any water use restrictions or precautions during treatment; and
6. A phone number that interested persons may call to obtain additional information from the Discharger.

## **C. Aquatic Pesticides Application Plan (APAP)**

Dischargers shall submit an APAP at least 90 days before the expected day of permit coverage. The APAP shall contain, but not be limited to, the following elements sufficient to address each proposed treatment area:\*

1. Description of the water system to which algaecides and aquatic herbicides are being applied;
2. Description of the treatment area in the water system;
3. Description of types of weed(s) and algae that are being controlled and why;
4. Algaecide and aquatic herbicide products or types of algaecides and aquatic herbicides expected to be used and if known their degradation byproducts, the method in which they are applied, and if applicable, the adjuvants and surfactants used;
5. Discussion of the factors influencing the decision to select algaecide and aquatic herbicide applications for algae and weed control;
6. If applicable, list the gates or control structures to be used to control the extent of receiving waters potentially affected by algaecide and aquatic herbicide application and provide an inspection schedule of those gates or control structures to ensure they are not leaking;
7. If the Discharger has been granted a short-term or seasonal exception under State Water Board *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays,\* and Estuaries of California* (Policy) section 5.3 from meeting acrolein and copper receiving water limitations, provide the beginning and ending dates of the exception period, and justification for the needed time for the exception. If algaecide and aquatic herbicide applications occur outside of the exception period, describe plans to ensure that receiving water criteria are not exceeded because the Dischargers must comply with the

acrolein and copper receiving water limitations for all applications that occur outside of the exception period;

8. Description of monitoring program;
9. Description of procedures used to prevent sample contamination from persons, equipment, and vehicles associated with algaecide and aquatic herbicide application;
10. Description of the BMPs to be implemented. The BMPs shall include, at the minimum:
  - a. Measures to prevent algaecide and aquatic herbicide spill and for spill containment during the event of a spill;
  - b. Measures to ensure that only an appropriate rate of application consistent with product label requirements is applied for the targeted weeds or algae;
  - c. The Discharger's plan in educating its staff and algaecide and aquatic herbicide applicators on how to avoid any potential adverse effects\* from the algaecide and aquatic herbicide applications;
  - d. Discussion on planning and coordination with nearby farmers and agencies with water rights diversion so that beneficial uses of the water (irrigation, drinking water supply, domestic stock water, etc.) are not impacted during the treatment period; and
  - e. A description of measures that will be used for preventing fish kill when algaecides and aquatic herbicides will be used for algae and aquatic weed controls.
11. Examination of Possible Alternatives. Dischargers should examine the alternatives to algaecide and aquatic herbicide use to reduce the need for applying algaecides and herbicides. Such methods include:
  - a. Evaluating the following management options, in which the impact to water quality, impact to non-target organisms including plants, algaecide and aquatic herbicide resistance, feasibility, and cost effectiveness should be considered:
    - i. No action;
    - ii. Prevention;
    - iii. Mechanical or physical methods;
    - iv. Cultural methods;
    - v. Biological control agents; and
    - vi. Algaecides and aquatic herbicides;

If there are no alternatives to algaecides and aquatic herbicides, Dischargers shall use the minimum amount of algaecides and aquatic herbicides that is necessary to have an effective control program and is consistent with the algaecide and aquatic herbicide product label requirements.

- b. Using the least intrusive method of algaecide and aquatic herbicide application; and
- c. Applying a decision matrix concept to the choice of the most appropriate formulation.

#### **D. APAP Processing, Approval, and Modifications**

Upon receipt of an APAP, staff will post it on the State Water Board's website for a 30-day public comment period<sup>2</sup> and will distribute a notice via the State Water Board's Lyris list that an APAP has been posted. Staff will coordinate with Regional Water Board staff in reviewing the application package for completeness and applicability to this General Permit. If no comments are received and State and Regional Water Board staff deem the APAP complete, the Deputy Director will issue an NOA within five (5) working days of closure of the comment period. If comments are received, staff will work with Regional Water Board staff and the Discharger to address the comments to allow the Deputy Director to issue an NOA as expeditiously as possible. Permit coverage will begin when the Discharger receives the NOA.

Major changes to the APAP shall be submitted to the Deputy Director for approval. Examples of major changes include using a different product other than what is specified in the APAP, changing an application method that may result in different amounts of pesticides being applied, or adding or deleting BMPs.

#### **E. Algaecide and Aquatic Herbicide Application Log**

The Discharger shall maintain a log for each algaecide and aquatic herbicide application. The application log shall contain, at a minimum, the following information:

1. Date of application;
2. Location of application;
3. Name of applicator;
4. Type and amount of algaecide and aquatic herbicide used;
5. Application details, such as flow and level of water body, time application started and stopped, algaecide and aquatic herbicide application rate and concentration;
6. Visual monitoring assessment; and
7. Certification that applicator(s) followed the APAP.

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<sup>2</sup> See *Waterkeeper Alliance, Inc. v. EPA*, 399 F.3d 486 (2nd Cir. 2005).

## IX. PROVISIONS

### A. Standard Provisions

1. All Dischargers authorized to discharge under this General Permit shall comply with the Federal Standard Provisions included in Attachment B of this General Permit.
2. This General Permit does not authorize the discharge of residual algaecides and aquatic herbicides or their degradation byproducts to waters of the United States that are impaired by the active ingredient of the algaecides and herbicides used. Impaired waters are those waters not meeting water quality standards pursuant to section 303(d) of the CWA. California impaired waters are listed on: [http://www.waterboards.ca.gov/water\\_issues/programs/tmdl/2010state\\_ir\\_reports/2010\\_combo303d.xls](http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/2010_combo303d.xls).
3. This General Permit does not authorize any take of endangered species. The discharge is prohibited from adversely impacting biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or state endangered species laws. To ensure that endangered species issues are raised to the responsible agencies, the State Water Board has notified the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the California Department of Fish and Wildlife of this General Permit.
4. The State Water Board may use this General Permit to regulate the discharge of algaecides and aquatic herbicides and their residues to a surface water classified as Outstanding National Resource Waters or as a water body impaired by unknown toxicity only after the following conditions are satisfied: (1) the proposed project will comply with the limitations and discharge requirements specified in the General Permit; and (2) if required, the proposed algaecide and aquatic herbicide application qualifies for and has been granted a Basin Plan prohibition exception prior to discharge. The two bodies of water that are classified as Outstanding National Resource Waters in California are Lake Tahoe and Mono Lake.
5. The Discharger must follow all FIFRA pesticide label instructions and any Restricted Material Use Permits issued by a County Agricultural Commissioner.
6. All adjuvants used with the algaecides and aquatic herbicides must be labeled for aquatic use.
7. The Discharger must comply with effluent and receiving water limitations and must develop and implement an APAP.
8. To reduce the potential impacts to water quality, Dischargers shall implement the feasible alternatives to algaecide and aquatic herbicide use that are identified in the APAP.
9. All Dischargers authorized to discharge under this General Permit shall comply with discharge prohibitions and other requirements contained in Basin Plans, as implemented by the State and the nine Regional Water Boards.

10. All Dischargers authorized to discharge under this General Permit shall comply with the following provisions:
- a. After notice and opportunity for a hearing, this General Permit may be terminated or modified for cause, including, but not limited to:
    - i. Violation of any term or condition contained in this General Permit;
    - ii. Obtaining this General Permit by misrepresentation or by failing to disclose fully all relevant facts;
    - iii. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge; and
    - iv. A material change in the character, location, or volume of discharge (if applicable).
  - b. The provisions of this General Permit are severable. If any provision of this General Permit is found invalid, the remainder of this General Permit shall not be affected.
  - c. The Discharger shall maintain a copy of this General Permit and make it available at all times to operating personnel. Key operating personnel shall be familiar with its content.
  - d. Laboratories that perform sample analyses must be identified in all monitoring reports submitted to the State and Regional Water Boards.
  - e. All monitoring and analysis instruments and devices used by the Discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated based on manufacturer's recommendations to ensure their continued accuracy.
  - f. Each Discharger shall file with the State Water Board and the appropriate Regional Water Board technical reports on self monitoring\* performed according to the detailed specifications contained in the Monitoring and Reporting Program attached to this General Permit.
  - g. The State and Regional Water Board are authorized to enforce the terms of this General Permit under provisions of the California Water Code, including, but not limited to, sections 13385, 13386, and 13387.

## **B. Monitoring and Reporting Program Requirements**

The Discharger shall comply with the Monitoring and Reporting Program, and future revisions thereto, in Attachment C of this General Permit.

## **C. Special Provisions**

### **1. Reopener Provisions**

This General Permit may be reopened for modification and reissuance in accordance with the provisions contained in title 40 Code Federal Regulation (40 C.F.R.) section 122.62, and for the following reasons:

- a. **Addition to the Public Entity List.** This General Permit may be reopened to modify Attachment G if any additional entity becomes qualified for a Policy section 5.3 exception.
- b. **Addition of Aquatic Pesticide Active Ingredients.** This General Permit may be reopened to add additional algaecide and aquatic herbicide active ingredients if new active ingredients are registered by U.S. EPA and DPR.
- c. **Acute and Chronic Toxicity.** If the State Water Board revises the Policy toxicity control provisions that would require new implementation procedures including the establishment of numeric chronic toxicity limitations, this General Permit may be reopened to include numeric acute and/or chronic toxicity receiving water limitations based on the new provisions.
- d. **Receiving Water Limitations.** This General Permit may be reopened to add numeric Receiving Water Limitations for the residual algaecide and aquatic herbicides\* exceeding the triggers if the additional investigation results show necessary.
- e. **Endangered Species Act.** If U.S. EPA develops biological opinions regarding algaecides and aquatic herbicides included in this General Permit, this General Permit may be re-opened to add or modify Receiving Water Limitations/Monitoring Triggers for aquatic herbicides and algaecides and their residues of concern, if necessary.

## 2. **Change of Discharger**

In the event of any change in the Discharger that has obtained coverage under this General Permit, the previous Discharger shall notify the new Discharger of the existence of this General Permit by letter. A copy of the letter shall be immediately forwarded to the Deputy Director. After receipt of the letter, the Deputy Director will terminate the permit coverage to the previous Discharger. The new Discharger shall complete and submit to the Deputy Director a revised NOI form (Attachment E), and any revisions to the APAP prepared by the previous control entity or a new APAP.

## 3. **Application Package**

Dischargers who seek coverage under this General Permit shall file a complete application package at least 90 days before the expected date of algaecide and aquatic herbicide application. The application package shall include an NOI, APAP, and application fee. Enrolled Dischargers will be billed annually thereafter.

## 4. **Special Studies, Technical Reports, and Additional Monitoring Requirements**

### a. **Additional Investigation**

Each Discharger must conduct additional investigations when the chemical monitoring shows exceedance of any receiving water limitation or monitoring trigger. The additional investigations shall identify corrective actions to

eliminate exceedance of receiving water limitations or monitoring triggers caused by the algaecide and aquatic herbicide application. The investigation shall include, but not be limited to evaluating the need to implement one or more of the following actions: revising and improving the existing BMPs, revising the mode of application, using less toxic algaecide and aquatic herbicide products, or selecting alternative methods for algae and aquatic weed control.

**b. Qualified Biologist Certification Following Project Completion**

Upon completion of an algaecide and aquatic herbicide project, public entities and mutual water companies listed in Attachment G of this General Permit shall provide certification by a qualified biologist\* that beneficial uses of receiving waters have been restored.

**5. Corrective Action**

**a. Exceedance of Receiving Water Limitations or Monitoring Triggers.**

If a Receiving Water Limitation in Table 3 or a Monitoring Trigger in Table 4 is exceeded in the Event or Post-Event sample, the Discharger shall perform the following actions: (1) initiate additional investigations for the cause of the exceedance, (2) implement appropriate BMPs to reduce the algaecide and aquatic herbicide concentration to be below the applicable receiving water limitation or monitoring triggers in future applications, and (3) evaluate the appropriateness of using alternative products.

**b. Revision of Control Measures.**

If any of the following situations occur, the Discharger must review and, as necessary, revise the evaluation and selection of the control measures to ensure that the situation is eliminated and will not be repeated in the future:

- i. An unauthorized release or discharge associated with the application of algaecides and aquatic herbicides (e.g., spill, leak, or discharge not authorized by this or another NPDES permit) occurs;
- ii. The Discharger becomes aware, or the State Water Board concludes, that the control measures are not adequate/sufficient for the discharge to meet applicable water quality standards;
- iii. Any monitoring activities indicate that the Discharger failed to:
  - a) Follow the label instructions for the product used;
  - b) Use the minimum amount of algaecide and aquatic herbicide product per application and optimum frequency of algaecide and aquatic herbicide applications that are necessary for an effective control program consistent with reducing the potential for development of resistance and the algaecide and aquatic herbicide product label requirements;
  - c) Perform regular maintenance activities to reduce leaks, spills, or other unintended discharges of algaecides and aquatic herbicides

associated with the application of algaecides and aquatic herbicides covered under this General Permit; or

- d) Maintain algaecide and aquatic herbicide application equipment in proper operating condition by adhering to any manufacturer's conditions and industry practices, and by calibrating, cleaning, and repairing such equipment on a regular basis to ensure effective algaecide and aquatic herbicide application and algae and aquatic weed control. The Discharger must ensure that the equipment's rate of algaecide and aquatic herbicide application is calibrated to deliver the minimum quantity of algaecides and aquatic herbicides that is needed to have an effective control program and is consistent with the algaecide and aquatic herbicide product label requirements.

**c. Corrective Action Deadlines**

If the Discharger determines that changes to the control measures are necessary to eliminate any situation identified above, the Discharger shall make such changes within 60 days. The Discharger shall take the corrective action before any further discharge of the algaecides and aquatic herbicides and their residues will be allowed.

**d. Effect of Corrective Action**

The occurrence of a situation identified in Section C.5.b above may constitute a violation of this General Permit. Correcting the situation according to Corrective Action Section C.5.c above does not absolve the Discharger of liability for any original violation. However, failure to comply with any Corrective Action as required by Section C.5.c above constitutes an additional permit violation. The State and Regional Water Boards will consider the appropriateness and promptness of corrective action in determining enforcement responses to permit violations.

The State Water Board and the appropriate Regional Water Boards may impose additional requirements and schedules of compliance, including requirements to submit additional information concerning the condition(s) triggering corrective action or schedules and requirements more stringent than specified in this General Permit. Those requirements and schedules will supersede those in the Corrective Action Section above if such requirements conflict.

**6. Adverse Incident to Threatened or Endangered Species or Critical Habitat**

If the Discharger becomes aware of an adverse incident\* to a federally-listed threatened or endangered species or its federally-designated critical habitat, that may have resulted from the Discharger's algaecides and aquatic herbicides application, the Discharger must immediately notify the National Marine Fisheries Service (NMFS) Santa Rosa office by phone at (707) 575-6050 in the case of an anadromous or marine species, or the U.S. Fish and Wildlife Service (FWS) at (916) 414-6600 in the case of a terrestrial or freshwater species. This notification must be made by telephone immediately when the Discharger becomes aware of the adverse incident and must include at least the following information:

- a. The caller's name, telephone number, and e-mail address;
- b. Applicator name and mailing address;
- c. The name of the affected species;
- d. How and when the Discharger became aware of the adverse incident;
- e. Description of the location of the adverse incident;
- f. Description of the adverse incident, including the U.S. EPA pesticide registration number for each product applied in the area of the adverse incident; and
- g. Description of any steps that have been taken or will be taken to alleviate the adverse impact to the species.

Additional information on federally-listed threatened or endangered species and federally-designated critical habitat is available from NMFS ([www.nmfs.noaa.gov](http://www.nmfs.noaa.gov)) for anadromous or marine species or FWS ([www.fws.gov](http://www.fws.gov)) for terrestrial or freshwater species.

#### **X. COMPLIANCE DETERMINATION**

Compliance with receiving water limitations and monitoring triggers shall be determined through event and post-event monitoring results.

## **Attachment A – Definitions**

### **Active Ingredient**

Active ingredients are ingredients disclosed by manufacturers that yield toxic effects\* on target organisms.

### **Adjuvants**

Adjuvants are ingredients that are mixed with herbicides prior to an application event and are often trade secrets. These ingredients are chosen by the Discharger, based on site characteristics, and typically increase the effectiveness of pesticides on target organisms.

### **Adverse Incident**

Adverse Incident means a situation where the Discharger observes upon inspection or becomes aware of in which:

- A person or non-target organism may have been exposed to an algaecide or aquatic herbicide residue; and
- The person or non-target organism suffered an adverse or toxic effect.

### **Adverse or Toxic Effect**

An “adverse or toxic effect” includes any impact that occurs within waters of the United States on non-target organisms as a result of algaecide or aquatic herbicide residue discharge.

Examples of these effects may include:

- Distressed or dead juvenile and small fishes
- Washed up or floating fish
- Fish swimming abnormally or erratically
- Fish lying lethargically at water surface or in shallow water
- Fish that are listless or nonresponsive to disturbance
- Stunting, wilting, or desiccation of non-target submerged or emergent aquatic plants
- Other dead or visibly distressed non-target aquatic organisms (amphibians, turtles, invertebrates, etc.)

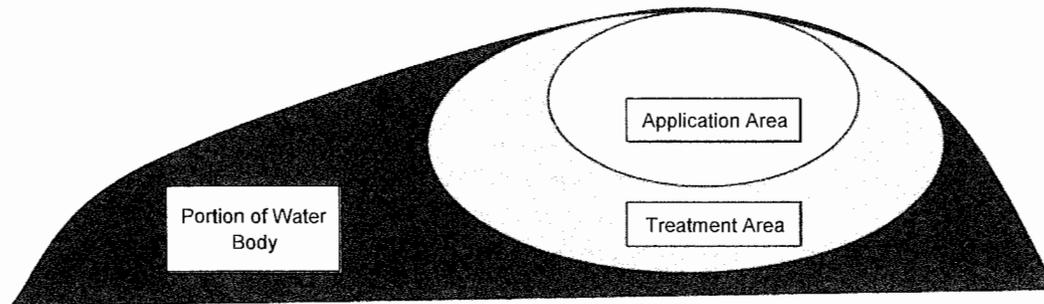
An “adverse or toxic effect” also includes any adverse effects to humans (e.g., skin rashes) or domesticated animals that occur either directly or indirectly from a discharge to waters of the United States that are temporally and spatially related to exposure to an algaecide and aquatic herbicide residue (e.g., vomiting, lethargy).

### **Algae Control**

Algae control means the treatment of filamentous algae, cyanobacteria (blue-green algae), or algal species that have the potential to affect human or environmental health.

### **Application Area**

The application area is the area to which aquatic pesticides are directly applied.



### **Application Event**

The application event is the time that introduction of the algaecide or aquatic herbicide to the treatment area takes place, not the length of time that the environment is exposed to the algaecide or aquatic herbicide.

### **Aquatic Pesticides**

Aquatic pesticides in this General Permit are limited to algaecides and aquatic herbicides labeled for aquatic use to control aquatic weeds or algae.

### **Beneficial Uses**

Beneficial uses of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

### **Coalition**

Specifically refers to a monitoring coalition which is a collaborative monitoring partnership of dischargers to develop a monitoring plan that addresses the monitoring requirements of this General Permit. The Coalition's monitoring plan will be submitted for Coalition members in lieu of individual monitoring plans from each member.

### **Enclosed Bays**

Enclosed Bays means indentations along the coast that enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between the headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. Enclosed bays do not include inland surface waters or ocean waters.

### **Estuaries**

Estuaries means waters, including coastal lagoons, located at the mouths of streams that serve as areas of mixing for fresh and ocean waters. Coastal lagoons and mouths of streams that are temporarily separated from the ocean by sandbars shall be considered estuaries. Estuarine waters shall be considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of freshwater and seawater. Estuaries do not include inland surface waters or ocean waters.

**Half-Life**

Half-life is the time required for half of the compound introduced into an ecosystem to be eliminated or disintegrated by natural processes.

**Inert Ingredients**

Inert ingredients are additional ingredients and are often trade secrets; therefore, they are not always disclosed by the manufacturer.

**Mutual Water Company**

A mutual water company is defined in the Public Utilities Code, section 2725 as “[a]ny private corporation or association organized for the purpose of delivering water to its stockholders and members at cost, including use of works for conserving, treating, and reclaiming water.”

**Point Source**

Any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock concentrated animal feeding operation, landfill leachate collection system, or vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

**Priority Pollutants**

Priority pollutants are listed within the California Toxics Rule in 40 Code of Federal Regulations, section 131.38(b)(1). Criteria to protect aquatic life and human health are set for priority pollutants in the California Toxics Rule.

**Public Entity**

Public entity includes the federal government or a state, county, city and county, city, district, public authority, or public agency.

**Qualified Biologist**

A qualified biologist is a biologist who has the knowledge and experience in the ecosystem where the algaecide or aquatic herbicide is applied so that he or she can adequately evaluate whether the beneficial uses of the receiving waters have been protected and/or restored upon completion of the algaecide and aquatic herbicide application project.

**Receiving Waters**

Receiving waters are waters of the United States anywhere outside of the treatment area at anytime and anywhere inside the treatment area after completion of the treatment event.

**Representative Monitoring Location**

To be considered “representative,” at a minimum, a location must be similar in hydrology, algaecide or aquatic herbicide use, and other factors that affect the residual discharge to the areas being represented in that environmental setting.

**Residual Algaecide and Aquatic Herbicide**

Residual algaecide and aquatic herbicide are those portions of the pesticides that remain in

the water after the application and its intended purpose (injury or elimination of targeted pests) have been completed.

### **Self Monitoring**

Sampling and analysis performed by the Discharger or Coalition to determine compliance with the Permit. All laboratory analyses must be conducted by a laboratory certified by the California Department of Public Health.

### **Treatment Area**

The treatment area is the area being treated by the algaecide or aquatic herbicide for algae and aquatic weed control and, therefore, the area being targeted to receive an appropriate rate of application consistent with product label requirements of algaecide or aquatic herbicide. It is the responsibility of the Discharger to define the treatment area for each specific algaecide and aquatic herbicide application.

### **Waters of the United States**

1. All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters, including interstate "wetlands;"
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sand flats, "wetlands," sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:
  - a. Which are or could be used by interstate or foreign travelers for recreational or other purposes;
  - b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
  - c. Which are used or could be used for industrial purposes by industries in interstate commerce.
4. All impoundments of waters otherwise defined as waters of the United States under this definition;
5. Tributaries of waters identified in items 1 through 4 of this definition;
6. The territorial sea; and
7. "Wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (1) through (6) of this definition. Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 C.F.R. section 423.11(m) which also meet the criteria of this definition) are not waters of the United States. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States [See Note 1 of this Section.] Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with U.S. EPA.

## Attachment B – Standard Provisions

### I. STANDARD PROVISIONS – PERMIT COMPLIANCE (IF APPLICABLE)

#### A. Duty to Comply

1. The Discharger must comply with all of the conditions of this General Permit. Any noncompliance constitutes a violation of the CWA and the California Water Code and is grounds for enforcement action, for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. (40 C.F.R. §122.41(a).)
2. The Discharger shall comply with effluent standards or prohibitions established under section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement. (40 C.F.R. §122.41(a)(1).)

#### B. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a Discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit. (40 C.F.R. §122.41(c).)

#### C. Duty to Mitigate

The Discharger shall take all reasonable steps to minimize or prevent any discharge in violation of this General Permit that has a reasonable likelihood of adversely affecting human health or the environment. (40 C.F.R. §122.41(d).)

#### D. Proper Operation and Maintenance

The Discharger shall at all times properly operate and maintain all facilities and systems of control (and related appurtenances) which are installed or used by the Discharger to achieve compliance with the conditions of this General Permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. (40 C.F.R. §122.41(e).)

#### E. Property Rights

1. This General Permit does not convey any property rights of any sort or any exclusive privileges. (40 C.F.R. §122.41(g).)
2. The issuance of this General Permit does not authorize any injury to persons or property or invasion of other private rights, or any infringement of state or local law or regulations. (40 C.F.R. §122.5(c).)

#### F. Inspection and Entry

The Discharger shall allow the Regional Water Board, State Water Board, United States Environmental Protection Agency (U.S. EPA), and/or their authorized

representatives (including an authorized contractor acting as their representative), upon the presentation of credentials and other documents, as may be required by law, (40 C.F.R. §122.41(i); Water Code, §13383) to:

1. Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this General Permit;
2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this General Permit;
3. Inspect and photograph, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this General Permit; and
4. Sample or monitor, at reasonable times, for the purposes of assuring General Permit compliance or as otherwise authorized by the CWA or the Water Code, any substances or parameters at any location.

## **II. STANDARD PROVISIONS – PERMIT ACTION**

### **A. General**

This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Discharger for modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any General Permit condition. (40 C.F.R. §122.41(f).)

### **B. Duty to Reapply**

If the Discharger wishes to continue an activity regulated by this General Permit after the expiration date of this General Permit, the Discharger must apply for and obtain authorization as required by the new permit. (40 C.F.R. §122.41(b).)

### **C. Transfers**

This General Permit is not transferable to any person except after notice to the State Water Board. The State Water Board may require modification or revocation and reissuance of the General Permit to change the name of the Discharger and incorporate such other requirements as may be necessary under the CWA and the Water Code. (40 C.F.R. §122.41(l)(3); §122.61.)

### **D. Continuation of this Permit**

If this permit is not reissued or replaced prior to the expiration date, it will be administratively continued in accordance with 40 C.F.R. section 122.6 and remain in full force and effect.

