Attachment E – Notice of Intent

RECEIVED
NOV 19 2013
DIVISION OF WATER QUALITY

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# 5B34NP00007

C. ☑ Change of ownership or responsibility: WDID# ____

II. DISCHARGER INFORMATION

A. Name CA Department of Parks and Recreation, Division of Boating and Waterways			
B. Mailing Address One Capitol Mall, Suite 410			
C. City Sacramento	D. County Sacramento	E. State CA	F. Zip 95814
G. Contact Person Geoff Newman (Aquatic Weed Unit)	H. E-mail address Geoff.Newman@parks.ca.gov	I. Title Environmental Scientist	J. Phone 916-327-1862

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. ☐ Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger.
   Name of the conveyance system: ______
2. ☐ 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: Sacramento-San Joaquin Delta, its tributaries and Suisun Marsh

B. Regional Water Quality Control Board(s) where treatment areas are located (REGION 1, 2, 3, 4, 5, 6, 7, 8, or 9): Region 5
(List all regions where algaecide and aquatic herbicide application is proposed.)

V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms: ____

Water hyacinth (Eichhornia crassipes), South American Spongeplant (Limnobium laevigatum), and Egeria densa

B. Algaecide and Aquatic Herbicide Used: List Name and Active ingredients

Roundup Custom (glyphosate)
Weedar64 (2,4-D)
Clearcast (imazamox)
Galleon (penoxsulam)
SonarOne, SonarPR, and SonarQ (fluridone)

C. Period of Application: Start Date March 1 (annual) End Date November 30 (annual)

D. Types of Adjuvants Used:
Agri-Dex and Competitor

VI. AQUATIC PESTICIDE APPLICATION PLAN

Has an Aquatic Pesticide Application Plan been prepared and is the applicator familiar with its contents?
☑ Yes ☐ No

If not, when will it be prepared? ______

VII. NOTIFICATION

Have potentially affected