## **III. STANDARD PROVISIONS – MONITORING**

Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. (40 C.F.R. §122.41(j)(1).)

Monitoring results must be conducted according to test procedures under 40 C.F.R. part 136 unless other test procedures have been specified in this General Permit. (40 C.F.R. §122.41(j)(4); §122.44(i)(1)(iv).)

#### **IV. STANDARD PROVISIONS – RECORDS**

##### **A. Records Retention**

The Discharger shall retain records of all monitoring information, including all calibration and maintenance records, copies of all reports required by this General Permit, and records of all data used to complete the application for this General Permit, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the the State Water Board's Deputy Director of the Division of Water Quality (Deputy Director) at any time. (40 C.F.R. §122.41(j)(2).)

##### **B. Records of monitoring information shall include:**

1. The date, exact place, and time of sampling or measurements (40 C.F.R. §122.41(j)(3)(i).);
2. The individual(s) who performed the sampling or measurements (40 C.F.R. §122.41(j)(3)(ii).);
3. The date(s) analyses were performed (40 C.F.R. §122.41(j)(3)(iii).);
4. The individual(s) who performed the analyses (40 C.F.R. §122.41(j)(3)(iv).);
5. The analytical techniques or methods used (40 C.F.R. §122.41(j)(3)(v).); and
6. The results of such analyses. (40 C.F.R. §122.41(j)(3)(vi).)

##### **C. Claims of confidentiality for the following information will be denied (40 C.F.R. §122.7(b).):**

1. The name and address of any permit applicant or Discharger (40 C.F.R. §122.7(b)(1).); and
2. Permit applications and attachments, permits and effluent data. (40 C.F.R. §122.7(b)(2).)

#### **V. STANDARD PROVISIONS – REPORTING**

##### **A. Duty to Provide Information**

The Discharger shall furnish to the Regional Water Board, State Water Board, or U.S. EPA within a reasonable time, any information which the Regional Water Board, State Water Board, or U.S. EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this General Permit or to determine compliance with this General Permit. Upon request, the Discharger shall also furnish to the Regional Water Board, State Water Board, or U.S. EPA copies of records required to be kept by this General Permit. (40 C.F.R. §122.41(h); Wat. Code, §13267.)

## B. Signatory and Certification Requirements

1. All applications, reports, or information submitted to the Regional Water Board, State Water Board, and/or U.S. EPA shall be signed and certified in accordance with Standard Provisions – Reporting V.B.2, V.B.3, V.B.4, V.B.5, and V.B.6 below. (40 C.F.R. §122.41(k).)
2. **For a corporation.** By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
3. **For a partnership or sole proprietorship.** By a general partner or the proprietor, respectively;
4. **For a municipality, state, federal, or other public agency:** All permit applications shall be signed by either a principal executive officer or ranking elected official. For purposes of this provision, a principal executive officer of a federal agency includes: (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA). (40 C.F.R. §122.22(a)(3).)
5. All reports required by this General Permit and other information requested by the Regional Water Board, State Water Board, or U.S. EPA shall be signed by a person described in Standard Provisions – Reporting V.B.1 above, or by a duly authorized representative of that person. A person is a duly authorized representative only if:
  - a. The authorization is made in writing by a person described in Standard Provisions – Reporting V.B.1 above (40 C.F.R. §122.22(b)(1).);
  - b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity or an individual or a position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) (40 C.F.R. §122.22(b)(2).); and
  - c. The written authorization is submitted to the Regional Water Board and State Water Board. (40 C.F.R. §122.22(b)(3).)

6. If an authorization under Standard Provisions – Reporting V.B.1 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Standard Provisions – Reporting V.B.1 above must be submitted to the Regional Water Board and State Water Board prior to or together with any reports, information, or applications, to be signed by an authorized representative. (40 C.F.R. §122.22(c).)

Any person signing a document under Standard Provisions – Reporting V.B.1 or V.B.3 above shall make the following certification:

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.” (40 C.F.R. §122.22(d).)

#### **C. Monitoring Reports**

1. Monitoring results shall be reported at the intervals specified in the Monitoring and Reporting Program (Attachment C) in this General Permit. (40 C.F.R. §122.22(l)(4).)
2. Monitoring results must be reported on a Self Monitoring\* Report (SMR) form as agreed to by the Deputy Director and the Discharger.
3. If the Discharger monitors any pollutant more frequently than required by this General Permit using test procedures approved under 40 C.F.R part 136 or as specified in this General Permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the SMR or a reporting form specified by the State Water Board. (40 C.F.R. §122.41(l)(4)(ii).)
4. Calculations for all limitations, which require averaging of measurements, shall utilize an arithmetic mean unless otherwise specified in this General Permit. (40 C.F.R. §122.41(l)(4)(iii).)

#### **D. Compliance Schedules**

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this General Permit, shall be submitted no later than 14 days following each schedule date. (40 C.F.R. §122.41(l)(5).)

#### **E. Planned Changes**

The Discharger shall give notice to the State and the Regional Water Board as soon as possible of any planned physical alterations or additions to the permitted activity or discharge. Notice is required under this provision (40 C.F.R. §122.41(l)(1)) only when

the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are subject neither to effluent limitations in this General Permit nor to notification requirements under 40 C.F.R. section 122.42(a)(1).

**F. Anticipated Noncompliance**

The Discharger shall give advance notice to the State and Regional Water Boards of any planned changes in the permitted discharge or activity that may result in noncompliance with General Permit requirements. (40 C.F.R. §122.41(l)(2).)

**G. Other Noncompliance**

The Discharger shall report all instances of noncompliance not reported under Standard Provisions – Reporting V.C, V.D, and V.E above at the time monitoring reports are submitted. The reports shall contain the information listed in Standard Provision – Reporting V.F above. (40 C.F.R. §122.41(l)(7).)

**H. Other Information**

When the Discharger becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the State Water Board, Regional Water Board, or U.S. EPA, the Discharger shall promptly submit such facts or information. (40 C.F.R. §122.41(l)(8).)

**VI. STANDARD PROVISIONS – ENFORCEMENT**

The State and the Regional Water Boards are authorized to enforce the terms of this General Permit under several provisions of the Water Code, including, but not limited to, sections 13385, 13386, and 13387.

## Attachment C – Monitoring and Reporting Program

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## ATTACHMENT C – MONITORING AND REPORTING PROGRAM

Section 122.48 of title 40 of the Code of Federal Regulations (40 C.F.R. §122.48) requires that all NPDES permits specify monitoring and reporting requirements. California Water Code sections 13267 and 13383 also authorize the State Water Resources Control Board (the State Water Board) and the Regional Water Quality Control Board (Regional Water Board) to require technical and monitoring reports. This Monitoring and Reporting Program (MRP) establishes monitoring and reporting requirements which implement federal and California State laws and regulations.

This MRP is designed to address the two key questions shown below. It also encourages Dischargers to form monitoring coalitions with others doing similar applications within a given watershed or doing applications of similar environmental settings (flowing water and non-flowing water). The Coalition or Discharger may select sites representing worst case scenarios or high-use areas for each active ingredient in each environmental setting. If the Discharger elects in its Aquatic Pesticide Application Plan (APAP) to undertake monitoring and reporting through a Coalition, then the Coalition will prepare and implement an MRP (pursuant to this Attachment C) and act on behalf of the Discharger with respect to monitoring and reporting. Otherwise, the Discharger will prepare and implement an individual MRP.

**Question No. 1:** Does the residual algaecides and aquatic herbicides discharge cause an exceedance of receiving water limitations?

**Question No. 2:** Does the discharge of residual algaecides and aquatic herbicides, including active ingredients, inert ingredients, and degradation byproducts, in any combination cause or contribute to an exceedance of the “no toxics in toxic amount” narrative toxicity objective?

If the Discharger elects in its APAP to undertake monitoring and reporting through a Coalition, the APAP should reference and attach the Coalition’s monitoring plan.

### I. GENERAL MONITORING PROVISIONS

- A. Samples and measurements taken as required herein shall be representative of the nature of the monitored discharge. All samples shall be taken at the anticipated monitoring locations specified in the Discharger’s or Coalition’s APAP.
- B. All laboratory analyses shall be conducted at a laboratory certified for such analyses by the California Department of Public Health in accordance with California Water Code section 13176. Laboratories that perform sample analyses shall be identified in all monitoring reports. The Discharger shall institute a Quality Assurance-Quality Control Program for any onsite field measurements such as electric conductivity, pH, turbidity, and temperature. A manual containing the steps followed in this program must be kept in the laboratory and shall be available for inspection by the State Water Board and the appropriate Regional Water Board staff. The Quality Assurance-Quality Control Program must conform to United States Environmental Protection Agency (U.S. EPA) guidelines or to procedures approved by the State Water Board and the appropriate Regional Water Board.

- C. All analyses shall be conducted in accordance with the latest edition of "Guidelines Establishing Test Procedures for Analysis of Pollutants," promulgated by the U.S. EPA in title 40 Code Federal Regulation (40 C.F.R.) 136 or equivalent methods that are commercially and reasonably available and that provide quantification of sampling parameters and constituents sufficient to evaluate compliance with applicable effluent limits and to perform reasonable potential analysis. Equivalent methods must be more sensitive than those specified in 40 C.F.R. 136 if the method is available in the 40 C.F.R. 136, and must be approved for use by the Regional Water Board Executive Officer.

Any procedures to prevent the contamination of samples as described in the monitoring program in the APAP shall be implemented.

- D. Records of monitoring information shall include the following:
1. The date, exact place, and time of sampling or measurements;
  2. The individuals who performed the sampling or measurements;
  3. The dates analysis were performed;
  4. The individuals who performed the analyses;
  5. The analytical techniques or methods used; and
  6. Results of analyses.
- E. All monitoring instruments and devices used to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their accuracy.
- F. Monitoring results, including noncompliance, shall be reported at intervals and in a manner specified in this MRP.

## II. MONITORING LOCATIONS AND SAMPLE TYPES

### A. Monitoring Locations

Each Discharger or Coalition shall establish monitoring locations specified in the APAP to demonstrate compliance with the receiving water limitations, discharge specifications, and other requirements in this General Permit. The number and location of samples shall be selected to answer the two key questions. A Discharger or Coalition may use representative monitoring locations\* to characterize water quality for all waters of the United States within the Discharger's or Coalition's boundaries for each environmental setting (flowing water and non-flowing water). However, the Discharger or Coalition must provide justification for the selection of the representative monitoring locations. To be considered "representative," at a minimum, a location must be similar in hydrology, algaecides and aquatic herbicides use, and other factors that affect the discharge of algaecides and aquatic herbicides and their residues to surface waters as a result of applications to the areas being represented in that environmental setting. Each Discharger or Coalition must provide technical justification and identify which areas are to be considered representative. Monitoring location information shall include a description of the treatment area, GPS

coordinates if feasible, and algaecides and aquatic herbicides being applied. The specific monitoring locations initially identified as representative monitoring locations may be changed based on surveillance of the Discharger or Coalition.

## B. Sample Types

The following monitoring is required for each sampling:

1. **Background Monitoring.** Background monitoring samples shall be collected upstream at the time of the application event\* or in the application area\* just prior to (up to 24 hours in advance of) the application event.
2. **Event Monitoring.** Event monitoring samples shall be collected immediately downstream of the treatment area in flowing waters or immediately outside of the treatment area in non-flowing waters, immediately after the application event, but after sufficient time has elapsed such that treated water would have exited the treatment area.
3. **Post-Event Monitoring.** Post-event monitoring samples shall be collected within the treatment area within one week after application.

## III. RECEIVING WATER MONITORING REQUIREMENTS – SURFACE WATER

### A. General Monitoring Requirements

The monitoring program described in the APAP shall be designed to answer the two key questions stated above. The monitoring program in the APAP shall describe the tasks and time schedules in which these two key questions will be addressed. Monitoring shall take place at locations that are being planned to be applied or may be applied as described in the Discharger's APAP.

The monitoring program described in the APAP must consider watershed specific attributes and waste constituents, based on the characteristics of applications within the Coalition's or Discharger's area, as well as the receiving water quality conditions. Developing the details of a monitoring design requires clearly defining several inputs to the design and then organizing these in a logical framework that supports effective decision making about indicators, monitoring locations, and monitoring frequency. The logical framework should describe:

1. The basic geographic and hydrographic features of the area, particularly application points and the pathways(s) of residue flows;
2. Algaecides and aquatic herbicides application practices and how they are distributed in space and time;
3. Relevant knowledge about the transport, fates, and effects of algaecides and aquatic herbicides, including best- and worst-case scenarios;
4. Description of the designated beneficial uses in each water body;
5. Relevant knowledge about the action of cumulative and indirect effects;

6. Mechanisms through which algaecides and aquatic herbicides applications could lead to designated use impacts, given the basic features of the area;
7. Known and potential impacts of algaecides and aquatic herbicides applications on water quality, ranked in terms of relative risk, based on factors such as magnitude, frequency and duration;
8. Sufficient number of sampling areas to assess the entire Discharger's or Coalition's area of influence; and
9. A description of sampling methods and a sampling schedule.

In conducting the receiving water sampling, a log shall be kept of the receiving water conditions throughout the reach bounded by the treatment area. Attention shall be given to the presence or absence of:

1. Floating or suspended matter;
2. Discoloration;
3. Bottom deposits;
4. Aquatic life;
5. Visible films, sheens, or coatings;
6. Fungi, slimes, or objectionable growths; and
7. Potential nuisance conditions.

Notes on receiving water conditions shall be summarized in the monitoring report.

#### **B. Visual, Physical, and Chemical Monitoring Requirements**

Monitoring shall take place at locations that are described and scheduled in the Coalition's or Discharger's APAP. Monitoring for all active ingredients must include frequent and routine monitoring on a pre-determined schedule, as summarized in the Table C-1 below:

**Table C-1. Monitoring Requirements**

Sample Type	Constituent/Parameter	Units	Sample Method	Minimum Sampling Frequency	Sample Type Requirement	Required Analytical Test Method
Visual	1. Monitoring area description (pond, lake, open waterway, channel, etc.) 2. Appearance of waterway (sheen, color, clarity, etc.) 3. Weather conditions (fog, rain, wind, etc.)	Not applicable	Visual Observation	1	Background, Event and Post-event Monitoring	Not applicable
Physical	1. Temperature <sup>2</sup>	°F	Grab <sup>4</sup>	5	Background, Event and Post-event Monitoring	6
	2. pH <sup>3</sup>	Number				
	3. Turbidity <sup>3</sup>	NTU				
	4. Electric Conductivity <sup>3</sup> @ 25°C	µmhos/cm				
Chemical	1. Active Ingredient <sup>7</sup>	µg/L	Grab <sup>4</sup>	5	Background, Event and Post-event Monitoring	6
	2. Nonylphenol <sup>8</sup>	µg/L				
	3. Hardness (if copper is monitored)	mg/L				
	4. Dissolved Oxygen <sup>2</sup>	mg/L				
<sup>1</sup> All applications at all sites. <sup>2</sup> Field testing. <sup>3</sup> Field or laboratory testing. <sup>4</sup> Samples shall be collected at three feet below the surface of the water body or at mid water column depth if the depth is less than three feet. <sup>5</sup> Collect samples from a minimum of six application events for each active ingredient in each environmental setting (flowing water and non-flowing water) per year, except for glyphosate. If there are less than six application events in a year, collect samples during each application event for each active ingredient in each environmental setting (flowing water and non-flowing water). If the results from six consecutive sampling events show concentrations that are less than the receiving water limitation/trigger for an active ingredient in an environmental setting, sampling shall be reduced to one application event per year for that active ingredient in that environmental setting. If the yearly sampling event shows exceedance of the receiving water limitation/trigger for an active ingredient in an environmental setting, then sampling shall return to six application events for that active ingredient in each environmental setting. For glyphosate, collect samples from one application event from each environmental setting (flowing water and non-flowing water) per year. <sup>6</sup> Pollutants shall be analyzed using the analytical methods described in 40 C.F.R. part 136. <sup>7</sup> 2,4-D, acrolein, dissolved copper, diquat, endothall, fluridone, glyphosate, imazamox, imazapyr, penoxsulam, and triclopyr. <sup>8</sup> It is required only when a surfactant is used.						

**IV. REPORTING REQUIREMENTS**

**A. General Monitoring and Reporting Requirements**

1. The Coalition or Discharger shall comply with all Standard Provisions (Attachment B) related to monitoring, reporting, and recordkeeping.

2. Upon written direction of the State Water Board or the Regional Water Board, the Coalition or Discharger shall submit information as specified.
3. The Coalition or Discharger shall report to the State Water Board and appropriate Regional Water Board any toxic chemical release data that are reported to the State Emergency Response Commission within 15 days of reporting the data to the Commission pursuant to section 313 of the "Emergency Planning and Community Right to Know Act" of 1986 (42 U.S.C. §11001 et. seq.).

#### **B. Annual Information Collection**

The Coalition or Discharger shall complete and retain all information on the previous reporting year beginning January 1 and ending December 31. When requested by the Deputy Director or Executive Officer of the applicable Regional Water Board, the Coalition or Discharger shall submit the annual information which must include the following:

1. An executive summary discussing compliance or violation of this General Permit and the effectiveness of the APAP to reduce or prevent the discharge of pollutants associated with algaecide and aquatic herbicide applications;
2. A summary of monitoring data, including the identification of water quality improvements or degradation as a result of the algaecide or aquatic pesticide application, if appropriate, and recommendations for improvements to the APAP [including proposed best management practices (BMPs)] and monitoring program based on the monitoring results. All receiving water monitoring data shall be compared to receiving water limitations and receiving water monitoring triggers;
3. Identification of BMPs currently in use and a discussion of their effectiveness in meeting the requirements in this General Permit;
4. A discussion of BMP modifications addressing violations of this General Permit;
5. A map showing the location of each treatment area;
6. Types and amounts of algaecides and aquatic herbicides used at each application event;\*
7. Information on surface area and/or volume of treatment areas and any other information used to calculate dosage, concentration, and quantity of each algaecide and aquatic herbicide used;
8. Sampling results shall indicate the name of the sampling agency or organization, detailed sampling location information (including latitude and longitude or township/range/section if available), detailed map or description of each sampling area (address, cross roads, etc.), collection date, name of constituent/parameter and its concentration detected, minimum levels, method detection limits for each constituent analysis, name or description of water body sampled, and a comparison with applicable water quality standards, description of analytical QA/quality control plan. Sampling results shall be tabulated so that they are readily discernible; and
9. Summary of algaecide and aquatic herbicide application log.

**C. Annual Report**

The Coalition or Discharger shall submit to the Deputy Director and the appropriate Regional Water Board Executive Officer an annual report consisting of a summary of the past year’s activities, and certify compliance with all requirements of this General Permit. If there is no discharge of algaecides and aquatic herbicides, their residues, or their degradation byproducts, the Coalition or Discharger shall provide the Deputy Director and the appropriate Regional Water Board Executive Officer a certification that algaecide and aquatic herbicide application activities did not result in a discharge to any water body. The annual report shall contain the following information:

1. An executive summary discussing compliance or violation of this General Permit and the effectiveness of the APAP; and
2. A summary of monitoring data, including the identification of water quality improvements or degradation as a result of the algaecide or aquatic pesticide application,
3. Dischargers shall submit the annual report according to the following schedule:

**Table C-2. Reporting Schedule**

Reporting Frequency	Reporting Period	Annual Report Due
Annual	January 1 through December 31	March 1

**D. Electronic Reporting**

At any time during the term of this General Permit, the State Water Board or the appropriate Regional Water Board may notify the Coalition or Discharger of the requirement to submit electronically Self Monitoring Reports (SMRs) using the State Water Board’s California Integrated Water Quality System (CIWQS) Program (<http://www.waterboards.ca.gov/ciwqs/index.html>). Until such notification is given, the Coalition or Discharger shall submit hardcopy SMRs. The CIWQS website will provide additional directions for SMR submittal in the event there will be service interruption for electronic submittal.

The Coalition or Discharger shall report the results for all monitoring specified in this MRP in the SMR. The Coalition or Discharger shall submit annual SMRs including the results of all required monitoring using U.S. EPA-approved test methods or other test methods specified in this General Permit. If the Coalition or Discharger monitors any pollutant more frequently than required by this General Permit, the results of this monitoring shall be included in the calculations and reporting of the data submitted in the SMR.

**E. Reporting Protocols**

The Coalition or Discharger shall report with each sample result the applicable reported Minimum Level (ML) and the current Minimum Detection Limit, as determined by the procedure in 40 C.F.R. part 136.

The Coalition or Discharger shall report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting protocols:

1. Sample results greater than or equal to the reported ML shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).
2. Sample results less than the Report Limit, but greater than or equal to the laboratory's MDL, shall be reported as "Detected, but Not Quantified," or DNQ. The estimated chemical concentration of the sample shall also be reported.

For the purposes of data collection, the laboratory shall write the estimated chemical concentration next to DNQ as well as the words "Estimated Concentration" (may be shortened to "Est. Conc."). The laboratory may, if such information is available, include numerical estimates of the data quality for the reported result. Numerical estimates of data quality may be percent accuracy (plus a percentage of the reported value), numerical ranges (low to high), or any other means considered appropriate by the laboratory.

3. Sample results less than the laboratory's MDL shall be reported as "<" followed by the MDL.
4. The Coalition or Discharger shall instruct laboratories to establish calibration standards so that the ML value (or its equivalent if there is differential treatment of samples relative to calibration standards) is the lowest calibration standard. At no time is the Coalition or Discharger to use analytical data derived from extrapolation beyond the lowest point of the calibration curve.
5. Multiple Sample Data: If two or more sample results are available, the Coalition or Discharger shall compute the arithmetic mean unless the data set contains one or more reported determinations of DNQ or "Not Detected" (ND). In those cases, the Coalition or Discharger shall compute the median in place of the arithmetic mean in accordance with the following procedure:
  - a. The data set shall be ranked from low to high, ranking the reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.
  - b. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.
6. The annual report shall comply with the following requirements:
  - a. The Coalition or Discharger shall arrange all reported data in a tabular format. The data shall be summarized to clearly illustrate whether the algaecide and aquatic herbicide applications are conducted in compliance

with effluent and receiving water limitations. The Coalition or Discharger is not required to duplicate the submittal of data that are entered in a tabular format within CIWQS. When electronic submittal of data is required and CIWQS does not provide for entry into a tabular format within the system, the Coalition or Discharger shall submit electronically the data in a tabular format as an attachment.

- b. The Coalition or Discharger shall attach a cover letter to the annual report that clearly identifies violations of the permit; discusses corrective actions taken or planned; and provides a time schedule for corrective actions. Identified violations must include a description of the requirement that was violated and a description of the violation.
- c. The annual report must be submitted to the State Water Board and the appropriate Regional Water Board, signed and certified as required by the Standard Provisions (Attachment B).

## **F. Other Reporting Requirements**

### **1. Twenty-Four Hour Report**

The Coalition or Discharger shall report to the State Water Board and appropriate Regional Water Board any noncompliance, including any unexpected or unintended effect of an algaecide or aquatic herbicide use that may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the Coalition or Discharger becomes aware of the circumstances and must include the following information:

- a. The caller's name and telephone number;
- b. Applicator name and mailing address;
- c. Waste Discharge Identification (WDID) number;
- d. The name and telephone number of a contact person;
- e. How and when the Coalition or Discharger become aware of the noncompliance;
- f. Description of the location of the noncompliance;
- g. Description of the noncompliance identified and the U.S. EPA pesticide registration number for each product the Discharger applied in the area of the noncompliance; and
- h. Description of any steps that the Coalition or Discharger has taken or will take to correct, repair, remedy, cleanup, or otherwise address any adverse effects.

If the Coalition or Discharger is unable to notify the State and the appropriate Regional Water Board within 24 hours, the Coalition or Discharger must do so as soon as possible and also provide the rationale for why the Discharger was unable to provide such notification within 24 hours.

## 2. **Five-Day Written Report**

The Coalition or Discharger shall also provide a written submission within five (5) days of the time the Discharger becomes aware of the noncompliance. The written submission shall contain the following information:

- a. Date and time the Coalition or Discharger contacted the State Water Board and the appropriate Regional Water Board notifying of the noncompliance and any instructions received from the State and/or Regional Water Board; information required to be provided in Section D.1 (24-Hour Reporting);
- b. A description of the noncompliance and its cause, including exact date and time and species affected, estimated number of individual and approximate size of dead or distressed organisms (other than the pests to be eliminated);
- c. Location of incident, including the names of any waters affected and appearance of those waters (sheen, color, clarity, etc);
- d. Magnitude and scope of the affected area (e.g. aquatic square area or total stream distance affected);
- e. Algaecide and aquatic herbicide application rate, intended use site (e.g., banks, above, or direct to water), method of application, and name of algaecide and herbicide product, description of algaecide and herbicide ingredients, and U.S. EPA registration number;
- f. Description of the habitat and the circumstances under which the noncompliance activity occurred (including any available ambient water data for aquatic algaecides and aquatic herbicides applied);
- g. Laboratory tests performed, if any, and timing of tests. Provide a summary of the test results within five days after they become available;
- h. If applicable, explain why the Coalition or Discharger believes the noncompliance could not have been caused by exposure to the algaecides or aquatic herbicides from the Coalition's or Discharger's application; and
- i. Actions to be taken to prevent recurrence of adverse incidents.

The State Water Board staff or Regional Water Board staff may waive the above-required written report under this provision on a case-by-case basis if an oral report has been received within 24 hours.

**Attachment D – Fact Sheet**

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## Attachment D – Fact Sheet

As described in Section III, Findings, of this General Permit, the State Water Resources Control Board (State Water Board) incorporates this Fact Sheet as findings of the State Water Board that support the issuance of this General Permit. This Fact Sheet includes the legal requirements and technical rationale that serve as the basis for the requirements of this General Permit.

This General Permit has been prepared under a standardized format to accommodate a broad range of discharge requirements for Dischargers in California.

### I. PERMIT INFORMATION

#### A. Background

##### 1. The Regulatory Background

In 1972, the Federal Water Pollution Control Act (also referred to as the Clean Water Act or CWA) was amended to provide that the discharge of pollutants to waters of the United States from any point source is effectively prohibited unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) Permit.

On September 22, 1989, the U.S. Environmental Protection Agency (U.S. EPA) granted the State of California, through the State Water Resources Control Board (State Water Board) and the Regional Water Quality Control Boards (Regional Water Boards), the authority to issue general NPDES permits pursuant to title 40 Code of Federal Regulations (40 C.F.R.) 122 and 123.

Section 122.28 of 40 C.F.R. provides for issuance of general permits to regulate a category of point sources if the sources involve the same or substantially similar types of operations; discharge the same type of waste; require the same type of effluent limitations or operating conditions; require similar monitoring; and are more appropriately regulated under a general permit rather than individual permits.

On March 12, 2001, the Ninth Circuit Court of Appeals held that discharges of pollutants from the use of aquatic pesticides in waters of the United States require coverage under an NPDES permit. (*Headwaters, Inc. v. Talent Irrigation District*).<sup>3</sup> The *Talent* decision was issued just prior to the major season for applying aquatic pesticides.

Because of the serious public health, safety, and economic implications of delaying pesticide applications, in 2001 the State Water Board adopted Water Quality Order (Order) No. 2001-12-DWQ, Statewide General NPDES Permit for

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<sup>3</sup> 243 F.3d 526 (9<sup>th</sup> Cir., 2001).

Discharges of Aquatic Pesticides to Waters of the United States on an emergency basis to provide immediate NPDES permit coverage for broad categories of aquatic pesticide use in California.

Order No. 2001-12-DWQ imposed requirements on any discharge of aquatic pesticides by public entities to waters of the United States in accordance with the Policy which establishes procedures for implementing water quality standards for priority pollutants\* in NPDES permits.

Section 5.3 of the State Water Board Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Policy) allows for short-term or seasonal exceptions from its requirements for resource or pest management conducted by public entities or mutual water companies. In order to qualify for an exception from meeting priority pollutant standards, a public entity must fulfill the requirements listed in section 5.3 and the State Water Board must decide to grant the exception. Among other requirements, entities seeking an exception to complying with water quality standards for priority pollutants must submit documents in compliance with California Environmental Quality Act (CEQA).<sup>4</sup> Because of the emergency adoption of Order No. 2001-12-DWQ, the State Water Board invoked an exemption to the requirements of section 5.3 of the Policy and issued the permit incorporating a categorical exception to water quality standards for priority pollutants.

Order No. 2001-12-DWQ required that Dischargers develop a best management practices (BMPs) plan that minimizes adverse impacts to receiving waters and a monitoring and reporting plan that is representative of each type of aquatic pesticide application.

In August 2001, Waterkeepers Northern California (Waterkeepers) filed a lawsuit against the State Water Board challenging several aspects of Order No. 2001-12-DWQ. Major aspects of the challenge included the emergency adoption of the Order without compliance with CEQA and other exception requirements of the Policy; failure to address cumulative impacts; and failure to comply with the California Toxics Rule (CTR).<sup>5</sup>

In a settlement of the Waterkeepers' lawsuit, the State Water Board agreed to fund a comprehensive aquatic pesticide monitoring program that would assess receiving water toxicity caused by aquatic pesticides and alternatives for pesticide use. The State Water Board contracted with the San Francisco Estuary Institute (SFEI) to conduct the program. SFEI published the final report on February 5, 2004.

In November 2002, the Ninth Circuit issued another opinion concerning the need for an NPDES permit for pesticide application. (*League of Wilderness Defenders*

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<sup>4</sup> Cal. Pub. Resources Code § 21000 et. seq.

<sup>5</sup> 40 C.F.R. Section 131.38.

*v. Forsgren*.<sup>6)</sup> In this case, the court held that the USDA Forest Service must obtain an NPDES permit before it sprays insecticides\* from an aircraft directly into or over rivers as part of silviculture activities. The court found that the insecticides are pollutants under the CWA. The court also defined the exemption for silvicultural pest control from the definition of “point source” in U.S. EPA’s regulations to be limited to pest control activities from which there is natural runoff.

Also in 2002, the Second Circuit issued an unpublished decision regarding the need for an NPDES permit for application of pesticides for mosquito control in federal wetland areas. (*Altman v. Town of Amherst*.) The lower court had dismissed a citizens’ suit, holding that pesticides, when used for their intended purpose, do not constitute a “pollutant” for purposes of the CWA, and are more appropriately regulated under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The appeals court vacated the trial court’s decision and remanded the matter. In its unpublished decision, the Second Circuit expressed concern that: “[u]ntil the EPA articulates a clear interpretation of current law - among other things, whether properly used pesticides released into or over waters of the United States can trigger the requirements for NPDES permits - the question of whether properly used pesticides can become pollutants that violate the [Clean Water Act] will remain open.”

Order No. 2001-12-DWQ expired on January 31, 2004. In 2004, it was replaced by two general permits: a vector control permit for larvicides (Order No. 2004-0008-DWQ) and a weed control permit (Order No. 2004-0009-DWQ). The State Water Board determined that adoption of these two permits was consistent with the Ninth Circuit decisions.

In 2005, the Ninth Circuit held that a pesticide that is applied consistent with FIFRA is not a “chemical waste” (*Fairhurst v. Hager*),<sup>7</sup> but also stated that it would not change its decision in *Headwaters*. The court stated that whether an NPDES permit was required depends on whether there was any “residue or unintended effect” from application of the pesticide. In *Fairhurst*, the court found neither residue nor unintended effect was present. Therefore, the pesticide application at issue did not require an NPDES permit.

**U.S. EPA’s Final Rule:** On November 20, 2006, U.S. EPA adopted a final regulation providing that NPDES permits are not required for pesticide applications as long as the Discharger follows FIFRA label instructions. According to the regulation, pesticides applied under the following two circumstances are not pollutants and, therefore, are not subject to NPDES permitting requirements:

- a. The application of pesticides directly to waters of the United States in order to control pests. Examples of such applications include applications to control

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<sup>6</sup> 309 F.3d 1181 (9<sup>th</sup> Cir., 2002).

<sup>7</sup> 422 F.3d 1146 (9<sup>th</sup> Cir., 2005).

mosquito larvae, aquatic weeds, or other pests that are present in waters of the United States; and

- b. The application of pesticides to control pests that are present over waters of the United States, including near such waters, where a portion of the pesticides will unavoidably be deposited to waters of the United States in order to target the pests effectively; for example, when insecticides are aerially applied to a forest canopy where waters of the United States may be present below the canopy or when pesticides are applied over or near water for control of adult mosquitoes or other pests.

**Lawsuits Against U.S. EPA's Final Rule:** After U.S. EPA's new regulation was adopted in 2006, lawsuits were filed by both the pesticide industry and environmental groups in 11 of the 13 Circuits, including the Ninth Circuit Court, challenging U.S. EPA's Final Rule.

***The National Cotton Council of America v. U.S. EPA:***<sup>8</sup> The petitions for review were consolidated in the Sixth Circuit Court by an order of the Judicial Panel on Multidistrict Litigation.

On January 11, 2009, the Sixth Circuit Court of Appeals determined that U.S. EPA's Final Rule is not a reasonable interpretation of the CWA and vacated the Final Rule. U.S. EPA did not request reconsideration of the decision, but did file a motion for a two-year stay of the effect of the decision in order to provide agencies time to develop, propose, and issue NPDES general permits for pesticide applications covered by the ruling. On June 8, 2009, the Sixth Circuit granted the motion, such that the U.S. EPA exemption was to remain in place until April 9, 2011. Subsequently, U.S. EPA was granted an extension of the stay, which allowed the exemption to continue until October 31, 2011.

## 2. Related Pesticide Regulation Information

Pesticide formulations may include "active ingredients" and "inert ingredients." Adjuvants or surfactants may be added to the ingredients in the application equipment that is used in the delivery of the aquatic pesticide.

As part of the registration process of pesticides for use in California, U.S. EPA and the California Department of Pesticide Regulation (DPR) evaluate data submitted by registrants to ensure that a product used according to label instructions will cause no harm or adverse impact on non-target organisms that cannot be reduced or mitigated with protective measures or use restrictions. Registrants are required to submit data on the effects of pesticides on target pests (efficacy) as well as non-target effects. Data on non-target effects include plant effects (phytotoxicity), fish and wildlife hazards (ecotoxicity), impacts on endangered species, effects on the environment, environmental fate, degradation byproducts, leachability, and persistence. Requirements that are specific to use in California are included in many pesticide labels that are approved by U.S. EPA.

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<sup>8</sup> 553 F.3d 927 (6<sup>th</sup> Cir., 2009).

Use must be reported to the County Agricultural Commissioner where required by law or by agreement with DPR.

The CWA, at section 301(a), broadly prohibits the discharge of any pollutant to waters of the United States, except in compliance with an NPDES permit. Since FIFRA is not necessarily as protective of water quality as the CWA, pesticides discharged into surface waters may constitute pollutants within the meaning of the CWA even if the discharge is in compliance with the registration requirements of FIFRA, thus, requiring coverage under a valid NPDES permit.

DPR and the County Agricultural Commissioners regulate the sale and use of pesticides in California. Pesticide applications subject to this General Permit must be consistent with permits issued by County Agricultural Commissioners and the pesticide label instructions approved by U.S. EPA under FIFRA. According to federal law, pesticide label language is under the sole jurisdiction of U.S. EPA. Label language and any changes thereto must be approved by U.S. EPA before the product can be sold in this country. DPR cannot require manufacturers to make changes on labels; however, DPR can refuse to register products unless manufacturers address unmitigated hazards by amending the pesticide label.

State regulations require that the County Agricultural Commissioners determine if a substantial adverse environmental impact will result from the proposed use of a restricted material. If the County Agricultural Commissioner determines that this is likely, the commissioner may deny the restricted pesticide use permit or may issue it under the condition that site-specific use practices be followed (beyond the label and applicable regulations) to mitigate potentially adverse effects. DPR conducts scientific evaluations of potential health and environmental impacts and provides commissioners with information in the form of suggested permit conditions. DPR's suggested permit conditions reflect minimum measures necessary to protect people and the environment. County Agricultural Commissioners use this information and its evaluation of local conditions to set site-specific limits in permits.

## **B. General Criteria**

1. This General Permit serves as a general NPDES Permit for the discharge of residual algaecides and aquatic herbicides to surface waters as a result of algaecides and aquatic herbicides applications for algae and aquatic weed controls.
2. Dischargers who submit a complete application under this General Permit are not required to submit an individual permit application. The State Water Board's Deputy Director of the Division of Water Quality (Deputy Director) may request additional information or determine that a Discharger is not eligible for coverage under this General Permit and would be better regulated under an individual permit or other general NPDES permit adopted by the appropriate Regional Water Board. If the discharge becomes covered by an individual or another general permit, the applicability of this General Permit to the specified discharge

will be immediately terminated on the effective date of the individual permit or coverage under the other general permit.

## II. NOTIFICATION REQUIREMENTS

### A. General Permit Application

To obtain authorization under this General Permit, Dischargers must submit to the State Water Board a complete application at least 90 days prior to their first application of the season. This is to allow posting of the Aquatic Pesticide Application Plan (APAP) for a 30-day comment period, staff to review APAP and respond to comments, and the Deputy Director to issue the Notice of Applicability (NOA). Following are the application information requirements:

1. A Notice of Intent (NOI shown as Attachment E) signed in accordance with the signatory requirements of the Standard Provisions in Attachment B;
2. An application fee. A fee is required only for new Dischargers. Dischargers that are enrolled under Order No. 2004-0009-DWQ and are applying for coverage under this Permit will be billed during the regular billing cycle; and
3. An APAP.

State Water Board staff will post the APAP on the State Water Board's website for 30 days for public review. In the meantime, the State and Regional Water Board staff will review the application package for completeness and applicability to this General Permit. After the application has been deemed complete, the Deputy Director will issue an NOA. The NOA will specify the permitted active ingredients of algaecides and aquatic herbicides that may be used, and any Regional Water Board specific conditions and requirements not stated in this General Permit. Any such region-specific conditions and requirements shall be enforceable. The Discharger is authorized to discharge starting on the date of the NOA. If comments are received, staff will immediately work to resolve them in order to issue an NOA within 90 days of receipt of the application.

This General Permit specifies an effective date of December 1, 2013. The effective date is delayed because, with the impending start of the 2013 application season, Dischargers may be unable to comply with the requirement to submit their applications 90 days prior to their first pesticide application. The delay will allow enrollees under Water Quality Order No. 2004-0009-DWQ to have continued permit coverage throughout the 2013 application season while preparing their new application for coverage under this General Permit; new enrollees to prepare and submit their applications as well; and Water Boards' staff to process the applications and issue NOAs.

Alternatively, the Deputy Director may issue a Notice of Exclusion, which either terminates permit coverage or requires submittal of an application for an individual permit or alternative general permit.

## **B. Fee**

The annual fee for enrollment under this General Permit, shall be based on Category 3 in section 2200(b)(9) of title 23, California Code of Regulations (Cal. Code Regs.). This category is appropriate because algaecide and aquatic herbicide applications incorporate BMPs to control potential impacts to beneficial uses, and this General Permit prohibits pollutant discharge associated with algaecide and aquatic herbicide applications from causing exceedance of CTR criteria or water quality objectives. Information concerning the applicable fees can be found at [http://www.waterboards.ca.gov/resources/fees/docs/fy1112fee\\_schdl\\_npdes\\_prmt.pdf](http://www.waterboards.ca.gov/resources/fees/docs/fy1112fee_schdl_npdes_prmt.pdf)

## **C. Public Notification**

The State Water Board has notified interested agencies and persons of its intent to prescribe waste discharge requirements in this General Permit and provided them with an opportunity to submit their written comments and recommendations.

## **III. DISCHARGE DESCRIPTION**

This General Permit covers the point source discharge to waters of the United States of pesticide residues resulting from applications using products containing 2,4-D, acrolein, copper, diquat, endothall, fluridone, glyphosate, imazamox, imazapyr, penoxsulam, sodium carbonate peroxyhydrate, and triclopyr-based algaecides and aquatic herbicides, and adjuvants containing ingredients represented by the surrogate nonylphenol. This General Permit covers only discharges of algaecides, aquatic herbicides, and adjuvants that are currently registered for use in California, or that become registered for use and contain the above-listed active ingredients and ingredients represented by the surrogate of nonylphenol.

### **A. Existing Discharge Description**

As of January 11, 2013, there were 153 active enrollees under Water Quality Order No. 2004-0009-DWQ, Statewide General National Pollutant Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States, General Permit No. CAG990005 (Order No. 2004-0009-DWQ). Most of the enrollees are local public agencies such as cities and irrigation, flood control, or reclamation districts. The other enrollees include six state of California agencies: the Departments of Boating and Waterways, Fish and Wildlife, Food and Agriculture, Parks and Recreation, Transportation, and Water Resources; a federal agency, U.S. Department of Fish and Wildlife Service; and a few private entities such as home owner associations and mobile home park owners.

The State Water Board granted exceptions to public agencies and mutual water companies that met the criteria stated in section 5.3 of the Policy for short-term or seasonal exceptions from meeting the receiving water limitations for priority pollutants of acrolein and copper.

Order No. 2004-0009-DWQ permits the discharge of aquatic pesticides with the following active ingredients: 2,4-D, acrolein, copper, diquat, endothall, fluridone, glyphosate, and triclopyr. The State Water Board reopened Order No. 2004-0009-DWQ after its adoption to add two more active ingredients: (1) imazapyr, a non-selective herbicide, for control of cordgrass and broadleaf weeds and other emergent aquatic species; and (2) sodium carbonate peroxyhydrate as an alternative to copper for algae control.\*

**B. Annual Report Review**

State Water Board staff reviewed annual reports from 2004 through 2008<sup>9</sup> submitted under Order No. 2004-0009-DWQ. The data are summarized in Table D-1 below. As shown in Table D-1, all constituent concentrations from post-event application samples were below receiving water limitations except for the following: three exceedances each for acrolein and glyphosate and 82 exceedances for copper out of 288 monitoring events. For glyphosate, it is likely that the three exceedances were not the result of aquatic pesticide applications because the pre-application samples also showed exceedances and the remaining 151 sampling events showed no exceedance. For copper, 43 of the 82 exceedances were from public agencies or mutual water companies that were excepted from meeting priority pollutant limitations during the exception period. Thus, staff did not consider these exceedances as violations of the receiving water limitations. However, 39 of the exceedances were from entities that did not have a Policy exception. Therefore, staff considered these exceedances as true violations of the receiving water limitations.

**Table D-1. Monitoring Data Summary, 2004-2008, Order No. 2004-0009-DWQ**

Pollutant	Number of Samples	Number of Exceedance
2,4-D	3	0
Acrolein	213	3
Copper	288	85
Diquat	17	0
Endothall	6	0
Fluridone	12	0
Glyphosate	154	3
Nonylphenol	53	0

Under Order No. 2004-0009-DWQ, the most commonly used aquatic pesticide products contained copper, acrolein, and glyphosate in descending order.

<sup>9</sup> The data are submitted to the Regional Water Boards per Order No. 2004-0009-DWQ. When State Water Board staff started collecting data from the Regional Water Boards, the data available covered only this period.

### **C. Receiving Water Description**

The annual reports showed that most algae and aquatic weed control applications were performed in fresh inland surface waters such as lakes, ponds, flood control and drainage channels, or canals. Some applications were performed in coastal waters, marina lagoons, and slough with brackish water.

## **IV. APPLICABLE PLANS, POLICIES, AND REGULATIONS**

The requirements contained in this General Permit are based on the applicable plans, policies, and regulations identified below.

### **A. Legal Authorities**

This General Permit is issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by the U.S. Environmental Protection Agency (U.S. EPA) and chapter 5.5, division 7 of the California Water Code, commencing with section 13370. It shall serve as an NPDES permit for point source discharges of residual algaecides and aquatic herbicides to surface waters. This General Permit also serves as WDRs pursuant to article 4, chapter 4, division 7 of the California Water Code (commencing with §13260).

This General Permit shall serve as a General NPDES permit for point source discharges of residues from algaecides and aquatic herbicide applications for algae and aquatic weed control. This General Permit also serves as general Waste Discharge Requirements pursuant to article 4, chapter 4, and division 7 of the California Water Code (commencing with §13260).

### **B. California Environmental Quality Act (CEQA)**

Pursuant to California Water Code section 13389, State and Regional Water Boards are exempt from the requirement to comply with Chapter 3, Division 13 of the Public Resources Code when adopting NPDES permits.

### **C. State and Federal Regulations, Policies, and Plans**

#### **1. Water Quality Control Plans (Basin Plans)**

The Regional Water Boards have adopted Basin Plans that designate beneficial uses, establish water quality objectives, and contain implementation programs and policies to achieve those objectives for all waters addressed through the plans. In addition, the Basin Plans implement State Water Board Resolution No. 88-63, which established state policy that all waters, with certain exceptions, should be considered suitable or potentially suitable for municipal or domestic supply. The Basin Plans identify typical beneficial uses as follows: municipal and domestic supply, agricultural irrigation, stock watering, process supply, service supply, hydropower supply, water contact recreation, canoeing and rafting recreation, other non-contact water recreation,\* warm freshwater aquatic habitat, cold freshwater habitat,\* warm fish migration habitat, cold fish migration habitat,

warm and cold spawning habitat, wildlife habitat, navigation, rare, threatened, or endangered species habitat, groundwater recharge,\* and freshwater replenishment.

Requirements of this General Permit implement provisions contained in the applicable Basin Plans.

**2. National Toxics Rule (NTR) and California Toxics Rule (CTR)**

U.S. EPA adopted the NTR on December 22, 1992, and later amended it on May 4, 1995 and November 9, 1999. About 40 criteria in the NTR applied in California. On May 18, 2000, U.S. EPA adopted the CTR. The CTR promulgated new toxics criteria for California and, in addition, incorporated the previously adopted NTR criteria that were applicable in the state. The CTR was amended on February 13, 2001. These rules contain water quality criteria for priority pollutants.

**3. State Implementation Policy (Policy)**

On March 2, 2000, the State Water Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (Policy). The Policy became effective on April 28, 2000 with respect to the priority pollutant criteria promulgated for California by U.S. EPA through the NTR and to the priority pollutant objectives established by the Regional Water Board in the Basin Plans. The Policy became effective on May 18, 2000 with respect to the priority pollutant criteria promulgated by U.S. EPA through the CTR. The State Water Board adopted amendments to the Policy on February 24, 2005 that became effective on July 13, 2005. The Policy establishes implementation provisions for priority pollutant criteria and objectives and provisions for chronic toxicity control. Requirements of this General Permit implement the Policy.

*Policy Exception*

The Policy provides categorical exceptions allowing short-term or seasonal exceptions from meeting the priority pollutant criteria/objectives if it is determined to be necessary to implement control measures for resource or pest management conducted by public entities or mutual water companies to fulfill statutory requirements. The Policy specifically refers to vector or weed control, pest eradication, or fishery management as the basis for categorical exceptions. The exceptions are only granted to public entities or mutual water companies that have adequately provided the following information as required by the Policy:

- a. A detailed description of the proposed action which includes the proposed method of completing the action;
- c. A time schedule;
- d. A discharge and receiving water monitoring plan that specifies monitoring prior to application events,\* during application events, and after completion with the appropriate quality control procedures;

- e. CEQA documentation including notifying potentially affected public and government agencies; and
- f. Any necessary contingency plans.

The public entities and mutual water companies listed in Attachment G have met the above requirements before the issuance or during the term of the Order No. 2004-0009-DWQ.

The final Negative Declaration or Mitigated Negative Declarations (ND/MND) prepared by the public entities or mutual water companies have determined that the water quality impacts identified in the environmental assessments of the ND/MND from algaecide and aquatic herbicide applications are less than significant, and would not have a significant effect on the environment. The boards of each public entity and mutual water company\*, as the lead agencies under CEQA, approved the final ND/MND. Therefore, each public entity or mutual water company is not required to meet priority pollutant criteria during the exception period.

During the issuance of the Order No. 2004-0009-DWQ, as required in section 15096 of the CEQA Guidelines, the State Water Board, as a Responsible Agency under CEQA, considered the ND/MND approved by the board of each public entity or mutual water company. The State Water Board found that the projects will have less than significant water quality impact if the Dischargers meet the requirements in this General Permit. Accordingly, the Policy 5.3 exception granted previously will continue to be valid under this Order.

Any Discharger not listed in Attachment G is required to meet all applicable priority pollutant criteria for receiving waters.

#### 4. **Antidegradation Policy**

Section 131.12 of 40 C.F.R. requires that the state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16. Resolution No. 68-16 incorporates the federal antidegradation policy where the federal policy applies under federal law. Resolution No. 68-16 requires that existing water quality be maintained unless degradation is justified based on specific findings. The Basin Plans implement, and incorporate by reference, both the state and federal antidegradation policies.

The permitted discharge must be consistent with the antidegradation provision of 40 C.F.R. section 131.12 and Resolution No. 68-16. The conditions of this General Permit require residual algaecide and aquatic herbicide discharges to meet applicable water quality objectives. Specifically, the General Permit sets receiving water limitations for 2,4-D, acrolein, copper, diquat, endothall, fluridone, glyphosate, and nonylphenol. It also sets receiving water monitoring triggers for imazapyr and triclopyr triethylamine (TEA).

The BMPs and other controls required pursuant to the General Permit constitute Best Available Technology Economically Achievable (BAT) and Best Conventional Pollutant Control Technology (BCT).

The General Permit requirements are protective of the broad range of beneficial uses set forth in basin plans throughout the state, constituting best control available consistent with the purposes of the algaecide and aquatic herbicide application in order to ensure that pollution or nuisance will not occur. The nature of pesticides is to be toxic in order to protect beneficial uses such as human health or long-term viability of aquatic life. For example, blue-green algae are bacteria that live in both fresh and marine waters. In California, certain forms of blue-green algae have been a particular problem in the Klamath River watershed and on the Central Coast. Blooms of these bacteria can poison livestock, wildlife, and humans; they can also damage drinking water sources. The use of an algaecide is one of the effective ways to control the harmful blooms of blue-green algae. Although algaecide application will temporarily degrade the water quality and result in short-term toxicity in the receiving water, it prevents the toxicities in the entire water body for a long period of time. While surface waters may be temporarily degraded; water quality standards and objectives will not be exceeded after project completion.

Another example of benefits of pesticide application is the control of aquatic weeds in flood control channels. Aquatic herbicides used to control emerging aquatic weeds in a flood control channel will effectively prevent full growth and bloom of aquatic weeds that may block the channel and cause flooding in the surrounding communities. Although the water quality is temporarily degraded while the herbicide is taking its effect in eliminating the weeds, the water quality will not be exceeded after the project is completed. In addition, the receiving water limitations and other requirements of this General Permit will ensure maintenance of the highest water quality consistent with maximum benefit to the people of the state.

Given the nature of a General Permit and the broad range of beneficial uses to be protected across the state, data analysis of specific water bodies is infeasible. While surface waters may be temporarily degraded, water quality standards and objectives will not be exceeded. The nature of pesticides is to be toxic in order to protect human health and water resources. However, compliance with receiving water limitations is required. Therefore, this General Permit is consistent with state and federal antidegradation policies.

#### **5. Endangered Species Act**

This General Permit does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code §2050 et. seq) or the Federal Endangered Species Act (16 U.S.C.A. §1531 et. seq). This General Permit requires compliance with effluent limitations, receiving water limitations, and other requirements to protect the beneficial uses of waters of the state. The Discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

## 6. Impaired Water Bodies on CWA 303(d) List

This General Permit does not authorize the discharge of residual algaecides and aquatic herbicides and their degradation byproducts to waters of the United States that are impaired by the same active ingredients and their degradation byproducts. The links to California's impaired waters bodies are provided at [http://www.waterboards.ca.gov/water\\_issues/programs/tmdl/integrated2010.shtm](http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtm).

## 7. Other Plans, Policies, and Regulations

The State Water Board adopted the *Water Quality Control Policy for the Enclosed Bays and Estuaries of California*. The requirements within this General Permit are consistent with the policy.

# V. RATIONALE FOR EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

Effluent limitations and toxic and pretreatment effluent standards established pursuant to sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 304 (Information and Guidelines), and 307 (Toxic and Pretreatment Effluent Standards) of the CWA and amendments thereto are applicable to the discharge.

The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. There are two principal bases for effluent limitations: (1) 40 C.F.R. section 122.44(a) requires that permits include applicable technology-based limitations and standards; and (2) 40 C.F.R. section 122.44(d) requires that permits include water quality-based effluent limitations to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of the receiving water where numeric water quality objectives have not been established.

The CWA mandates the implementation of effluent limitations that are as stringent as necessary to meet water quality standards established pursuant to state or federal law (33 U.S.C., §1311(b)(1)(C); 40 C.F.R. §122.44(d)(1)). NPDES permits must incorporate discharge limits necessary to ensure that water quality standards are met. This requirement applies to narrative criteria as well as to numeric criteria specifying maximum amounts of particular pollutants. Pursuant to 40 C.F.R. section 122.44(d)(1)(i), NPDES permits must contain limits that control all pollutants that "*are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality.*" Section 122.44(d)(1)(vi) of 40 C.F.R. further provides that "[w]here a state has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State water quality standard, the permitting authority must establish effluent limits."

The CWA requires point source dischargers to control the amount of conventional, non-conventional, and toxic pollutants that are discharged into the waters of the United States. The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. There are two principal bases for effluent limitations: 40 C.F.R. section 122.44(a) requires that permits include applicable technology-based

limitations and standards; and section 122.44(d) requires that permits include water quality-based effluent limitations to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of the receiving water where numeric water quality objectives have not been established.

With respect to narrative objectives, the State Water Board must establish effluent limitations using one or more of three specified sources: (1) U.S. EPA's published water quality criteria; (2) a proposed state criterion (i.e., water quality objective) or an explicit state policy interpreting its narrative water quality criteria; or (3) an indicator parameter (i.e., 40 C.F.R. §122.44(d)(1)(vi)(A), (B) or (C)). Basin Plans contain a narrative objective requiring that: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.*" Basin Plans require the application of the most stringent objective necessary to ensure that surface water and groundwater do not contain chemical constituents, discoloration, toxic substances, radionuclides, or taste and odor producing substances that adversely affect beneficial uses. Basin Plans state that material and relevant information, including numeric criteria, and recommendations from other agencies and scientific literature will be utilized in evaluating compliance with the narrative toxicity objective. Basin Plans also limit chemical constituents in concentrations that adversely affect surface water beneficial uses. Basin Plans further state that, to protect all beneficial uses, the Regional Water Board may apply limits more stringent than MCLs.

#### **A. Discharge Prohibitions**

1. The discharge of residual algaecides, residual aquatic herbicides, and their degradation byproducts in a manner different from that described in this General Permit is prohibited.

This prohibition is based on 40 C.F.R. 122.21(a), "Duty to Apply," and California Water Code section 13260, which requires filing a Report of Waste Discharge before discharges can occur. Discharges not described in the NOI, and subsequently not discharged in the manner permitted by this General Permit, are prohibited.

2. The discharge of residual algaecides, residual aquatic herbicides, and their degradation byproducts shall not create a nuisance as defined in section 13050 of the California Water Code.

This prohibition is based on California Water Code section 13050 for water quality control for achieving water quality objectives.

3. The discharge shall not cause, have a reasonable potential to cause, or contribute to an in-stream excursion above any applicable standard or criterion promulgated by U.S. EPA pursuant to section 303 of the CWA, or water quality objective adopted by the State or Regional Water Boards.

This prohibition is based on CWA section 301 and California Water Code.

4. All pesticides are prohibited from the waters of the Lahontan Region (Region 6). The use of this permit is invalid in the Lahontan Region unless the discharger has

requested a prohibition exemption from the Lahontan Water Board and the Lahontan Water Board has granted an exemption for the use of algaecides or aquatic herbicides.

This prohibition is based on the Lahontan Water Board's region-wide waste discharge prohibition for pesticides in water with exemption criteria to allow certain uses of aquatic pesticides.

## **B. Effluent Limitations**

### **1. Technology-Based Effluent Limitations**

The intent of technology-based effluent limitations in NPDES permits is to require a minimum level of treatment of pollutants based on available treatment technologies while allowing the Discharger to use any available control technique to meet the limitations. For industrial and other non-municipal facilities, technology-based effluent limitations are derived by using: (1) national effluent limitations guidelines and standards established by U.S. EPA; or best professional judgment on a case-by-case basis in the absence of national effluent limitations guidelines and standards. In the case of pesticide applications, U.S. EPA has not developed guidelines and standards other than the requirement to follow the labels when applying pesticides. At this point, it is not appropriate to establish technology-based effluent limitations other than following the label when applying algaecides and aquatic herbicides.

Therefore, the effluent limitations contained in this General Permit are narrative and include requirements to develop and implement an APAP that describes appropriate BMPs, including compliance with all algaecide and aquatic herbicide label instructions, and to comply with numeric receiving water limitations and actions required if monitoring triggers are exceeded.

The BMPs required herein constitute BAT and BCT and will be implemented to minimize the area and duration of impacts caused by the discharge of algaecides and aquatic herbicides in the treatment area and to allow for restoration of water quality and protection of beneficial uses of the receiving waters to pre-application quality following completion of an application event.\* In addition, for those enrollees that have been granted an exception to meeting receiving water limitations for acrolein and copper, in accordance with the Policy, this General Permit requires that upon completion of a pesticide application project, the Discharger shall provide certification by a qualified biologist that the receiving water beneficial uses have been restored.

The development of BMPs provides the flexibility necessary to establish controls to minimize the area extent and duration of impacts caused by the discharge of algaecides and aquatic herbicides. This flexibility allows Dischargers to implement appropriate BMPs for different types of applications and different types of waters.

Much of the BMP development has been incorporated into the algaecide and aquatic herbicide regulation process by U.S. EPA, DPR, and County Agricultural

Commissioners. The Dischargers must be licensed by DPR if such licensing is required for the algaecide and aquatic herbicide application project. The algaecide and aquatic herbicide use must be consistent with the algaecide and aquatic herbicide label instructions and any Restricted Material Use Permits issued by County Agricultural Commissioners.

U.S. EPA and DPR scientists review algaecide and aquatic herbicide labels to ensure that a product used according to label instructions will cause no harm (or “adverse impact”) on non-target organisms that cannot be reduced (or “mitigated”) with protective measures or use restrictions. Many of the label directions constitute BMPs to protect water quality and beneficial uses. Label directions may include: precautionary statements regarding toxicity and environmental hazards; directions for proper handling, dosage, application, and disposal practices; prohibited activities; spill prevention and response measures; and restrictions on type of water body and flow conditions.

A Restricted Material Use Permit issued by the County Agricultural Commissioner incorporates applicable suggested permit conditions from DPR and local site-specific conditions necessary to protect the environment. State regulations require that specific types of information be provided in an application to the County Agricultural Commissioners for a Restricted Material Use Permit. The County Agricultural Commissioners review the application to ensure that appropriate alternatives were considered and that any potential adverse effects are mitigated. The County Agricultural Commissioners also conduct pre-project inspections on at least five percent of projects.

This General Permit requires that Dischargers use BMPs when implementing control programs in order to mitigate effects to water quality resulting from algaecide and aquatic herbicide applications. Dischargers are required to consider alternative control measures to determine if there are feasible alternatives to the selected algaecide and aquatic herbicide application project that could reduce potential water quality impacts. If the Discharger identifies alternative control measures to the selected algaecide and aquatic herbicide application project that could reduce potential water quality impacts and that are also feasible, practicable, and cost-effective, the Discharger shall implement the identified alternative measures. The selection of control measures that use non-toxic and less toxic alternatives is an example of an effective BMP.

## 2. **Water Quality-Based Effluent Limitations (WQBELs)**

### a. **Scope and Authority**

Section 122.44(d)(1)(i) of 40 C.F.R. mandates that permits include effluent limitations for all pollutants that are or may be discharged at levels that have the reasonable potential to cause or contribute to an exceedance of a water quality standard, including numeric and narrative objectives within a standard. Where reasonable potential has been established for a pollutant, but there is no numeric criterion or objective for the pollutant, WQBELs must be established using: (1) U.S. EPA criteria under CWA section 304(a), supplemented where necessary by other relevant information; (2) an

indicator parameter for the pollutant of concern; or (3) a calculated numeric water quality criterion, such as a proposed state criterion or policy interpreting the state's narrative criterion, supplemented with other relevant information, as provided in 40 C.F.R. section 122.44(d)(1)(vi).

The process for determining reasonable potential and calculating WQBELs when necessary is intended to protect the designated uses of the receiving water as specified in the Basin Plans, and achieve applicable water quality objectives and criteria that are contained in other state plans and policies, or any applicable water quality criteria contained in the CTR and NTR.

Section 122.44(k)(3) of 40 C.F.R. allows the use of other requirements such as BMPs in lieu of numeric effluent limits if the latter are infeasible. It is infeasible for the State Water Board to establish numeric effluent limitations in this General Permit because:

- i. The application of algaecides and aquatic herbicides is not necessarily considered a discharge of pollutants according to the *National Cotton Council of America v. U.S. EPA*<sup>10</sup> and other applicable case law. The Sixth Circuit Court of Appeals ruled that residual pesticides associated with the application of pesticides at, over, or near water constitute pollutants within the meaning of the CWA and that the discharge must be regulated under an NPDES permit;
- ii. This General Permit regulates the discharge of residual algaecides and aquatic herbicides used for algae and aquatic weed control to waters of the United States. These are algaecides and herbicides with registration labels that explicitly allow direct application to water bodies. In algaecides and aquatic herbicides applications to control pests, any algaecides and aquatic herbicides residue or degradation byproduct that is deposited in waters of the United States is a pollutant. However, at what point the algaecides and aquatic herbicides become a residue is not precisely known and varies depending on the type of algaecides and aquatic herbicides, application method and quantity, water chemistry, etc. Therefore, in the application of algaecides and aquatic herbicides, the exact effluent is unknown;
- iii. It would be impractical to provide effective treatment of the algaecides and aquatic herbicides residue to protect water quality, given typically, algaecides and aquatic herbicides applications consist of numerous short duration intermittent algaecides and aquatic herbicides residue releases to surface waters from many different locations; and
- iv. Treatment may render the algaecides and aquatic herbicides useless for algae and aquatic weed control.

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<sup>10</sup> 553 F.3d 927 (6<sup>th</sup> Cir., 2009)

Therefore, as stated in Technology-Based Effluent Limitations, Section V.B.1 above, the effluent limitations contained in this General Permit are narrative and include requirements to develop and implement an APAP that describes appropriate BMPs, including compliance with all algaecides and aquatic herbicides label instructions, and to comply with narrative receiving water limitations and triggers.

**b. Receiving Water Beneficial Uses**

Algaecide and aquatic herbicide applications for algae and aquatic weed control may potentially deposit residual algaecides and aquatic herbicides to surface waters. Beneficial uses of receiving waters are as follows: municipal and domestic supply, agricultural irrigation, agricultural stock watering, process water supply, service water supply, and hydropower supply, water contact recreation, canoeing and rafting recreation, other non-contact water recreation, warm freshwater aquatic habitat, cold freshwater aquatic habitat, warm fish migration habitat, cold fish migration habitat, warm and cold spawning habitat, wildlife habitat, navigation, groundwater recharge, and freshwater replenishment. Requirements of this General Permit implement the applicable Basin Plans.

**c. Determining the Need for WQBELs**

Water quality standards include Regional Water Board Basin Plan beneficial uses and narrative and numeric water quality objectives, State Water Board-adopted standards, and federal standards, including the CTR and NTR, as well as antidegradation policies. The Basin Plans include numeric site-specific water quality objectives and narrative objectives for toxicity, chemical constituents, and tastes and odors. The narrative toxicity objective states: *"All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life."* With regard to the narrative chemical constituent objective, the Basin Plans state that waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. At minimum, *"...water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs)" in title 22 of CCR.* The narrative tastes and odors objective states: *"Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses."*

Federal regulations require effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause, or contribute to an in-stream excursion above a narrative or numerical water quality standard.

**d. Antidegradation Policy**

The permitted discharge is consistent with the antidegradation provisions of 40 C.F.R. section 131.12 and State Water Board Resolution No. 68-16. Compliance with these requirements will result in the use of best practicable treatment or control of the discharge. Due to the low volume of discharge expected from discharges regulated under this General Permit, the impact on existing water quality will be insignificant. Dischargers seeking authorization to discharge under this General Permit are required to demonstrate compliance with receiving water limitations during the application. If, however, the appropriate Regional Water Board, subsequent to review of any application, finds that the impact of a discharge will be significant, then authorization for coverage under this General Permit will be denied and coverage under an individual permit will be required (including preparation of an antidegradation analysis).

**VI. RATIONALE FOR RECEIVING WATER LIMITATIONS AND MONITORING TRIGGERS**

**A. Groundwater**

[Not Applicable]

**B. Surface Water**

CWA section 303(a-c), requires states to adopt water quality standards, including criteria necessary to protect beneficial uses. Regional Water Boards adopted water quality criteria as water quality objectives in the Basin Plans. The Basin Plans state that “[t]he numerical and narrative water quality objectives define the least stringent standards that the Regional Water Board will apply to regional waters in order to protect the beneficial uses.” The Basin Plans include numeric and narrative water quality objectives for various beneficial uses and water bodies. This General Permit contains receiving water limitations based on the Basin Plans’ numerical and narrative water quality objectives for bio-stimulatory substances, chemical constituents, color, temperature, floating material, settleable substances, suspended material, tastes and odors, and toxicity. This General Permit also requires compliance with any amendment or revision to the water quality objectives contained in the Basin Plans adopted by Regional Water Boards subsequent to adoption of this General Permit.

Once algaecides and aquatic herbicides have been applied to a treatment area, the algaecide and aquatic herbicide product can actively control pests within the treatment area. The discharge of algaecides and aquatic herbicides, their residues, and their degradation byproducts from the applications to surface water must meet applicable water quality criteria and objectives. The receiving water limitations ensure that an application event\* does not result in an exceedance of a water quality standard in the receiving water.

To protect all designated beneficial uses of the receiving water, the most protective (lowest) and appropriate (to implement the CTR criteria and WQOs in the Basin

Plans) criteria should be selected as the permit limitation for a particular water body and constituent. In many cases, water quality standards include narrative, rather than numerical, water quality objectives. In such cases, numeric water quality limits from the literature or publicly available information may be used to ascertain compliance with water quality criteria.

Algaecide and aquatic herbicide formulations contain disclosed “active” ingredients that yield toxic effects\* on target organisms and may also have toxic effects on non-target organisms. Algaecide and aquatic herbicide active ingredients that do not contain pollutants for which there are applicable numeric CTR criteria may still have toxic effects on receiving water bodies. In addition, the inactive or “inert” ingredients of algaecides and aquatic herbicides, which are trade secrets and have not been publicly disclosed, may also contain toxic pollutants or pollutants that could affect water quality.

DPR is responsible for reviewing toxic effects of product formulations and determining whether an algaecide or aquatic herbicide is suitable for use in California’s waters. In this General Permit, inert ingredients are also considered on a constituent-by-constituent basis. U.S. EPA regulates pesticide use through strict labeling requirements in order to mitigate negative impacts to human health and the environment, and DPR environmental and medical toxicologists review toxicity data on formulations and can deny registration or work with registrants or County Agricultural Commissioners to impose additional requirements in order to protect human health or the environment.

U.S. EPA and DPR require that pesticides undergo toxicity testing and meet specific toxicity requirements before registering the pesticide for application to surface waters. U.S. EPA has found that the application of properly registered pesticides pose a minimal threat to people and the environment. In addition, the effects of these pesticides on water quality will be mitigated through compliance with FIFRA label requirements, application of BMPs, and monitoring.

Basin Plan water quality objectives to protect the beneficial uses of surface water and groundwater include numeric objectives and narrative objectives, including objectives for chemical constituents, toxicity, and tastes and odors. The toxicity objective requires that surface water and groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological responses in humans, plants, animals, or aquatic life. The chemical constituent objective requires that surface water and groundwater shall not contain chemical constituents in concentrations that adversely affect any beneficial use or that exceed the MCLs set forth in title 22, Cal. Code Regs. The tastes and odors objective states that surface water and groundwater shall not contain taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses. The Basin Plans require the application of the most stringent objective necessary to ensure that surface water and groundwater do not contain chemical constituents, toxic substances, radionuclides, or taste and odor producing substances in concentrations that adversely affect domestic drinking water supply, agricultural supply, or any other beneficial use.

**1. Receiving Water Limitations**

The instantaneous maximum receiving water limitations are based on promulgated water quality criteria such as those provided in the CTR, water quality objectives adopted by the State and Regional Water Boards in their Basin Plans, water quality criteria adopted by the California Department of Fish and Wildlife, water quality standards such as drinking water standards adopted by U.S. EPA or the California Department of Public Health (CDPH), or U.S. EPA National Recommended Ambient Water Quality Criteria.

This General Permit provides receiving water limitations based on the lowest water quality criteria/objectives to protect all designated beneficial uses of the receiving water. The receiving water limitations in this General Permit are the same as those in Order No. 2004-0009-DWQ. The rationale for each limitation is summarized below.

**Table D-2. Summary of Receiving Water Limitations**

Constituent/ Parameter	BENEFICIAL USE <sup>1</sup>			Basis
	MUN, µg/L	WARM or COLD, µg/L	Other than MUN, WARM, or COLD, µg/L	
2,4,-D	70			U.S. EPA MCL
Acrolein <sup>2</sup>	320	21	780	U.S. EPA Water Quality Criteria, 1986.
Copper <sup>2</sup>				Dissolved Freshwater <sup>3</sup> Copper Chronic = $0.960 \exp\{0.8545 [\ln(\text{hardness}^4)] - 1.702\}$ <sup>5,6</sup>  Dissolved saltwater <sup>3</sup> Copper Chronic = $0.83 \exp\{0.8545 [\ln(\text{hardness}^4)] - 1.702\}$ <sup>5,6</sup>  California Toxics Rule
Diquat	20			U.S. EPA MCL
Endothall	100			U.S. EPA MCL
Fluridone	560			U.S. EPA Integrated Risk Information System
Glyphosate	700			U.S. EPA MCL
Nonylphenol				Freshwater Chronic Criterion = 6.6 µg/L  Saltwater Chronic Criterion = 1.7 µg/L  U.S. EPA National Recommended Ambient Water Quality Criteria
Toxicity	Algaecide and aquatic herbicide applications shall not cause or contribute to toxicity in receiving water(s).			Regional Water Boards' Basin Plans

Notes

1. See Regional Water Boards' Water Quality Control Plans (Basin Plans) for beneficial use definitions.
2. Public entities and mutual water companies listed in Attachment G are not required to meet this receiving water limitation during the exception period described in Section VIII.C.10, Limitations and Discharge Requirements, Aquatic Pesticides Application Plan (APAP).

3. For waters in which the salinity is equal to or less than 1 part per thousand 95% or more of the time, the freshwater criteria apply. For waters in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, saltwater criteria apply. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable criteria are the more stringent of the freshwater or saltwater criteria.
4. For freshwater aquatic life criteria, waters with a hardness 400 mg/L or less as calcium carbonate, the actual ambient hardness of surface water shall be used. For waters with a hardness of over 400 mg/L as calcium carbonate, a hardness of 400 mg/L as calcium carbonate shall be used with a default Water-Effect Ratio of 1.
5. Values should be rounded to two significant figures.
6. This limitation does not apply to the Sacramento River and its tributaries above the State Highway 32 Bridge at Hamilton City. See Table III-1 of the Basin Plan for the Sacramento and San Joaquin River Basins for copper limitation.

The copper limitation in Order No. 2004-0009-DWQ was based on the CTR's Criteria Continuous Concentration (CCC) expressed in total recoverable concentration. This General Permit also uses CCC from the CTR as the basis of the copper limitations; however, the copper limitation is now expressed in dissolved concentration. Since the copper criterion in the CTR is expressed in dissolved concentration, the receiving water limitation must also be expressed in dissolved rather than total concentration since it is the dissolved portion of copper that is bioavailable to aquatic life.

Based on Policy section 5.3, this General Permit grants public entities and mutual water companies listed in Attachment G a short-term or seasonal exception from meeting receiving water limitations for acrolein and copper during treatment. As a condition of the exception, this General Permit requires Dischargers to provide the length and justification of required exception periods in their APAPs. There is no discrete definition for short-term; but the intent is to allow the exception to apply during the treatment period. It is up to the Discharger to make this demonstration.

The receiving water dissolved oxygen limitation is based on the Regional Water Board Basin Plans' dissolved oxygen objectives.

## 2. **Receiving Water Monitoring Triggers**

In algaecide or aquatic herbicide applications, it is reasonable to conclude that some residual algaecides or aquatic herbicides will remain in the receiving waters. These residual algaecides or aquatic herbicides may cause toxicity to aquatic life. However, information regarding the specific amount of algaecide or aquatic herbicide residues (described below) in the receiving water as a result of direct applications for weed control is not adequate to develop receiving water limitations for these algaecides and aquatic herbicides. Therefore, this General Permit only contains Receiving Water Monitoring Triggers and/or monitoring requirements for these algaecides or aquatic herbicides. The monitoring triggers and monitoring data will be used to assess whether the discharges of these algaecide or aquatic herbicide residues have the reasonable potential to cause or contribute to an excursion of a water quality standard, including numeric and narrative objectives within a standard.

In the absence of adopted criteria, objectives, or standards, the State Water Board used U.S. EPA's Ambient Criteria for the Protection of Freshwater Aquatic

Life (Ambient Water Quality Criteria) which are directly applicable as a regulatory level to implement narrative toxicity limitations included in all Regional Water Board Basin Plans. Where adopted criteria, objectives, standards, or Ambient Water Quality Criteria are unavailable, the State Water Board used data from U.S. EPA's *Ecotoxicity Database* to develop the Receiving Water Monitoring Triggers to protect all beneficial uses of the receiving water.

For constituents that do not have Ambient Water Quality Criteria, the Instantaneous Maximum Receiving Water Monitoring Trigger is based on one-tenth of the lowest 50 Percent Lethal Concentration (LC50) from U.S. EPA's *Ecotoxicity Database*. Using one-tenth of the lowest LC50 as the receiving water monitoring trigger is consistent with the Central Valley Regional Water Board's Basin Plan approach when developing the Daily Maximum Limitation for algaecides or aquatic herbicides that do not have water quality criteria.

This General Permit may be re-opened to add receiving water limitations to the algaecides or aquatic herbicides listed below if the monitoring triggers are exceeded or the monitoring data indicate re-opening of the permit is appropriate. The following is a detailed discussion of toxicity data, applicable water quality criteria, and Receiving Water Monitoring Triggers, if applicable, for these algaecide or aquatic herbicide:

a. Imazamox

Imazamox is a derivative of the active ingredient, ammonium salt of imazamox for the aquatic herbicide Clearcast, which DPR registered for use in California in October 2012. It is labeled for application to water for the control of submerged aquatic plants species and some emergent and floating species.

Imazamox is an herbicide that inhibits an enzyme in aquatic plants that is essential for the synthesis of three-branched chain amino acids.

Staff obtained toxicity data for imazamox from U.S. EPA's *Ecotoxicity Database* to assess its toxicity to freshwater aquatic life. However, U.S. EPA's *Ecotoxicity Database* contains toxicity data only for imazamox, but not for its salt. Table D-3 summarizes the toxicity data for imazamox below.

**Table D-3. Toxicity Data Summary for Imazamox (CAS# 114311-32-9)**

Type of Organism	Study Length	Study Date	LC50 (mg/L)
Mysid	96 h	1998	> 100
		1998	> 94.3
Bluegill sunfish	96 h	1994	> 119
Rainbow trout	96 h	1994	> 122
Sheephead mino	96 h	1998	> 94.2
		1998	> 94.2
<b>Lowest LC50/10 &gt; 9.4 mg/L</b>			

Ambient Water Quality Criteria are unavailable for imazamox and imazamox salt. Table D-3 shows that one-tenth of the lowest LC50 to protect the most sensitive freshwater aquatic life for imazamox is greater than 9.4 mg/l.

Due to the absence of water quality criteria for imazamox and its low toxicity to aquatic life as indicated in U.S. EPA's *Ecotoxicity Database*, this General Permit does not have a receiving water monitoring trigger for imazamox. However, this General Permit requires receiving water monitoring for imazamox to collect data, which will provide information on whether the use of imazamox has water quality impacts.

b. Imazapyr

The active ingredient imazapyr is marketed by the trade names Arsenal, Chopper, and Assault. Upon contact, imazapyr can interfere with DNA synthesis and cell growth of the plants. The target weed species are grasses, broad-leaves, vines, brambles, shrubs and trees, and riparian and emerged aquatics. The result of exposure is death of new leaves. It was first registered in the United States in 1984.

Imazapyr is a slow-acting amino acid synthesis inhibitor. It has an average water half-life\* of four days with photodegradation as the primary form of degradation in water. Imazapyr acts more quickly and is less toxic than other low-volume herbicides. According to the San Francisco Estuary\* Invasive *Spartina* Project's May 4, 2005 report titled *Use of Imazapyr Herbicide to Control Invasive Cordgrass (Spartina spp.) in the San Francisco Estuary*, imazapyr in water rapidly degrades via photolysis. The report further states that a number of field studies demonstrated that imazapyr rapidly dissipated from water within several days, and no detectable residues of imazapyr were found in either water or sediment within two months; in estuarine systems, dilution of imazapyr with the incoming tides contributes to its rapid dissipation, suggesting that imazapyr is not environmentally persistent in the estuarine environment and does not result in significant impacts to water quality. The report concludes that imazapyr herbicides can be a safe, highly effective treatment for control and eradication of non-native *Spartina* species in the San Francisco Estuary and offers an improved risk scenario over the existing treatment regime with glyphosate herbicides. On August 30, 2005, DPR registered imazapyr for aquatic application as an aquatic herbicide.

Toxicity data for imazapyr were obtained from U.S. EPA's *Ecotoxicity Database* to assess the toxicity of imazapyr to freshwater aquatic life. Tables D-4 and D-5 summarize the toxicity data for imazapyr and imazapyr salt.

**Table D-4. Toxicity Data Summary for Imazapyr (CAS#81334-34-1)**

Type of Organism	Study Length	Study Date	LC50 (mg/L)
Pink shrimp	96 h	1988	> 189
Atlantic silverside	96 h	1988	> 184
Bluegill sunfish	96 h	1983	> 100
		1983	> 100

Type of Organism	Study Length	Study Date	LC50 (mg/L)
Channel catfish	96 h	1983	> 100
Rainbow trout	96 h	1983	> 100
		1995	> 110
<b>Lowest LC50/10 &gt; 10</b>			

**Table D-5. Toxicity Data Summary for Imazapyr Isopropylamine Salt (CAS#81510-83-0)**

Type of Organism	Study Length	Study Date	LC50 (mg/L)
Water flea	48 h	1984	350
Rainbow trout	96 h	1984	<b>112</b>
Bluegill sunfish	96 h	1984	> 1000
<b>Lowest LC50/10 = 11.2</b>			

Ambient Water Quality Criteria are unavailable for imazapyr and imazapyr salt. Tables D-4 and D-5 show that the lowest one-tenth of LC50 to protect the most sensitive freshwater aquatic life for imazapyr is 11.2 mg/l.

Due to its safe use in the environment and low toxicity to aquatic life as indicated in U.S. EPA's *Ecotoxicity Database*, this General Permit does not have a receiving water limitation for imazapyr. However, this General Permit contains a monitoring trigger of 11.2 mg/l based on one-tenth of the lowest LC50 from U.S. EPA's *Ecotoxicity Database* and requires receiving water monitoring to collect data, which will provide information on whether imazapyr has water quality impacts.

c. Penoxsulam

Penoxsulam is the active ingredient for Galleon SC, a selective systemic aquatic herbicide for management of freshwater aquatic vegetation in ponds, lakes, reservoirs, marshes, wetlands, non-irrigation canals, slow-moving water bodies, etc. Penoxsulam is a post-emergence acetolactate synthase (ALS) inhibitor developed by Dow AgroSciences to be used as a foliar spray on dry-seeded rice crops. The mode of action is to inhibit the acetolactate synthases enzyme in the target weed.

The U.S. EPA Pesticide Fact Sheet states that penoxsulam is expected to be very mobile, but not very persistent, in either aqueous or terrestrial environments. Penoxsulam exists almost exclusively in a disassociated state at pH values normally found in rice paddy water (averaging about eight), but not in terrestrial environments where lower pH values may be found.

Penoxsulam degrades by two different transformation mechanisms, producing 13 different identified transformation products, 11 of which meet

the criteria to be classified as major degradation byproducts,<sup>11</sup> six of which reached peak concentrations at study termination, indicating a greater degree of persistence than penoxsulam and a potential to reach concentrations even greater than those reported at study termination. The results of the screening-level risk assessment suggest that penoxsulam will not pose a threat to aquatic or terrestrial animals, however, this conclusion must be tempered by the fact that testing has not been conducted on several major degradation byproducts.

Toxicity data for penoxsulam were obtained from U.S. EPA's *Ecotoxicity Database* to assess the toxicity of penoxsulam to freshwater aquatic life. Table D-6 summarizes the toxicity data for penoxsulam.

**Table D-6. Toxicity Data Summary for Penoxsulam (CAS#219714-96-2)**

Type of Organism	Study Length	Study Date	LC50 (mg/L)
Bluegill sunfish	96 h	2000	> 103
Common carp fish	96 h	2001	> 101
Mysid	96 h	2000	> 114
Rainbow trout	96 h	2002	> 147
		2000	> 102
Scud	96 h	2000	> 126
<b>Lowest LC50/10 &gt; 10.1</b>			

Ambient Water Quality Criteria are unavailable for penoxsulam. Table D-6 shows that the lowest one-tenth of LC50 to protect the most sensitive freshwater aquatic life for penoxsulam is greater than 10.1 mg/l.

Due to its safe use in the environment, low toxicity to aquatic life as indicated in U.S. EPA's *Ecotoxicity Database*, and lack of accurate toxicity value, this General Permit does not have a receiving water monitoring trigger. However, this General Permit requires receiving water monitoring to collect data, which will provide information on whether penoxsulam has water quality impacts.

d. Sodium Carbonate Peroxyhydrate

Sodium carbonate hydroxyhydrate has been registered as an algaecide since early 2006. The most common brand names are PAK 27, Phycomycin, and Green Clean. It is an alternative to traditional copper based algaecides. It acts as an oxidizing agent and thus kills the target algae. When it is

<sup>11</sup> U.S. EPA defines major degradation byproducts to be BSA, 2-amino-TP, TPSA, BSTCA methyl, BSTCA, 2-amino-TCA, 5-OH-penoxsulam, SFA, sulfonamide, 5,8-di-OH and 5-OH, 2 aminoTP.

applied into water, the compound quickly breaks down into hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and sodium carbonate. The hydrogen peroxide oxidizes and thus kills the target pests. After contact, the hydrogen peroxide breaks down into water and oxygen.

U.S. EPA has waived toxicity testing for freshwater fish and invertebrate during the registration process. According to the U.S. EPA fact sheet, when the pesticide is applied in accordance with directions on the label, no harm is expected to freshwater fish or freshwater invertebrates.

There are no toxicity data for sodium carbonate peroxyhydrate in U.S. EPA's *Ecotoxicity Database*. Therefore, this General Permit does not have a monitoring trigger or a monitoring requirement for sodium carbonate peroxyhydrate.

e. Triclopyr Triethylamine (TEA) Salt

Triclopyr TEA is a systemic herbicide used to control broad-leaf weeds and woody plants.

U.S. EPA concluded in its re-registration document that triclopyr TEA is practically non-toxic to freshwater fish and aquatic invertebrates on an acute basis and triclopyr TEA is slightly toxic to practically non-toxic to estuarine/marine fish and invertebrates on an acute basis.

Triclopyr produces the metabolite or degradate 3,5,6-trichloro-2-pyridinol (TCP). Based on its analysis, U.S. EPA concludes that the existing uses of triclopyr are unlikely to result in acute or chronic dietary risks from TCP. Based on limited available data and modeling estimates, with less certainty, the U.S. EPA concluded that existing uses of triclopyr are unlikely to result in acute or chronic drinking water risks from TCP.

Toxicity data for triclopyr TEA were obtained from U.S. EPA's *Ecotoxicity Database* to assess the toxicity of triclopyr TEA to freshwater aquatic life. Table D-7 summarizes the toxicity data for Triclopyr TEA.

**Table D-7. Toxicity Data Summary for Triclopyr TEA Salt  
 (CAS#57213-69-1)**

Type of Organism	Study Length	Study Date	LC50 (mg/L)
Bluegill sunfish	96 h	1978	891
	96 h	1973	471
Fathead minnow	96 h	1978	947
	96 h	1983	546
	96 h	1983	279
Grass shrimp	96 h	1992	326
Inland Silverside fish	96 h	1989	<b>130</b>
Pink shrimp	96 h	1975	895
Rainbow trout	96 h	1973	240
	96 h	1978	552

Type of Organism	Study Length	Study Date	LC50 (mg/L)
Lowest LC50/10 = 13.0			

Ambient Water Quality Criteria are unavailable for triclopyr TEA. Table D-7 shows that the lowest one-tenth of LC50 to protect the most sensitive freshwater aquatic life for triclopyr TEA is 13 mg/l.

Due to its safe use in the environment and low toxicity to aquatic life as indicated in U.S. EPA's *Ecotoxicity Database*, this General Permit does not have a receiving water limitation for triclopyr TEA. However, this General Permit contains a monitoring trigger of 13.0 mg/l based on one-tenth of the lowest LC50 from U.S. EPA's *Ecotoxicity Database* and requires receiving water monitoring to collect data, which will provide information on whether triclopyr TEA has water quality impacts.

**VII. RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS**

**A. MRP Goals**

Section 122.48 of 40 C.F.R. requires that all NPDES permits specify requirements for recording and reporting monitoring results. Water Code sections 13267 and 13383 authorize the State and Regional Water Boards to require technical and monitoring reports. The Monitoring and Reporting Program (MRP) in Attachment C of this General Permit establishes monitoring and reporting requirements to implement federal and state requirements.

The goals of the MRP are to:

1. Identify and characterize algaecide or aquatic herbicide application projects conducted by the Discharger;
2. Determine compliance with the receiving water limitations and other requirements specified in this General Permit;
3. Measure and improve the effectiveness of the APAP;
4. Support the development, implementation, and effectiveness of BMPs;
5. Assess the chemical, physical, and biological impacts on receiving waters resulting from algaecide or aquatic herbicide applications;
6. Assess the overall health and evaluate long-term trends in receiving water quality;
7. Demonstrate that water quality of the receiving waters following completion of resource or weed management projects are equivalent to pre-application conditions; and
8. Ensure that projects that are monitored are representative of all algaecide or aquatic herbicide and application methods used by the Discharger.

The MRP in the Attachment C of this General Permit is considered as baseline monitoring requirements. Monitoring plans proposed by Dischargers in their APAP must meet the minimum requirements prescribed in the MRP. Public entities and mutual water companies that have a Policy section 5.3 exception should comply with the MRP in this General Permit as well as monitoring plan proposed in their CEQA document where the two plans differ.

## **B. Effluent Monitoring**

Pursuant to the requirements of 40 C.F.R. section 122.44(i), effluent monitoring is required for all constituents with effluent limitations. Effluent monitoring is necessary to assess compliance with effluent limitations, assess the effectiveness of the treatment process, and assess the impacts of the discharge on the receiving water and groundwater.

The application of pesticides for pest control is not necessarily considered a discharge of pollutants according to the *National Cotton Council of America v. U.S. EPA* decision and other applicable case law. The regulated discharge is the discharge of residual pesticides. At what point the pesticide becomes a residue is not precisely known. Therefore, in the application of pesticides, the exact effluent is unknown. Thus, the effluent monitoring requirement is not applicable for algaeicide or aquatic herbicide applications.

## **C. Toxicity Testing Requirements**

The State Water Board, pursuant to the Porter-Cologne Act and the federal CWA, customarily requires the Discharger to conduct toxicity monitoring. In fact, both Acts anticipate Discharger self monitoring. However, this General Permit does not require toxicity testing based on the 2004 toxicity study funded by the State Water Board and data collected from 2004 to 2008. The toxicity study found the following: (1) There was no toxicity with the use of 2,4-D, glyphosate, and triclopyr; (2) Toxicity testing was difficult for acrolein due to its volatility; (3) Results were inconclusive for diquat and fluridone; and (4) Peak copper concentrations did not exceed toxicity values. The monitoring data collected under Order No. 2004-0009-DWQ from 2004 to 2008 showed that all constituent concentrations from post-event application samples were below receiving water limitations except for the following: three exceedances each for acrolein and glyphosate and 82 exceedances for copper out of 288 monitoring events. For glyphosate, it is likely that the three exceedances were not the result of aquatic herbicide applications because the pre-application samples also showed exceedances and the remaining 151 samples showed no exceedance. For copper, 43 of the 82 exceedances were from public agencies or mutual water companies that were excepted from meeting priority pollutant limitations during the exception period. The Policy allows the exception. Thus, staff did not consider these exceedances as violations of the receiving water limitations. However, 39 of the exceedances were from entities that did not have a Policy exception. Although staff considered these exceedances as true violations of the receiving water limitations, staff is not aware of any long-term impacts from these exceedances. Long-term impacts from

exceedances are likely not going to occur for the following reasons: (1) water quality criteria, which are used directly as receiving water limitations in this General Permit, have built-in factors of safety; (2) as shown in the 2004 toxicity study, the actual peak concentrations after applications of copper did not exceed toxicity values; and (3) the applications are short-term in duration. All of the foregoing information indicates that widespread acute ecosystem impacts will not occur from algaecide or aquatic herbicides applied according to their label instructions and requirements of this General Permit. Therefore, toxicity monitoring requirements are not necessary.

#### **D. Receiving Water Monitoring**

Receiving water monitoring is necessary to determine the impacts of the discharge on the receiving stream.

All forms of testing have some degree of uncertainty associated with them. The more limited the amount of test data available, the larger the uncertainty. The intent of this General Permit's sampling program is to select a number that will detect most events of noncompliance without requiring needless or burdensome monitoring.

Staff also used EPA's Technical Support Document for Water Quality-Based Toxics Control (TSD) to determine the appropriate number of samples that would be needed to characterize the impacts of the residual pesticide discharge from pesticide applications. Page 53 of the TSD recommends using a coefficient of variation (CV) 0.6 when the data set contains less than 10 samples. Table 3-1 of the TSD shows that with a CV of 0.6, the multiplying factors used to determine whether a discharge causes, has the reasonable potential to cause, or contributes to an excursion above a state water quality standard begin to stabilize when the sample number is six. Thus, this General Permit requires six samples per year for each active ingredient in each environmental setting (flowing water and non-flowing water) to characterize the effects of residual pesticide discharge from pesticide applications. However, after a Discharger or Coalition has provided results from six consecutive sampling events showing concentrations that are less than the receiving water limitation/trigger for an active ingredient in a specific environmental setting, sampling shall be reduced to one application event per year for that active ingredient in that environmental setting.

Similarly, this General Permit contains a reduced monitoring frequency of once per year (instead of six) at each environmental setting for glyphosate. The reduced monitoring frequency is based on staff's review of available data from 2004 to 2008 that showed no exceedance of the permit limitation for glyphosate under Order No. 2004-0009-DWQ.

### **VIII. RATIONALE FOR AQUATIC PESTICIDE USE REQUIREMENTS**

#### **A. Application Schedule**

The Discharger shall provide a phone number or other specific contact information for all persons who request the Discharger's application schedule.

## **B. Application Notification Requirements**

The Policy section 5.3, Categorical Exception, requires public agencies and mutual water companies that have been granted the short-term or seasonal exception for compliance with priority pollutant limitations to notify potentially affected public and government agencies of algaecide or aquatic herbicide application.

## **C. APAP**

This General Permit contains narrative effluent limitations, which include implementing BMPs described in the APAP, which is a requirement of this General Permit. See Section VI, Rationale for Effluent Limitations and Discharge Specifications, for more detailed explanation of the need for an APAP.

## **D. APAP Processing, Approval, and Modifications**

Upon receipt of a new or an amended APAP, staff will post it on the State Water Board's website. Major changes to the APAP shall be submitted to the Deputy Director for approval. Examples of major changes include using a different product other than what is specified in the APAP, changing an application method that may result in different amounts of algaecide or aquatic herbicides being applied, or adding or deleting BMPs. Since the APAP shall include ALL (1) the water bodies or water body systems in which algaecide or aquatic herbicides are being planned to be applied or may be applied to control algae and aquatic weeds and (2) the application areas and the target areas in the system that are being planned to be applied or may be applied, changes in monitoring locations are not considered major changes. However, these changes need to be reported in the annual report.

In preparing for the reissuance of the General Permit, staff will evaluate review periods and comments received during the life of this permit and look for efficiencies. Based on this information, staff will propose revisions to the public comment process for APAPs.

## **E. Aquatic Pesticide Application Log**

An application log to record all algaecide or aquatic herbicide applications is necessary. This application log will help Dischargers and the Water Boards' staff to investigate any exceedance of receiving water limitations or receiving water monitoring triggers.

# **IX. RATIONALE FOR PROVISIONS**

## **A. Standard Provisions**

### **1. Standard Provisions in Attachment B**

Standard Provisions, which apply to all NPDES permits in accordance with 40 C.F.R. section 122.41, and additional conditions applicable to specified categories of permits in accordance with 40 C.F.R. section 122.42, are provided

in Attachment B. The Discharger must comply with applicable standard provisions and with those additional conditions that are applicable under 40 C.F.R. section 122.42.

Sections 122.41(a)(1) and (b) through (n) of 40 C.F.R. establish conditions that apply to all state-issued NPDES permits. These conditions must be incorporated into the permits either expressly or by reference. If incorporated by reference, a specific citation to the regulations must be included in the General Permit. Section 123.25(a)(12) of 40 C.F.R. allows the state to omit or modify conditions to impose more stringent requirements. In accordance with 40 C.F.R. Section 123.25, this General Permit omits federal conditions that address enforcement authority specified in 40 C.F.R. section 122.41(j)(5) and (k)(2) because the enforcement authority under the California Water Code is more stringent. In lieu of these conditions, this General Permit incorporates by reference California Water Code section 13387(e).

## 2. Discharge to Impaired Water Bodies

Impaired water bodies are water quality limited segments listed under CWA 303(d) listings. The water bodies on these lists do not meet water quality standards, even if the discharge itself meets water quality standards. The Basin Plans state that *“Additional treatment beyond minimum federal standards will be imposed on dischargers to Water Quality Limit Segments. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment.”* The allocated loads are Discharger and receiving water specific. It is infeasible to assign a uniform load in a statewide general permit. Therefore, this General Permit does not authorize the discharge of active ingredients of algaecides or aquatic herbicides, their residues, and their degradation byproducts to water bodies that are already impaired due to the same product active ingredients, their residues, and their degradation byproducts.

## B. Special Provisions

### 1. Reopener Provisions

The reopener provisions allow future modification to this General Permit in accordance with 40 C.F.R. section 122.62.

#### a. Addition to Policy Exception List in Attachment G

This General Permit may be reopened to add a public entity or a mutual water company which may not otherwise meet the receiving water limitations for acrolein and copper and meets the requirements for an exception from meeting those limitations, consistent with section 5.3 of the Policy.

#### b. Addition of Aquatic Pesticide Active Ingredients

This General Permit may be reopened to add newly registered algaecide or aquatic herbicide active ingredients so that Dischargers can be covered by this General Permit when they apply the algaecide or aquatic herbicide products with the new active ingredients.

c. Acute and Chronic Toxicity

When the State Water Board revises the Policy's toxicity control provisions that would require the establishment of numeric chronic toxicity limitations or other actions, this General Permit may be reopened to comply with those requirements.

d. Receiving Water Limitations

If monitoring data for residual pesticides show exceedance of monitoring triggers, the Discharger or Coalition shall conduct additional investigations to determine the cause of exceedance. At a minimum, the Discharger or Coalition shall evaluate its application methods, BMPs, and the appropriateness of using alternative products. As a result of the evaluation, this General Permit may be re-opened to add numeric Receiving Water Limitations for the residual pesticides exceeding the triggers.

e. Endangered Species Act

If U.S. EPA develops biological opinions regarding pesticides included in this General Permit, this General Permit may be re-opened to add or modify Receiving Water Limitations/Monitoring Triggers for residual pesticides of concern, if necessary.

2. **Special Studies, Technical Reports, and Additional Monitoring Requirements**

a. Additional Investigation

This General Permit requires Dischargers to conduct additional investigations if the monitoring results exceed the receiving water monitoring limitations. These investigations are necessary in order to address the exceedance caused by the algaecide or aquatic herbicide application and meet the General Permit's limitations and requirements including Basin Plans' narrative water quality objective of no toxics in toxic amount.

b. Qualified Biologist Certification Following Project Completion

The requirement is retained from Order No. 2004-0009-DWQ and is based on Policy section 5.3 exception.

3. **Corrective Action**

When receiving water limitations or triggers are exceeded, Dischargers are expected to assess the cause of exceedance and take appropriate actions as necessary to prevent recurrence of the problem.

**X. COMPLIANCE DETERMINATION**

This General Permit specifies that compliance be based on event and post-event sampling results. The event sample results will determine if exceedance occurred outside the Treatment Area\* during treatment. Post-event samples will determine if exceedance occurred in the Application or Treatment Area after treatment. Since the minimum effective concentration and time needed to effectively kill or control target weeds or algae vary due

to site specific conditions, such as flow, target species, water chemistry, and type of algaecides or aquatic herbicides, this General Permit allows Dischargers to determine when treatment is completed.

## **XI. PUBLIC PARTICIPATION**

The State Water Board is considering the issuance of WDRs that will serve as a general NPDES permit for algaecide or aquatic herbicide applications. As a step in the WDR adoption process, the State Water Board staff has developed tentative WDRs. The State Water Board encourages public participation in the WDR adoption process.

### **A. Notification of Interested Parties**

The State Water Board has notified interested agencies, parties, and persons of its intent to prescribe general WDRs for algaecide or aquatic herbicide applications and has provided them with an opportunity to submit their written comments and recommendations. Notification was provided to interested parties through specific mailings and publication in major newspapers throughout California. The State Water Board, in a public meeting, heard and considered all comments pertaining to discharges to be regulated by this General Permit. Details of the Public Hearing are provided in the Fact Sheet of this General Permit.

### **B. Written Comments**

Interested persons were invited to submit written comments concerning this tentative WDR. Comments were due at the State Water Board offices by 12:00 noon on **August 21, 2012**. Seven comment letters were received.

### **C. Public Hearing and Meeting**

The State Water Board held a public hearing on the tentative WDRs during its regular Board meeting on **August 7, 2012**. The State Water Board will consider adoption of the WDRs at a public meeting on the following date, time, and location:

Date: **February 19, 2013**  
Time: 9:00 a.m.  
Location: State Water Resources Control Board  
1001 I Street  
Sacramento, CA 95814

Interested persons are invited to attend. At the public meeting, the State Water Board will hear comments, if any, limited to changes on the draft General Permit.

Please be aware that dates and venues may change. The State Water Board's website address is [www.waterboards.ca.gov](http://www.waterboards.ca.gov) where you can access the current agenda for changes in dates and locations.

**D. Information and Copying**

The tentative effluent limitations, receiving water limitations, and special provisions, comments received, and other information are on file and may be inspected at the address above at any time between 8:30 a.m. and 4:45 p.m., Monday through Friday. Copying of documents may be arranged through the State Water Board by calling (916) 379-9152.

**E. Register of Interested Persons**

Any person interested in being placed on the mailing list for information regarding this general WDR and NPDES permit should contact the State Water Board, reference the general WDR and NPDES permit, and provide a name, address, and phone number.

**F. Additional Information**

Requests for additional information or questions regarding this General Permit should be directed to [NPDES\\_Wastewater@waterboards.ca.gov](mailto:NPDES_Wastewater@waterboards.ca.gov).

**Attachment E – Notice of Intent**

**WATER QUALITY ORDER NO. 2013-0002-DWQ  
 GENERAL PERMIT NO. CAG990005**

**STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
 (NPDES) PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES TO WATERS OF  
 THE UNITED STATES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATIONS**

**I. NOTICE OF INTENT STATUS (see Instructions)**

Mark only one item	A. New Applicator	B. Change of Information: WDID# _____
	C. <input type="checkbox"/> Change of ownership or responsibility: WDID# _____	

**II. DISCHARGER INFORMATION**

A. Name			
B. Mailing Address			
C. City	D. County	E. State	F. Zip
G. Contact Person	H. E-mail address	I. Title	J. Phone

**III. BILLING ADDRESS (Enter Information only if different from Section II above)**

A. Name			
B. Mailing Address			
C. City	D. County	E. State	F. Zip
G. E-mail address	H. Title	I. Phone	

**IV. RECEIVING WATER INFORMATION**

A. Algaecide and aquatic herbicides are used to treat (check all that apply):	
1.	<input type="checkbox"/> Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger. Name of the conveyance system: _____
2.	<input type="checkbox"/> Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger. Owner's name: _____ Name of the conveyance system: _____
3.	Directly to river, lake, creek, stream, bay, ocean, etc. Name of water body: _____
B. Regional Water Quality Control Board(s) where treatment areas are located (REGION 1, 2, 3, 4, 5, 6, 7, 8, or 9): Region _____ (List all regions where algaecide and aquatic herbicide application is proposed.)	

**V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION**

A. Target Organisms: _____
B. Algaecide and Aquatic Herbicide Used: List Name and Active ingredients
C. Period of Application: Start Date _____ End Date _____
D. Types of Adjuvants Used:

**VI. AQUATIC PESTICIDE APPLICATION PLAN**

Has an Aquatic Pesticide Application Plan been prepared and is the applicator familiar with its contents? <input type="checkbox"/> Yes <input type="checkbox"/> No
If not, when will it be prepared? _____

**VII. NOTIFICATION**

Have potentially affected public and governmental agencies been notified? <input type="checkbox"/> Yes <input type="checkbox"/> No
--

**VIII. FEE**

Have you included payment of the filing fee (for first-time enrollees only) with this submittal? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA
--

GENERAL NPDES PERMIT FOR RESIDUAL  
 AQUATIC PESTICIDE DISCHARGES FROM  
 ALGAE AND AQUATIC WEED CONTROL APPLICATIONS

C1770800 Exhibit D, Attachment B  
 ORDER NO. 2013-0002-DWQ  
 NPDES NO. CAG990005

**IX. CERTIFICATION**

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. Additionally, I certify that the provisions of the General Permit, including developing and implementing a monitoring program, will be complied with."

A. Printed Name: \_\_\_\_\_

B. Signature: \_\_\_\_\_ Date: \_\_\_\_\_

C. Title: \_\_\_\_\_

**XI. FOR STATE WATER BOARD STAFF USE ONLY**

<b>WDID:</b>	<b>Date NOI Received:</b>	<b>Date NOI Processed:</b>
<b>Case Handler's Initial:</b>	<b>Fee Amount Received:</b> \$	<b>Check #:</b>
<input type="checkbox"/> <b>Lyris List Notification of Posting of APAP</b>	<b>Date</b> _____	<b>Confirmation Sent</b> _____

## INSTRUCTIONS FOR COMPLETING NOI

### WATER QUALITY ORDER NO. 2013-0002-DWQ GENERAL PERMIT NO. CAG990005

#### STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES TO WATERS OF THE UNITED STATES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATIONS

These instructions are intended to help you, the Discharger, to complete the Notice of Intent (NOI) form for the Statewide General NPDES permit. **Please type or print clearly when completing the NOI form.** For any field, if more space is needed, submit a supplemental letter with the NOI.

Send the completed and signed form along with the filing fee and supporting documentation to the Division of Water Quality, State Water Resources Control Board. Please also send a copy of the form and supporting documentation to the appropriate Regional Water Quality Control Board (Regional Water Board).

#### **Section I – Notice of Intent Status**

Indicate whether this request is for the first time coverage under this General Permit or a change of information for the discharge already covered under this General Permit. Dischargers that are covered under Order No. 2004-0009-DWQ before effective date of this General Permit should check the box for change of information. For a change of information or ownership, please supply the eleven-digit Waste Discharge Identification (WDID) number for the discharge.

#### **Section II – Discharger Information**

Enter the name of the Discharger.

Enter the street number and street name where correspondence should be sent (P.O. Box is acceptable).

Enter the city that applies to the mailing address given.

Enter the county that applies to the mailing address given.

Enter the state that applies to the mailing address given.

Enter the zip code that applies to the mailing address given.

Enter the name (first and last) of the contact person.

Enter the e-mail address of the contact person.

Enter the contact person's title.

Enter the daytime telephone number of the contact person

#### **Section III – Billing Address**

Enter the information **only** if it is different from Section II above.

- A. Enter the name (first and last) of the person who will be responsible for the billing.

- B. Enter the street number and street name where the billing should be sent (P.O. Box is acceptable).
- C. Enter the city that applies to the billing address.
- D. Enter the county that applies to the billing address.
- E. Enter the state that applies to the billing address.
- F. Enter the zip code that applies to the billing address.
- G. Enter the e-mail address of the person responsible for billing.
- H. Enter the title of the person responsible for billing.
- I. Enter the daytime telephone number of the person responsible for billing.

**Section IV – Receiving Water Information**

Please be reminded that this General Permit does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code §2050 et. seq) or the Federal Endangered Species Act (16 U.S.C.A. §1531 et. seq). This General Permit requires compliance with effluent limitations, receiving water limitations, and other requirements to protect the beneficial uses of waters of the state. The Discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

Additional information on federally-listed threatened or endangered species and federally-designated critical habitat is available from NMFS ([www.nmfs.noaa.gov](http://www.nmfs.noaa.gov)) for anadromous or marine species or FWS ([www.fws.gov](http://www.fws.gov)) for terrestrial or freshwater species.

- A. Check all boxes that apply. At least one box must be checked.
  - 1. Check this box if the treatment area is a canal, ditch, or other constructed conveyance system owned and controlled by Discharger. Print the name of the conveyance system.
  - 2. Check this box if the treatment area is a canal, ditch, or other constructed conveyance system owned and controlled by an entity other than the Discharger. Print the owner's name and names of the conveyance system.
  - 3. Check this box if the treatment area is not a constructed conveyance system (including application to river, lake, creek, stream, bay, or ocean) and enter the name(s) of the water body(s).
  
- B. List all Regional Water Board numbers where algaecide and aquatic herbicide application is proposed. Regional Water Board boundaries are defined in section 13200 of the California Water Code. The boundaries can also be found on our website at [http://www.waterboards.ca.gov/waterboards\\_map.shtml](http://www.waterboards.ca.gov/waterboards_map.shtml)

Regional Water Board Numbers	Regional Water Board Names
1	North Coast
2	San Francisco Bay
3	Central Coast

<b>Regional Water Board Numbers</b>	<b>Regional Water Board Names</b>
4	Los Angeles
5	Central Valley (Includes Sacramento, Fresno, Redding Offices)
6	Lahontan (South Lake Tahoe, Victorville offices)
7	Colorado River Basin
8	Santa Ana
9	San Diego

**Section V – Algaecide and Aquatic Herbicide Application Information**

- A. List the appropriate target organism(s).
- B. List the name and active ingredients of each algaecide and aquatic herbicide to be used.
- C. List the start and end date of proposed aquatic algaecide and aquatic herbicide application event.
- D. List the name(s) and type(s) of adjuvants that will be used.

The Discharger must submit a new NOI if any information stated in this section will be changed. If the Discharger plans to use an algaecide and aquatic herbicide product not currently covered under its Notice of Applicability (NOA), and the algaecide and aquatic herbicide product may be discharged to a water of the United States as a result of algaecide and aquatic herbicide application, the Discharger must receive a revised NOA from the State Water Board’s Deputy Director of the Division of Water Quality before using that product.

**Section VI – Aquatic Pesticide Application Plan**

The Coalition or Discharger must prepare and complete an Aquatic Pesticide Application Plan (APAP). The minimum contents of APAP are specified in the permit under Section VIII.C, Limitations and Discharge Requirements, of the General Permit. The Discharger must ensure that its applicator is familiar with the APAP contents before algaecide and aquatic herbicide application.

If an APAP is not complete at the time of application, enter the date by which it will be completed.

**Section VII – Notification**

Indicate if you have notified potentially affected public and governmental agencies, as required under item VIII.B of the General Permit.

**Section VIII – Fee**

The amount of Annual fee shall be based on Category 3 discharge specified in section 2200(b)(9) of title 23, California Code of Regulations. Fee information can be found at [http://www.waterboards.ca.gov/resources/fees/docs/fy1112fee\\_schdl\\_npdes\\_prmt.pdf](http://www.waterboards.ca.gov/resources/fees/docs/fy1112fee_schdl_npdes_prmt.pdf).

Check the YES box if you have included payment of the annual fee. Check the NO box if you have not included this payment. **NOTE:** You will be billed annually and payment is required to continue coverage.

**Section IX– Certification**

- A. Print the name of the appropriate official. The person who signs the NOI must meet the signatory and certification requirements stated in Attachment B Standard Provisions item V.B.
- B. The person whose name is printed above must sign and date the NOI.
- C. Enter the title of the person signing the NOI.



**IV. CERTIFICATION**

"I certify under penalty of law that 1) I am not required to be permitted under this General Permit No.CAG990005, and 2) this document and all attachments were prepared under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. Additionally, I understand that the submittal of this Notice of Termination does not release an algaecide or aquatic herbicide applicator from liability for any violations of the Clean Water Act."

A. Printed Name: \_\_\_\_\_

B. Signature: \_\_\_\_\_ Date: \_\_\_\_\_

C. Title: \_\_\_\_\_

**V. FOR STATE WATER BOARD USE ONLY**

Approved for Termination

Denied and Returned to the Discharger

A. Printed Name: \_\_\_\_\_

B. Signature: \_\_\_\_\_

C. Date: \_\_\_\_\_

NOT Effective Date:     /     /

## **Attachment G – Exception List**

### **LIST OF PUBLIC AGENCIES AND MUTAL WATER COMPANIES GRANTED AN EXCEPTION PURSUANT TO STATE WATER RESOURCES CONTROL BOARD POLICY FOR IMPLEMENTATION OF TOXICS STANDARDS FOR INLAND SURFACE WATERS, ENCLOSED BAYS, AND ESTUARIES OF CALIFORNIA**

The public entities and mutual water companies listed herein have prepared Initial Studies, Negative Declarations (ND), Mitigated Negative Declarations (MND), and Notices of Determination for the discharge of algaecides and aquatic herbicides in accordance with the California Environmental Quality Act (CEQA (Public Resources Code § 21000 et seq.)) to comply with the exception requirements of section 5.3 of the Policy. The boards of each public entity, as the lead agencies under CEQA, approved the Final ND/MND and determined that the discharge of algaecides and aquatic herbicides in their respective projects would not have a significant effect on the environment. These public entities and mutual water companies have determined that the water quality or related water quality impacts identified in the environmental assessments of the ND/MND are less than significant.

In addition to submitting the CEQA documentation, these public entities and mutual water companies have also complied with the other exception requirements of section 5.3 of the Policy.

As required in section 15096 of the CEQA Guidelines, the State Water Resources Control Board (State Water Board), as a Responsible Agency under CEQA, considered the ND/MND approved by the board of each public entity and finds that the projects will have less than significant water quality impact if the waste discharge requirements in this General Permit are followed. Accordingly, the public entities and mutual water companies listed herein are hereby granted an exception pursuant to section 5.3 of the Policy.

1. Byron-Bethany Irrigation District
2. City of Antioch Department of Public Works
3. Contra Costa Water District
4. Contra Costa County Flood Control and Water Conservation District
5. Department of Food and Agriculture
6. Department of Water Resources
7. Friant Water Users Authority
8. Glenn-Colusa Irrigation District
9. Maine Prairie Water District
10. Marin Municipal Water District
11. Metropolitan Water District of Southern California
12. Modesto Irrigation District
13. Nevada Irrigation District

GENERAL NPDES PERMIT FOR RESIDUAL  
AQUATIC PESTICIDE DISCHARGES FROM  
ALGAE AND AQUATIC WEED CONTROL APPLICATIONS

C1770800 Exhibit D, Attachment B  
ORDER NO. 2013-0002-DWQ  
NPDES NO. CAG990005

14. North Marin Water District
15. Oakdale Irrigation District
16. Placer County Water Agency
17. Potter Valley Irrigation District
18. Princeton-Cordora-Glenn Irrigation District
19. Provident Irrigation District
20. Reclamation District 1004
21. Santa Cruz Water Department
22. Solano Irrigation District
23. South Feather Water and Power Agency
24. South Sutter Water District
25. Tehama Colusa Canal Authority
26. Turlock Irrigation District
27. Woodbridge Irrigation District
28. Yolo County Flood Control and Water Conservation District



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
Southwest Region  
501 West Ocean Boulevard, Suite 4200  
Long Beach, California 90802-4213

**FEB 27 2013**

In response refer to:  
2013/9443

Howard Q. Zhang, Ph.D. and Director  
Western Regional Research Center  
USDA-ARS  
800 Buchanan Street  
Albany, California 94710

Dear Dr. Zhang:

This letter is in response to the United States Department of Agriculture's (USDA) January 4, 2013, request for section 7 consultation pursuant to the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*), with NOAA's National Marine Fisheries Service (NMFS) on the proposed 5-year (2013-2017) Water Hyacinth Control Program (WHCP) in the Sacramento-San Joaquin Delta (Delta) and the San Joaquin River (SJR) basin. Specifically, USDA has determined that the proposed WHCP may affect, but is not likely to adversely affect, the federally listed as endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), threatened Central Valley (CV) spring-run Chinook salmon (*O. tshawytscha*), threatened California CV steelhead (*O. mykiss*), the threatened Southern distinct population segment (DPS) of North American green sturgeon (*Acipenser medirostris*), or designated critical habitats for these listed species. In addition, this letter serves as essential fish habitat consultation for Pacific salmon pursuant to provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and consultation under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act of 1934, as amended.

### **Description of the Proposed Action**

USDA serves as the Federal nexus for a cooperative project with its applicant, the California Department of Boating and Waterways (CDBW), with regard to managing invasive plants in the Delta and its tributaries and providing research and scientific expertise. USDA proposes to utilize chemical treatment and physical removal methods to control water hyacinth in the Delta and SJR waterways from 2013 through 2017<sup>1</sup>. The chemical treatment is the use of four

<sup>1</sup> USDA originally proposed on October 25, 2012, biological methods to control water hyacinth but withdrew them from the proposed action on January 4, 2013.



herbicides<sup>2</sup>: 2,4-D, glyphosate, imazamox, and penoxsulam. As alternatives to chemical treatment, USDA proposes to physically remove water hyacinth, including handpicking, herding, and mechanical removal. The WHCP emphasizes chemical treatment, with limited physical removal, to control water hyacinth.

### Action Area

The action area for the WHCP includes the Delta, mainstem SJR, Tuolumne River, and Merced River. The general boundaries for the action area are as follows (starting from the Delta):

- (1) West up to and including Sherman Island at the confluence of the Sacramento and San Joaquin Rivers;
- (2) West up to the Sacramento Northern Railroad to include water bodies north of the southern confluence of the Sacramento River and Sacramento Deep Water Ship Channel;
- (3) North to the northern confluence of the Sacramento River and Sacramento Deep Water Ship Channel, plus waters within Lake Natoma;
- (4) South along the San Joaquin River to Mendota, just east of Fresno;
- (5) East along the San Joaquin River to Friant Dam on Millerton Lake;
- (6) East along the Tuolumne River to LaGrange Reservoir below Don Pedro Reservoir; and
- (7) East along the Merced River to Merced Falls, below Lake McClure.

There are approximately 350 treatment sites that average between one and two miles in length. In any given year, USDA and CDBW will treat only a portion of the total treatment sites. During the past 29 years of the WHCP, the highest annual treatment area was 2,770 acres in 2004 and the lowest was 166 acres in 1985, accounting for 4.1 percent and 0.2 percent, respectively, of the total waterway area (~67,800 acres<sup>3</sup>) of the Delta and the SJR basin. However, the action area is expected to encompass a greater area than the actual treatment area due to water movement resulting from flow and tidal influences.

The action area contains waterways where Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, California CV steelhead, and/or the Southern DPS of North American green sturgeon may be present. The three listed salmonids have the greatest potential to occur in the action area primarily between November and June, based on the timing of adult and juvenile migrations in and through the waterways of the Delta. Juvenile steelhead may occur in the SJR and its tributaries from October through June. Green sturgeon presence is presumed to be year-round within the Delta.

The action area includes waters that have been designated as critical habitat for CV spring-run Chinook salmon, California CV steelhead, and the Southern DPS of North American green

<sup>2</sup> USDA proposed on October 25, 2012, the use of a fifth herbicide imazapyr, which was withdrawn as part of the proposed action on January 4, 2013, because it has not been approved by the California Department of Pesticide Regulation for use in controlling water hyacinth.

<sup>3</sup> The total water area is 61,619 acres in the Delta and 6,180 acres in the San Joaquin River basin.

sturgeon. The primary constituent elements (PCE) of the critical habitat in the action area for the listed species include areas for emigration, rearing, and/or smoltification of juveniles and immigration of adults. The PCE attributes of prey availability, primary productivity, shelter availability, and water quality (*i.e.*, dissolved oxygen) are the primary assessment endpoints addressed when evaluating the effects of the proposed action on the designated critical habitat. Information evaluated for effects to prey, primary production, or shelter includes survival, growth, reproduction, or abundance of prey (*e.g.*, macroinvertebrates), phytoplankton, and macrophytes.

### **General Procedure for Controlling Water Hyacinth**

Prior to the start of each treatment season, USDA and CDBW will conduct environmental awareness training for all field crew members. The training will include: species identification and impact avoidance guidelines; protocol for identification and protection of Chinook salmon, steelhead, green sturgeon, and associated protected habitats. In addition, field crew members will be trained on the use and calibration of spray equipment and the WHCP Operations Management Plan.

USDA and SDBW will conduct pre- and post-season surveys to identify locations and coverage of water hyacinth, and supplement these formal surveys with mid-season evaluations of water hyacinth coverage. Starting in February, and again in October and November, field crews will conduct visual surveys of all treatment sites. For each site, crews will record water hyacinth coverage (acres and percent coverage) and growth at the site.

In the early season survey, field crews will identify problem areas such as those with the greatest impact on navigation, public safety, nursery areas, and sites close to pumps or other structures. Treatment crews will also identify crops adjacent to treatment sites in order to help select the appropriate herbicide for treatment. Crews will validate field survey information with data from the prioritization process and note any changes. This survey information will be used to help prioritize treatment locations at the start of the treatment season, and to measure efficacy of water hyacinth treatments at the end of the season.

During the treatment season, as crews are working throughout the Delta, they will continue to monitor and record water hyacinth coverage by site. This ongoing survey will assist the management team in identifying mid-season adjustments to prioritizing treatment sites and determining treatment effectiveness. The crews will follow specific requirements to account for wind, dissolved oxygen, drinking water intakes, agricultural intakes, and total acres treated. Treatment crews will follow all label requirements and implement a fish passage protocol (described below in Chemical Control) to ensure that listed anadromous fish species and their critical habitats are not impacted by the WHCP.

USDA and CDBW will prepare an annual report for the WHCP and submit the report to NMFS by February 1 of each year starting 2014. This annual report will summarize infestation levels, treatment acreage and types, amount of each herbicide used, materials and methods, and water

quality monitoring results (including herbicide concentration and dissolved oxygen). NMFS will review the report and assess whether or not the WHCP poses negative effects to listed anadromous fish species and their critical habitats from the use of the herbicides, particularly the two new herbicides—imazamox and penoxsulam.

### Chemical Control

USDA proposes to use four herbicide products: Weedar 64, AquaMaster, Clearcast, and Galleon SC (Table 1). The products contain one of the four active ingredients (a.i.): 2,4-D, glyphosate, imazamox, and penoxsulam. Imazamox and penoxsulam are new to the WHCP. All herbicides will be applied with an adjuvant, either Agridex or Competitor. Only one herbicide will be utilized in a given site for any single treatment.

The proposed maximum application rate and the estimated environmental concentration (EEC) are presented in Table 1. The EEC in water column is calculated using the maximum application rate, spray efficiency, and water depth. Spray efficiency is defined as the fraction of the a.i. intercepted by the target plant canopy. The amount of droplet capture will depend on the canopy coverage and the volume, speed and direction of the spray cloud. According to USDA, the typical spray efficiency is between 80 and 90 percent when applying 2,4-D to water hyacinth mats. NMFS assumes that the 1-meter water depth is appropriate for estimating the concentration of herbicide to which salmon and steelhead may be exposed and 2-meter water depth is appropriate for green sturgeon. Salmonid juveniles generally migrate or rear in the top layer of water column ranging from 3-6 meters while green sturgeon migrate or rear at the bottom of a waterbody. Use of 1-meter for salmonids and 2-meter for green sturgeon is conservatively protective of the species.

**Table 1. Maximum application rates and estimated environmental concentrations of the proposed herbicides and adjuvants**

Product	Active Ingredient (a.i.)	Proposed Maximum Application Rate (pound a.i./acre)	Estimated Environmental Concentration (mg/L)	
			1-meter Water	2-meter Water
Weedar 64	2,4-D	4.58	0.103	0.051
AquaMaster	Glyphosate	4.05	0.091	0.045
Clearcast	Imazamox	0.5	0.012	0.006
Galleon SC	Penoxsulam	0.088	0.002	0.001
Agridex	Oil, esters, and emulsifier	3.67	0.082	0.041
Competitor	Ester and glycol	3.68	0.083	0.041

Crews for herbicide application will conduct treatments with hand-held sprayers applied from aluminum airboats or aluminum outboard motor boats. The work boats will be equipped with direct metering of herbicides, adjuvants, and water pump systems. The crews will spray the

chemical mixture directly onto the plants utilizing pump-driven hand-held spray nozzles. The pump will mix calibrated amounts of herbicide, adjuvant, and water.

USDA and CDBW will only treat those sites that have water hyacinth infestations, treating only the water hyacinth plants within those sites. The WHCP may also be limited by time and resource constraints. Within a given treatment location, field crews will treat according to current herbicide label requirements or the fish passage protocol to limit the potential for the decay of plants to cause low dissolved oxygen levels.

USDA and CDBW will follow the fish passage protocol to ensure that during herbicide applications a zone of the treatment area is left untreated for passage of listed fish species at all times, taking into account the location and size of treatment areas.

- (1) In slow-moving and back-end sloughs infested with water hyacinth, USDA and CDBW will treat up to 30 percent of the water hyacinth mat at one time. Mats will be treated in up to 3-acre strips, leaving at least 100-foot buffer strips between treated areas. The untreated buffer strips and remaining 70 percent of the water hyacinth mat will be treated at least three more times following the initial treatment (in 30 percent increments). These follow-up treatments will take place at three-week intervals.
- (2) In Delta tidal waters, USDA and CDBW will treat up to 50 percent of the water hyacinth mat at one time. Mats will be treated in up to 3-acre strips, leaving at least 100-foot buffer strips between treated areas. The untreated buffer strips and remaining 50 percent of the mat will be treated three weeks following the initial treatment for 2,4-D treatments, and one week following initial treatment for other herbicides.

The size of treatment sites ranges from 6.5 acres to 1,707 acres, with an average size of 219 acres. Thus, there may be several different water hyacinth infestations spread out within a site that require treatment. In these cases, USDA and CDBW will treat all water hyacinth mats in the site as time and resources allow.

Repeat treatments, when needed, may utilize a different herbicide, depending on conditions at the site, for example:

- (1) A location will not be treated again if, after the herbicide has had time to take effect, the initial treatment was effective in killing the majority of water hyacinth plants at that site.
- (2) A given water hyacinth mat will be treated a second time if buffer strips for fish passage were left untreated. In this case, DBW will return to treat the remainder of the site after the specified time<sup>4</sup> between treatments, per herbicide label requirements or the fish passage protocol, whichever is more protective of listed fish species. In this case, new plants within a given water hyacinth mat will be treated, not the previously treated plants.

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<sup>4</sup> The label required time between treatments is 21 days for 2,4-D and 1 day for glyphosate.

- (3) Previously treated water hyacinth plants will be treated a second time at a given site if the first treatment was not effective in killing the plants. In this case, the second treatment will not be conducted until the specified time period, per label requirements or the fish passage protocol, whichever is more protective of listed fish species.
- (4) The actual number of locations that will be treated more than once depends on factors such as herbicide efficacy, growth of the water hyacinth plants, and tidal movement that cannot be easily predicted. USDA and CDBW will seek to minimize the number of times that a given water hyacinth mat will be treated, and will follow herbicide labels regarding total number of applications allowed.

Daily treatments occur Monday through Thursday when weather, wind-speed, and other environmental conditions are favorable for treatment to be maximized. On any given treatment day, treatment acres per day are limited by: (1) the number of crews available; (2) travel time to reach the site; (3) time required to set-up, conduct monitoring, and treat a site; (4) the amount of water hyacinth growing at a particular site; (5) the herbicide label restrictions; (6) fish passage protocols; and (7) weather and tide conditions. The crew can treat, on average, between 5 and 16 acres per day, based on historical data from 2007 through 2011.

### **Physical Removal**

USDA proposes to use four physical removal methods to supplement the chemical control of water hyacinth under some specific circumstances. Handpicking will be used to manually remove water hyacinth in nursery areas (e.g., slow moving waterways, temporarily isolated oxbow lakes, tule stands along channel margins, and stagnant, dead-end sloughs). The area for handpicking is estimated to be less than 100 acres per year. Herding will be used in order to push water hyacinth mats (1) into main channels where it flows naturally out of the Delta and dies in the more saline water of San Francisco Bay; or (2) toward mechanical removal sites. Due to timing and logistical limitations of herding activities, this method may not be used as frequently as handpicking. USDA will primarily use boats to push water hyacinth mats towards the U.S. Bureau of Reclamation excavator at the Tracy Fish Facility. The area for herding is estimated to range from 500 to 1,000 acres per year.

USDA proposes two mechanical approaches to remove dense mats of water hyacinth in locations where chemical treatment is precluded and/or mechanical removal is likely to be more successful. The area for mechanical removal is estimated to be less than 200 acres per year. The first approach will be to park a small excavator and dump truck on a concrete boat ramp and mechanically lift water hyacinth from the waterway surrounding the ramp. Field crews will support the excavation by herding water hyacinth that is outside of the excavator's reach closer to the equipment. This mechanical removal approach will be used only in limited locations when water hyacinth growth is concentrated near a boat ramp. There may be relatively few locations within the Delta that are appropriate for excavation.

The second mechanical removal approach will utilize mechanical equipment designed specifically to safely remove aquatic weeds from waterways. This mechanical equipment utilizes cutters and conveyors to physically remove the plant from the water, and onto the bed of the equipment. The equipment will collect and unload vegetation using a conveyor system on a boom, adjustable to the appropriate cutting height (two to three feet below the surface for water hyacinth). Cutter bars will collect material and bring it aboard the vessel using the conveyor; when the vessel has reached capacity (between 2,000 and 15,000 pounds of plant material), the cut plant material will be offloaded to a dump truck parked at a nearby boat ramp to offload water hyacinth. Water hyacinth will be disposed of at an authorized location, typically utilizing nearby farm fields. This mechanical removal will primarily be utilized to remove dense mats of water hyacinth in locations where chemical treatment must be avoided, such as sites with many valley elderberry shrubs along the shoreline.

### **Timing of Control Activities**

USDA proposes a calendar-based schedule for WHCP activities from 2013 to 2017 (Table 2). USDA proposes to apply 2,4-D according to the following application windows established by NMFS<sup>5</sup> to minimize the potential negative effects to steelhead:

- (1) June 15 to September 15 within the Delta, and
- (2) July 15 to August 15 in the SJR.

USDA proposes to apply glyphosate, imazamox, and penoxsulam between March and November. USDA proposes to use physical (herding and mechanical) removal from July to April. Neither chemical treatment nor physical removal will be performed at or near sites where listed anadromous fish species are likely to be present.

The actual start date will depend on a combination of calendar-dates, field surveys of water hyacinth to evaluate plant growth, and surveys to determine presence of listed fish species. The objective of this approach is to improve WHCP chemical treatment efficacy without negatively impacting listed fish species. Seasonal temperature fluctuations in the Delta impact both water hyacinth growth and migratory fish activity. These weather fluctuations can become relatively extreme, and may make calendar-based start dates less relevant.

On any given treatment day, actual start of treatments depends on the distance from CDBW's boat dock to the treatment site. Field crews begin their work day at 6:30 a.m., thus treatment activities generally occur in mid-morning, and again in early-afternoon.

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<sup>5</sup> NMFS. 2011. Biological Opinion on US EPA's Registration of Pesticides: 2,4-D, Triclopyr BEE, Diuron, Linuron, Captan, and Chlorothalonil. Appendix 9.

**Table 2. Proposed calendar-based control activities and application window (shaded) for the WHCP from 2013 to 2017. The darker shading indicates the 2,4-D application window in the SJR.**

Control Method	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2,4-D												
Glyphosate												
Penoxsulam												
Imazamox												
Handpicking												
Herding												
Mechanical Removal												

### **Endangered Species Act Section 7 Consultation**

NMFS has received all of the information necessary to initiate consultation on federally listed anadromous fish species and their designated critical habitats within the action area. Based on our review of the material provided, and the best scientific and commercial data currently available, NMFS concurs with USDA and CDBW's determination that the proposed use of herbicide products, adjuvants, or physical removal methods is not likely to adversely affect federally listed Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, California CV steelhead, or the Southern DPS of North American green sturgeon, or any of their respective designated critical habitats. NMFS reached this concurrence based on the following project elements:

#### **Chemical Control**

Application of the proposed herbicides and adjuvants may pose negative direct or indirect effects to listed fish species and/or their critical habitats, as summarized in Table 3. Note that the potential indirect effects to the listed species overlap with the potential effects to critical habitats.

**Table 3. Summary of potential direct or indirect effects of herbicides and adjuvants to listed fish species and/or critical habitats**

Target	Potential Direct Effects	Potential Indirect Effects
Listed Species	(1) Kill fish (2) Reduce growth (3) Reduce reproduction	(1) Reduce native aquatic plants (shelter for listed species) (2) Reduce invertebrates (food for listed species) (3) Reduce phytoplankton (food for invertebrates) (4) Degrade water quality ( <i>i.e.</i> , dissolved oxygen)
Critical Habitat	(1) Delta and SJR: Habitat for migration, rearing, and/or smoltification (2) Habitat Loss: Unlikely	

	<p>(3) Habitat Modification</p> <p>(a) Reduce native aquatic plants</p> <p>(b) Reduce invertebrates</p> <p>(c) Reduce phytoplankton</p> <p>(d) Degrade water quality (<i>i.e.</i>, dissolved oxygen)</p>
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USDA determined that the proposed use of four herbicides and two adjuvants is not likely to:

- (1) kill individuals of the listed fish species;
- (2) reduce growth and reproduction of the listed fish species;
- (3) reduce prey availability for the listed fish species;
- (4) reduce aquatic plants serving as a shelter for the listed fish species; or
- (5) reduce primary productivity that would affect the food source for primary consumers (*e.g.*, macroinvertebrates), which are food sources for listed fish species.

NMFS conducted effects analyses and risk assessments using the data submitted by USDA and from other sources (*e.g.*, ECOTOX database) and the well-established process developed by the U.S. Environmental Protection Agency (US EPA) and NMFS<sup>6</sup>. Briefly, the analytical framework includes organizing, evaluating, and synthesizing available data and information on listed resources and the potential stressors of the proposed action. Separate evaluations are conducted for the effect and risk to listed species and to designated critical habitats from the stressors of the proposed action. Studies using listed species are preferable, however, when there is not a complete suite of information relating to effects on listed fish species, data from surrogate species are used. Specifically, rainbow trout are used as surrogates for salmonids and white sturgeon for green sturgeon. Even though there may be interspecies extrapolation, data from surrogates are considered the best available and were used in previous national pesticide consultations.

Exposure of the listed species to 2,4-D, glyphosate, imazamox, penoxsulam, or adjuvants, if applied as proposed, poses a low risk to fish mortality and reduction in fish growth and reproduction. Although the chronic toxicity data for rainbow trout indicated that the application of 2,4-D or glyphosate as proposed may have potential negative chronic effects of 2,4-D or glyphosate on Chinook or steelhead juveniles, the potential chronic effect is deemed insignificant<sup>7</sup> or discountable<sup>8</sup> considering the dissipation half-life and observed concentration of the herbicides, the size of a treatment area, and juvenile migration speed in the Delta.

<sup>6</sup> NMFS, 2013. Effect Analysis and Risk Assessment for Exposure of the Water Hyacinth Control Program Stressors to Listed Anadromous Fish Species and Their Designated Critical Habitat in the Sacramento-San Joaquin Delta

<sup>7</sup> Insignificant effects – relate to the magnitude of the impact: the effects cannot be meaningfully detected, measured, or evaluated, and should never reach the scale where a “take” occurs. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects.

<sup>8</sup> Discountable effects – relate to the likelihood of the impact: the effects are extremely unlikely to occur. Based on best judgment, a person would not expect discountable effects to occur.

The proposed use of the herbicides and adjuvants poses a low risk to the critical habitats designated for spring-run Chinook salmon, CCV steelhead, and green sturgeon. Although the use of imazamox or penoxsulam may negatively affect aquatic vascular plants, the potential effect is deemed insignificant or discountable considering the dissipation half-life of the herbicides, recoverability of affected aquatic plants, and the size of a treatment area.

### **Dissolved Oxygen**

Decomposition of water hyacinth and other aquatic plants following application of herbicide products may reduce dissolved oxygen (DO) concentrations, and low DO can result in fish mortality. However, according to USDA and CDBW, application of Weedar 64 and AquaMaster is not likely to reduce DO to a level unsafe for listed fish species. Of 719 treatments occurring between 2007 and 2011, there were 13 cases with no change in DO, 404 cases with an increase in DO (average increase of 0.8 mg/L), and 302 cases with an average decrease of 0.6 mg/L in DO. The average pre-treatment DO was 7.9 mg/L, and the average post-treatment DO was 8.1 mg/L. Since imazamox and penoxsulam are slow-acting systemic herbicides, they are not expected to result in reduced DO levels.

Following the herbicide label requirements or the fish passage protocol regarding the number of treatments and time between treatments for each treatment site and herbicide application will minimize the potential for low DO as a result of herbicide applications. To further minimize the effect of potential decreases in DO on listed species, USDA and CDBW will monitor DO pre- and post-treatment for all WHCP treatments. No treatments will be performed if DO levels are between 3 mg/L and the Basin Plan limits established by the Central Valley Regional Water Quality Control Board (ranging from 5 mg/L to 8 mg/L).

### **Physical Removal**

The negative effects of handpicking and herding on listed fish species are extremely unlikely to occur due to the nature and limited scope of the activities. Mechanical removal may negatively affect the listed species if and when they co-occur with the removal activities. However, the potential effects would be discountable as they are highly unlikely to occur, based on the following information and mitigation measures:

- (1) Mechanical removal methods will be used in limited locations when water hyacinth growth is concentrated near a boat ramp or where chemical treatment must be avoided, such as sites with many valley elderberry shrubs along the shoreline. The area where mechanical removal may be used is estimated to be less than 200 acres or 0.3 percent of the total waterway area in the Delta;

- (2) Mechanical removal methods are limited to dense water hyacinth mats where listed salmonid species are not likely present; and
- (3) If a field survey<sup>9</sup> as described in the USDA's proposed action indicates that listed fish species are present or likely to be present, physical removal will not be conducted until such time as listed fish species are not likely to be present.

This concludes informal consultation for the USDA's proposed WHCP for 2013-2017. Reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (2) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered; or (3) a new species is listed or critical habitat designated that may be affected by the action.

#### **Essential Fish Habitat (EFH) Consultation**

With regards to EFH consultation, the action area has been identified as EFH for Pacific salmon in Amendment 14 of the Pacific Salmon Fishery Management Plan pursuant to the MSA. Federal action agencies are mandated by the MSA (section 305(b)(2)) to consult with NMFS on all actions that may adversely affect EFH, and NMFS provides EFH conservation recommendations to those agencies pursuant to MSA section 305(b)(4)(A). Based on our review of the material provided, and the best scientific and commercial data currently available, NMFS has determined that the proposed action would adversely affect EFH for Pacific salmon. However, the proposed action includes adequate measures (described in the ESA section 7 Consultation section above) to avoid, minimize, or otherwise offset the adverse effects to EFH. Therefore, NMFS is not providing any EFH Conservation Recommendations at this time and the Federal action agency is not required to provide a written response under section 305(b)(4)(B) of the MSA and Federal regulations (50 CFR 600.920(k)). However, if there are revisions to the project description that could result in adverse effects to EFH, USDA will need to re-initiate EFH consultation.

#### **Fish and Wildlife Coordination Act (FWCA) Consultation**

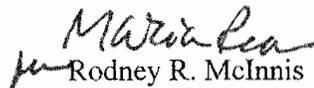
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<sup>9</sup> A field survey is the combination of visual observation by a trained biologist and fish migration probability based on juvenile monitoring data in the lower Sacramento River, San Joaquin River, and at fish collection facilities in the South Delta. Use of monitoring data would provide a good indication if salmonids are migrating through a particular location in the Delta. Chemical treatments during the sensitive March to June time period will be focused on areas where salmonids are not likely to be migrating.

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration and is coordinated with other aspects of water resources development (16 U.S.C. Sec. 661). The FWCA establishes a consultation requirement for Federal departments and agencies that undertake any action that proposes to modify any stream or other body of water for any purpose, including navigation and drainage (16 U.S.C. Sec. 662(a)). Consistent with this consultation requirement, NMFS provides recommendations and comments to Federal action agencies for the purpose of conserving fish and wildlife resources. The FWCA provides the opportunity to offer recommendations for the conservation of species and habitats beyond those currently managed under the ESA and MSA. Because the proposed project is designed to avoid environmental impacts to aquatic habitat within the action area, NMFS has no FWCA comments to provide.

Please contact Dr. Li-Ming (Lee) He at (916) 930-5615, or via email at [li-ming.he@noaa.gov](mailto:li-ming.he@noaa.gov), if you have any questions regarding this consultation.

Sincerely,

  
Rodney R. McInnis  
Regional Administrator

cc: Copy to file: ARN 151422SWR2012SA001889

NMFS-PRD, Long Beach, CA

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## Water Hyacinth Control Program Fish Passage Protocol

October 17, 2012

### Background

Water hyacinth (*Eichhornia crassipes*) is a non-native, free-floating aquatic macrophyte. Water hyacinth was first reported in California in 1904, and by the early 1980s this invasive weed had become a significant problem for agriculture, boating and recreation, and wildlife in the Sacramento-San Joaquin Delta (Delta) and its tributaries. Water hyacinth is characterized by showy lavender flowers and thick, highly glossy leaves up to ten inches across. The plant grows from 1 ½ to 5 feet in height, and the floating portion of the plant can grow to more than four feet in diameter. In the Delta, the plant is found in sloughs, connecting waterways, and tributary rivers. The growing season for water hyacinth in the Delta is typically from March to early December. Water hyacinth spreads and grows rapidly under favorable temperature and nutrient conditions such as those found in the Delta in the summer months, and mats may double in surface area in six to fifteen days.

SB 1344 (Garamendi, Chapter 263, Statutes of 1982) amended the California Harbors and Navigation Code to designate the California Department of Boating and Waterways (DBW) as the lead agency for controlling water hyacinth in the Delta, its tributaries, and the Suisun Marsh. DBW developed an interagency task force to coordinate the control activities of federal, state, and local interests and to resolve problems and concerns associated with public health and safety, and environmental impacts. DBW initiated the water hyacinth control program (WHCP) in 1983. The WHCP's primary treatment method has been chemical, supported by hand-picking, herding, and biological controls.

Current program herbicides include 2,4-Dichlorophenoxyacetic acid, dimethylamine salt (2,4-D), glyphosate, penoxsulam, and imazamox. Imazapyr may be added to the program once the California Department of Pesticide Regulation (CDPR) approves its use for water hyacinth. Chemical treatment is typically conducted with hand-held sprayers from aluminum air or outboard motor boats. The boats are equipped for direct metering of herbicides, adjuvants, and water into pump delivery systems. Trained field crews spray the chemical mixture directly onto the plants. For the seventeen years between 1983 and 2011, the DBW treated between 160 and 2,770 acres of water hyacinth a year (out of 67,779 water acres in the project area). The WHCP is intended to support beneficial uses under the Clean Water Act, and there have been no known measurable water quality or environmental degradation effects, including no known impacts to fish.

The DBW and cooperating counties halted the WHCP in 2000 after a legal action from the *Delta Keepers* claimed that the DBW must obtain a National Pollutant Discharge Elimination System (NPDES) permit from the Central Valley Regional Water Quality Control Board (CVRWQCB) under the 9<sup>th</sup> Circuit Court's *Talent Irrigation District v. Talent Irrigation District* decision. The DBW applied for the newly required NPDES permit in January 2000, and the

CVRWQCB developed permit conditions in October 2000, but did not issue a permit. In March 2001, the State Water Board issued the DBW a NPDES permit for the WHCP, incorporating most of the conditions developed by the CVRWQCB. One of the conditions of WHCP's NPDES permit required the DBW to develop a protocol to be followed to ensure that the WHCP operations provide a zone of passage to fish at all times. The original WHCP Fish Passage Protocol was developed in 2001 and implemented by the WHCP ever since. This protocol was incorporated into the 2009 WHCP Programmatic Environmental Impact Report (PEIR), and has been a component of WHCP operations since 2001.

Conditions and requirements have changed since the 2001 Fish Passage Protocol was developed. In March 2006, the CVRWQCB issued a NPDES General Permit for Aquatic Weed Control, replacing the prior NPDES permit. The WHCP has been following the NPDES General Permit requirements since 2006. Currently, the State Water Resources Control Board (SWRCB) is in the process of revising the NPDES General Permit for Aquatic Weed Control, with a final version expected in November 2012. The 2006 or 2012 NPDES permits do not require a fish passage protocol.

Since 2001, the DBW has also received biological opinions for the program. Conditions in the biological opinions by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) promote fish passage in Delta waters. WHCP environmental monitoring since 2001 has not found negative impacts to fish, or low dissolved oxygen levels that might impede fish passage. The WHCP has stopped using one herbicide (diquat), and is adding more reduced risk new herbicides (penoxsulam, imazamox, and in the future imazapyr), as evidence of their adaptive management program approach. Furthermore, herbicide labels for the two original WHCP herbicides (2,4-D and glyphosate) are now less restrictive in regards to measures to avoid dissolved oxygen impacts.

As a result of these significant changes, DBW and United States Department of Agriculture, Agricultural Research Service (USDA-ARS) have revised the fish passage protocol. A formal fish passage protocol is not required by the NPDES permit. However, DBW and USDA-ARS will implement this new fish passage protocol as a best practice to reduce the potential for negative effects on listed fish species movement near water hyacinth treatment sites.

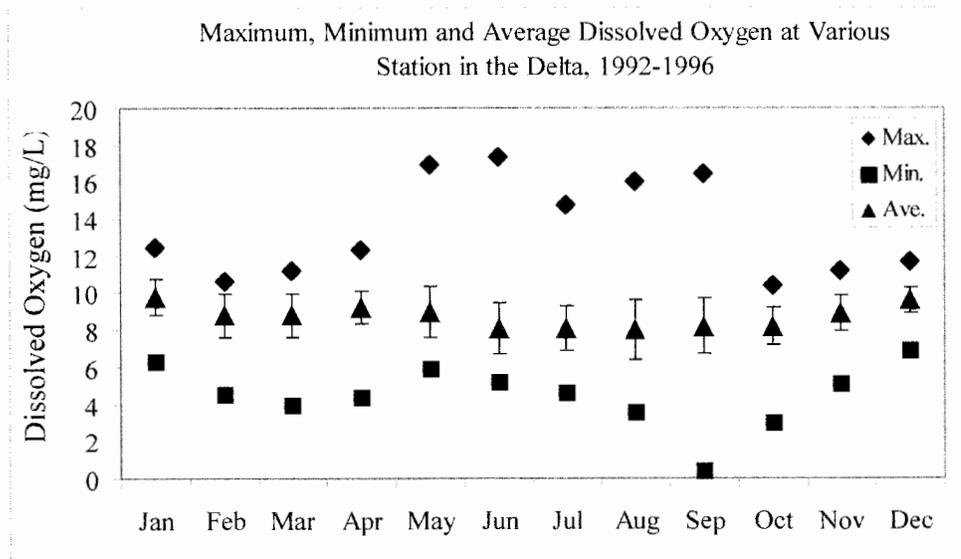
### **Dissolved Oxygen and Water Hyacinth**

Dissolved oxygen (DO) is the content of oxygen found in water. DO is determined by temperature, weather, water flow, nutrient levels, algae, and aquatic plants. Generally, a higher level of DO is beneficial to fish. Fish begin to experience oxygen stress or exhibit avoidance at levels below 5 mg/liter. Salmonids have been reported to actively avoid areas with low dissolved oxygen concentrations (Davis 1975 in Carter 2005). Fish will migrate to areas with higher DO levels. A 1990 study found that brookling trout moved away from water with DO concentrations of 1 to 1.9 mg/liter within one hour, moved away from water with DO concentrations of 2 to 2.9 mg/liter within one to two hours, and moved away more slowly from water with concentrations of 3 to 3.9 mg/liter (Carter 2005). Juvenile Chinook salmon avoided DO concentrations of 1.5, 3.0, and 4.5 mg/liter (Carter 2005). Salmonids are also likely to avoid water hyacinth mats in slow-moving waters and

shorelines. In a fish migration study in Washington State, juvenile coho salmon, steelhead, and cutthroat trout were all found to use the faster-moving and deeper water sections of the waterway (Zydlewski et al. 2002).

DO levels drop in warmer temperatures, and increase with precipitation, wind, and water flow. Running water, such as the tidal water in the Delta, dissolves more oxygen than still water. Diurnal tidal movement also mixes lower DO water that might be present under a growing or decaying water hyacinth mat with incoming, higher DO, water. High levels of nutrients in water reduce DO levels, while algae and aquatic plants can increase DO through photosynthesis, but decrease DO through respiration and decomposition. DO levels fluctuate throughout the day, and are typically lowest in the morning and peak in the afternoon. In deep, still waters, DO levels are lower in the hypolimnion (bottom layer of water) because there is little opportunity for oxygen replenishment from the atmosphere. As illustrated in **Exhibit 1**, DO levels measured at various locations in the Delta averaged between 8 and 9.8 mg/l.

### Exhibit 1.



Treatment of aquatic weeds with certain herbicides can result in a faster than natural decaying of plant biomass that may create a large biological oxygen demand, resulting in decreases in dissolved oxygen. DBW recognizes that decaying water hyacinth has the potential to temporarily reduce DO levels. The problem of low DO following herbicide treatment of water hyacinth is a concern when the herbicide is relatively fast-acting, such as 2,4-D, imazapyr, and to a lesser extent glyphosate. The labels for these three herbicides include recommendations to reduce the potential for DO impacts. The low DO following herbicide treatment may be amplified by the fact that DO levels under large water hyacinth mats can already be low. DBW conducts DO monitoring, as described in this document, to evaluate DO impacts following treatment. A further uncertainty as to the extent of potential low DO impacts on fish is that few native fish are found in water hyacinth mats (Hanni 2005).

**Table 1**, below, summarizes the herbicide label requirements regarding dissolved oxygen effects and timing of follow-up treatments, should they be required. Note that the follow-up treatment timing refers to treating previously treated plants a second (or more) time, not treating previously untreated plants in the same site. These requirements help to avoid negative impacts to fish resulting from decaying weeds.

**Table 1**  
**Summary of Herbicide Label Requirements Related to Dissolved Oxygen and Repeat Treatments** (Current as of October 2012)

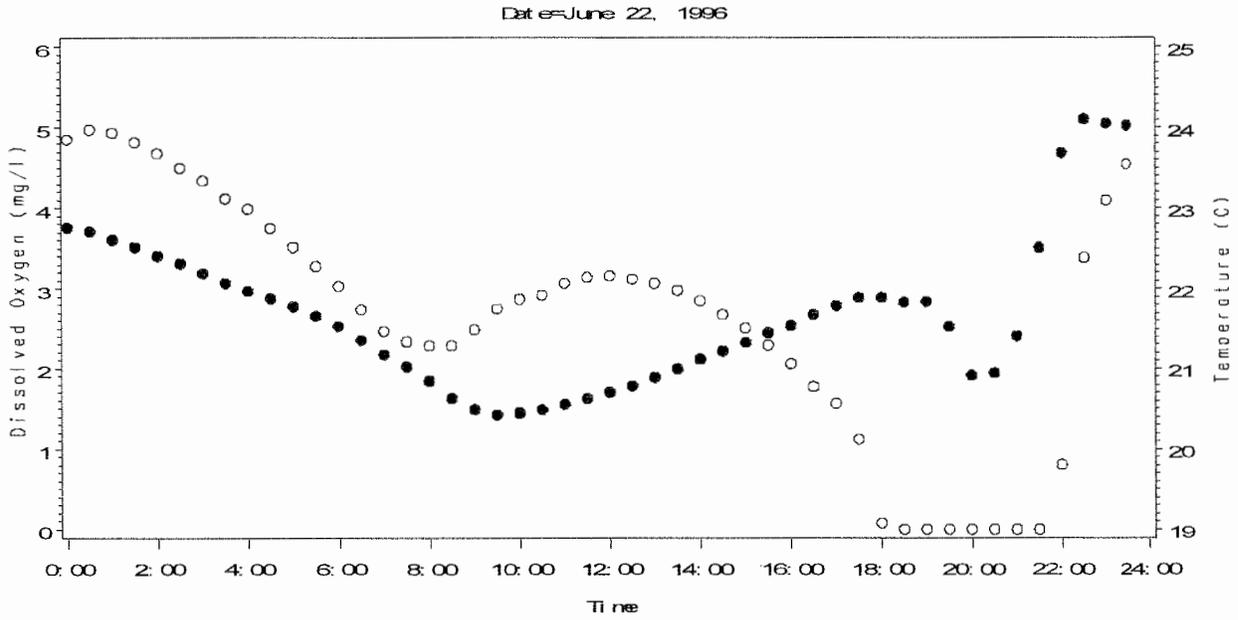
Herbicide	Dissolved Oxygen Requirements	Number of Treatments	Time Between Treatments
2,4-D	<u>It may be appropriate to treat only part of the infestation at one time. For example, apply the product in lanes separated by untreated strips that can be treated after the vegetation in treated lanes has disintegrated</u> (2-3 weeks in growing season). Begin treatment along the shore and move outward in bands to allow fish to move into untreated areas.	Two applications per season	21 days between applications
Glyphosate	When infestations require treatment of the total surface area of impounded water*, <u>treating the area in strips may avoid oxygen depletion</u> due to decaying vegetation.	May require retreatment	24 hours between applications
Penoxsulam	None	Not specified	Not specified
Imazamox	None	Up to 4 applications per season at 32 ounces per acre application rate	Not specified
Imazapyr	When infestations require treatment of the total surface area of impounded water*, <u>treating the area in strips may avoid oxygen depletion</u> due to decaying vegetation. Do not treat more than one-half of the surface area of the water in a single operation. Begin treatment along the shore and move outward in bands to allow fish to move into untreated areas.	Up to 3 applications per season at 32 ounces per acre application rate	10 to 14 days between treatments

\* The WHCP project area encompasses tidal and riverine waters, not impounded waters.

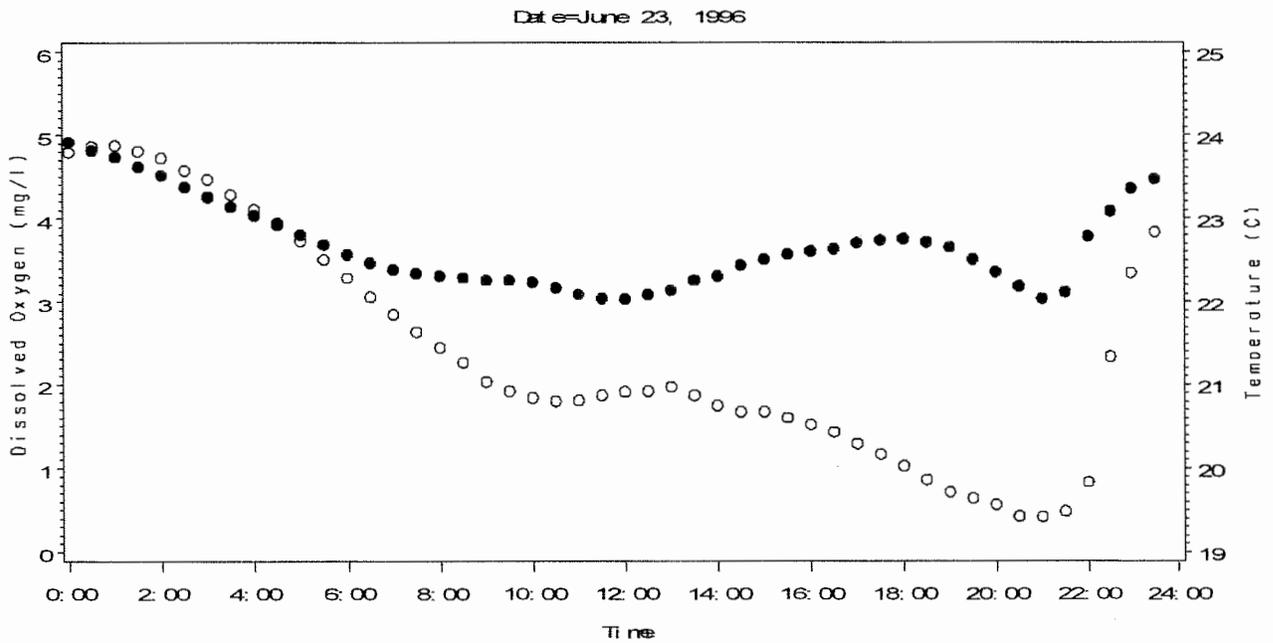
Existing DO levels in large water hyacinth mats are often already low, particularly in slower-moving waters and dead-end sloughs. Thus, with adequate avoidance measures, further decreases in dissolved oxygen that would impede fish passage can be avoided and/or minimized. Large patches of water hyacinth can cause low dissolved oxygen levels (Toft 2000). Data summarized below indicate that DO levels under water hyacinth mats are lower than DO levels elsewhere in the Delta. Toft found average spot DO measurements below 5 mg/l for water hyacinth and above 5 mg/l for pennywort (Toft 2000). In a similar study of DO in aquatic weeds in Texas, water hyacinth was found to have the lowest DO levels as compared to milfoil, hydrilla, pondweed, and a mix of native species, and was the only plant to have DO levels below 5 mg/l (Madsen 1997 in Toft).

Research in the Delta conducted by USDA-ARS measured DO levels every half-hour under a large mat of water hyacinth that completely covered a 15-meter wide slough on the Consumnes River Nature Preserve. The slough was subject to tidal flows. Over a four-day period in June 1996, DO levels each day ranged from 0mg/l to just over 5mg/l. Only about 5 of 200 data points measured under the mat were above 5mg/l, and the vast majority of the data points were between 2 mg/l to 4mg/l (Spencer 2001). The results of the DO testing are shown in **Exhibit 2**. These data indicate that large infestations of water hyacinth across waterways, such as those that have occurred on the Merced and San Joaquin Rivers prior to treatment, are likely to impede the passage of fish.

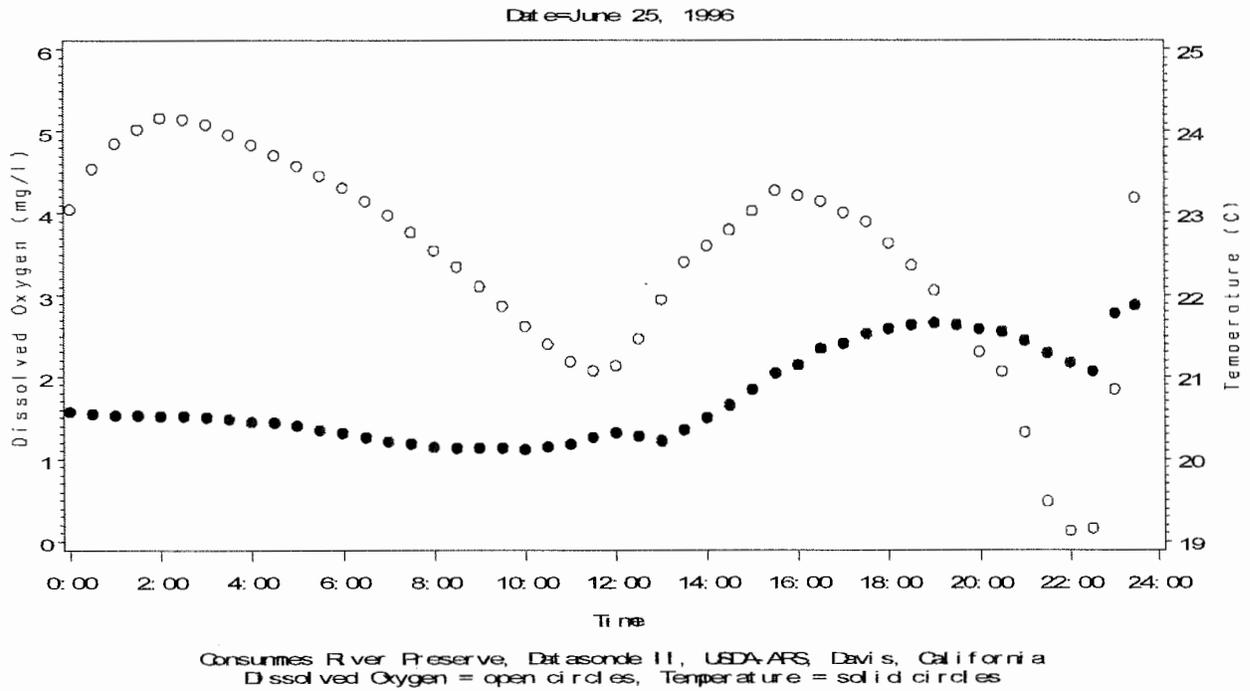
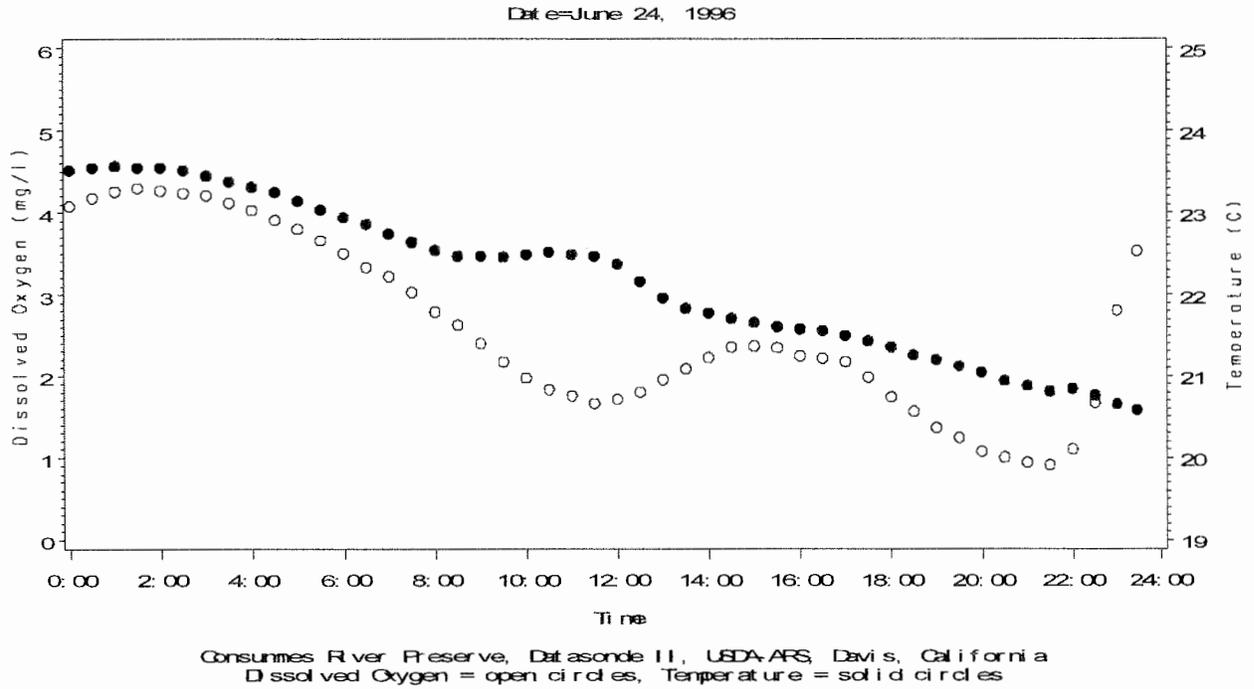
**Exhibit 2.** Four graphs depicting datasonde results under a dense mat of water hyacinth plants in a slough on the Consumnes River Nature Preserve.



Consumnes River Preserve, Datasonde II, USDA-ARS, Davis, California  
 Dissolved Oxygen = open circles, Temperature = solid circles



Consumnes River Preserve, Datasonde II, USDA-ARS, Davis, California  
 Dissolved Oxygen = open circles, Temperature = solid circles



## Results of WHCP Dissolved Oxygen Monitoring

DBW and USDA-ARS track two sets of DO monitoring. At every herbicide application, treatment crews take DO samples immediately prior to treating, and approximately one-hour post-treatment. These levels would be expected to be similar, as they occur a few hours apart and the potential for lowering DO due to decaying water hyacinth would not occur immediately post-treatment. Data from Daily Treatment Logs support that there is no significant impact on DO immediately post-treatment. Of 719 treatments occurring between 2007 and 2011, there were 13 cases with no change in DO, 404 cases with an increase in DO (average increase of 0.8 mg/l), and 302 cases with an average decrease in DO (average decrease of 0.6 mg/l). The average pre-treatment DO was 7.9 mg/l, and the average post-treatment DO was 8.1 mg/l. The minimum allowable DO in most of the WHCP program area is 5.0 mg/l. Both pre- and post-treatment levels are well above the 5.0 mg/l considered safe for fish.

The DO monitoring that occurs with follow-up water quality sampling would be more likely to show potential decreases in DO, as post-treatment sampling occurs several days after treatment, when plant death symptoms are starting to occur. However, representative DO monitoring data from 2011 shows that herbicide treatments do not significantly impact DO. The data below in **Table 2** provide 2011 treatment and post-treatment DO levels taken at the time of water quality sampling, on the day of treatment, and between four and seven days post-treatment. In five cases, DO levels increased. Note that the most significant increase occurred at Site 16, where existing DO was at an extremely low 2.06 mg/l prior to treatment (a level resulting in stress and avoidance for fish), and DO increased by six days post-treatment to 7.03 mg/l, a level safe for fish. In the other instance of extremely low DO prior to treatment at site 301, DO increased from 1.07 mg/l to 2.71 mg/l by five days post-treatment. In these two critical cases where DO levels prior to treatment were below levels safe for fish, DO levels improved following WHCP treatments. The average decrease in DO among the six 2011 monitoring sites with decreased DO was 0.79 mg/l, and in all cases where DO decreased, it was still well above the Basin Plan minimum of 5.0 mg/l. DBW and USDA-ARS will continue to monitor pre- and post-treatment DO levels.

**Table 2**  
**Comparison of Treatment and Post-Treatment Dissolved Oxygen Levels (in mg/l)**  
**(2011)**

Site	Days Post Treatment	Treatment DO	Post-Treat DO	Difference (Post-Treatment)
<b>2,4-D Treatments</b>				
13	6	7.18	7.09	(0.09)
14	5	8.46	7.23	(1.23)
15	6	7.74	7.73	(0.01)
16*	6	2.06	7.03	4.97
58	6	7.06	7.15	0.09
59	4	6.92	6.98	0.06
68	6	7.86	7.97	0.11
<b>Glyphosate Treatments</b>				
216	7	9.80	8.40	(1.40)
217	7	7.70	6.18	(1.52)
300	5	8.50	8.00	(0.50)
301*	5	1.07	2.71	1.64
Average increase for five increased DO sites:				1.37
Average decrease for six decreased DO sites:				(0.79)

\* Highlighted rows had DO levels harmful to fish prior to WHCP treatments.

If reductions in dissolved oxygen do occur, these decreases in DO resulting from treatment of water hyacinth are likely to be short-term since the Delta is a flowing rather than a standing water system. One of the long-term benefits of treating with herbicides is a reduction in the volume of water hyacinth in the Delta. Removing large patches of water hyacinth will allow DO levels to increase, thus enhancing the ability of fish to move unimpeded in Delta waters. It can be argued that such a benefit outweighs the impact of potential short-term localized decreases in dissolved oxygen.

### **Fish Passage Protocol**

There is very little quantitative information and/or scientific literature upon which to base treatment acreage limitations for a fish passage protocol, and even less information specific to the Delta environment. The previous 3 acre limitation was originally put forward by a member of the Water Hyacinth Task Force in the early 1980s as a precautionary limit to address potential for reductions in water quality beneficial uses. At the time the 3 acres was proposed, water hyacinth treatments started earlier in the season, before mats grew to the large acreage (sometimes over 50 acres) that can occur in today's Delta environment. Based on data summarized in this document, these large mats likely have a greater detrimental impact on dissolved oxygen than herbicide treatments.

The protocol below is based on combined recommendations of an aquatic weed expert, an herbicide company representative, the Pacific Northwest Weed Management Handbook, Washington State NPDES requirements, herbicide label requirements, Delta water conditions, prior dissolved oxygen monitoring data, the prior 3 acre limit, and literature on salmonid migration. The intent is to provide a fish passage protocol with numerical treatment limits that provide conservative fish protection, reflect actual Delta conditions, take into account the variability in treatment site size (6.5 acres to 1,707 acres) and consider field operation constraints.

1. In slow-moving and back-end sloughs infested with water hyacinth, DBW will treat up to 30 percent of the water hyacinth mat at one time. Mats will be treated in up to 3 acre strips, leaving at least 100 foot buffer strips between treated areas. The untreated buffer strips and remaining 70 percent of the water hyacinth mat will be treated at least three more times following the initial treatment (in 30 percent increments). These follow-up treatments will take place at three week intervals.
2. In Delta tidal waters, DBW will treat up to 50 percent of the water hyacinth mat at one time. Mats will be treated in up to 3 acre strips, leaving at least 100 foot buffer strips between treated areas. The untreated buffer strips and remaining 50 percent of the mat will be treated three weeks following the initial treatment for 2,4-D treatments, and one week following initial treatment for other herbicides.
3. If DO levels in an area to be treated are at a level considered to be detrimental to fish species prior to treatment (below 3 mg/liter), the DBW may treat the entire area (without the 3 acre strips or buffer strips), therefore allowing the DO levels to increase to beneficial use levels once the water hyacinth is controlled.
4. For each treatment site and herbicide application, DBW staff shall follow herbicide label requirements, as specified, to reduce the potential for low dissolved oxygen. Current requirements for WHCP herbicides are provided in Table 1.
5. When follow-up herbicide applications of previously treated plants are required, DBW staff shall follow herbicide label requirements, as specified, regarding the number of treatments and time between treatments.

Below, and in **Exhibit 3**, starting on page 12, we provide examples of the fish passage protocol. The large numerals in Exhibit 3 refer to the treatment number.

20 acre water hyacinth mat in a dead end slough site:

Treatment 1: 30% = 6 acres

Protocol – spray two strips of 3 acres each with 100 feet between strips

Treatment 2: 30% = 6 acres

Protocol – spray two strips of just under 3 acres each with 100 feet between strips, plus the previously untreated strip

Treatment 3: 30% = 6 acres

Protocol – spray two strips of just under 3 acres each with 100 feet between strips, plus the previously untreated strip

Treatment 4: 10% = 2+ acres

Protocol – spray the remaining 2+ acres, plus the previously untreated strip.

20 acre water hyacinth mat in a tidal site:

Treatment 1: 50% = 10 acres

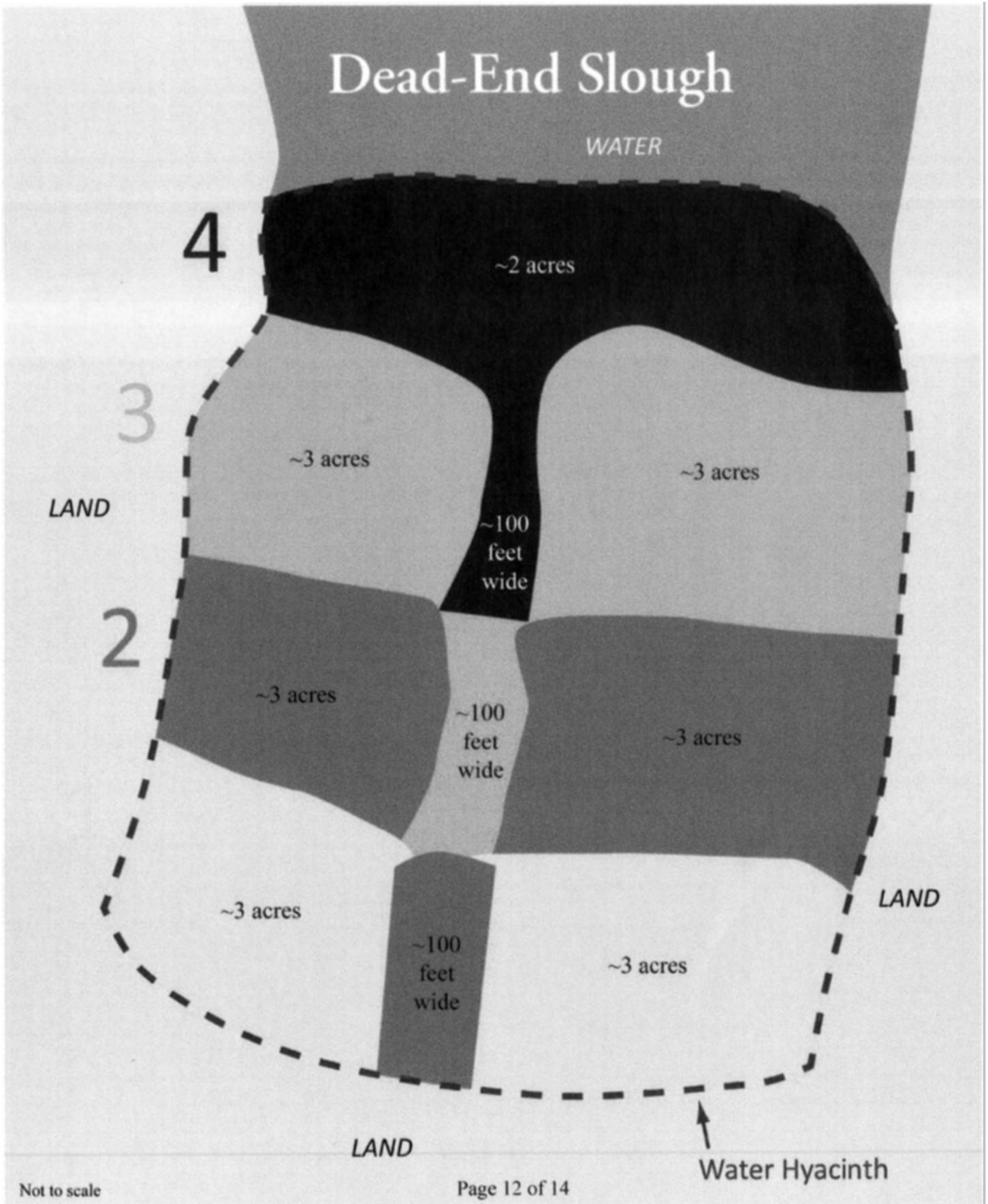
Protocol – spray three strips of 3 acres plus one strip of 1 acre with 100 feet between strips, or treat four 4 strips of 2.5 acres with 100 feet between strips

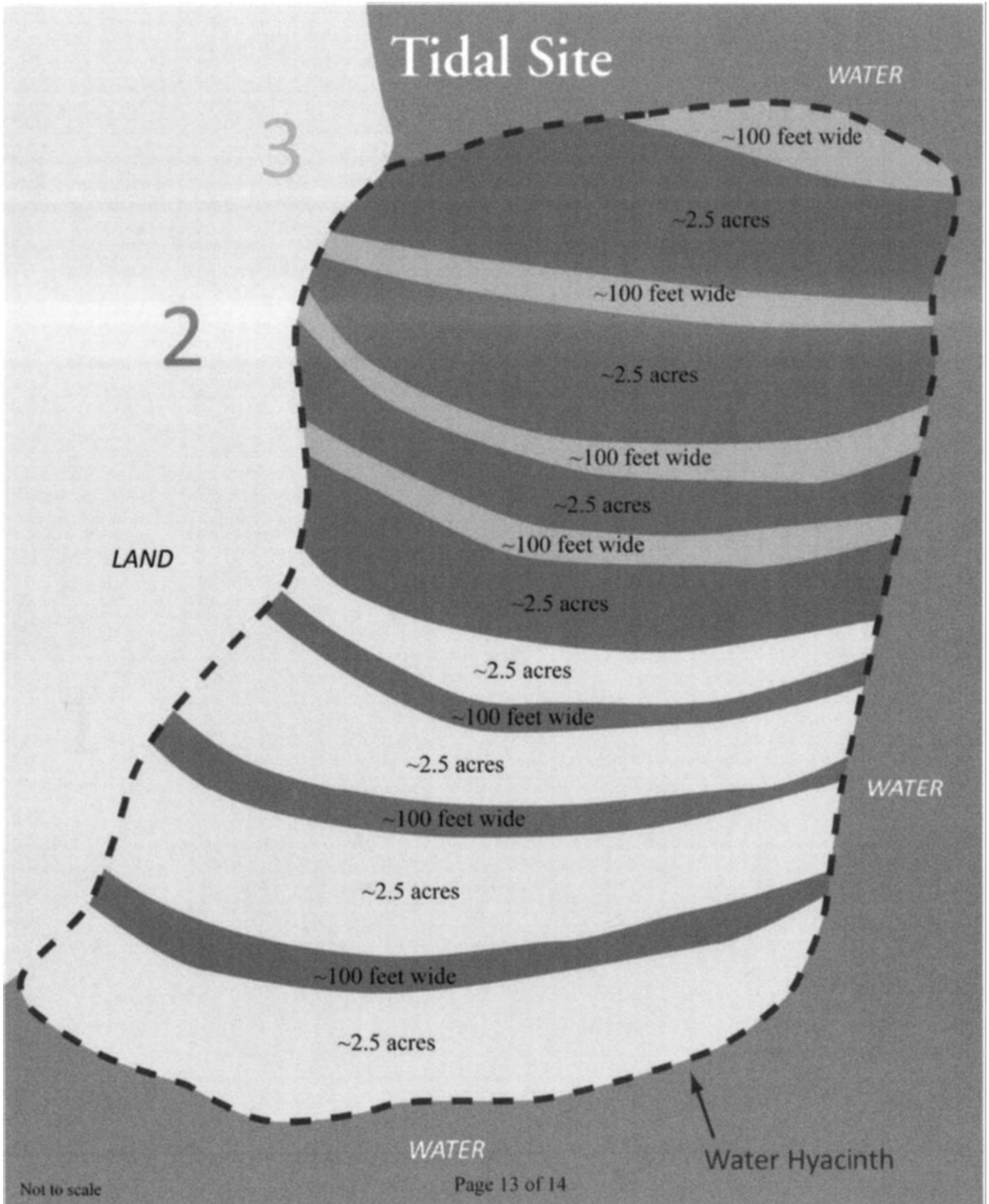
Treatment 2: 50% = 10 acres

Protocol – spray three strips of just under 3 acres plus one strip of 1 acre with 100 feet between strips, or treat four 4 strips of just under 2.5 acres with 100 feet between strips, plus previously untreated strips

Treatment 3: untreated strips

Protocol – spray remaining untreated strips from Treatment 2.





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CONTRACT NAME: Water Hyacinth

CONTRACT NUMBER: C1770800

REVIEWED AND RECOMMENDED  
FOR APPROVAL:

Department Head's Signature



Les Wright  
Agricultural Commissioner/Sealer

APPROVED AS TO LEGAL FORM:

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By:   
Deputy County Counsel

APPROVED AS TO ACCOUNTING FORM:

By:   
Oscar J. Garcia, C.P.A.  
Auditor-Controller/Treasurer-Tax Collector

FOR ACCOUNTING INFORMATION ONLY:

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Fund: 0001  
Program: 0  
Subclass: 10000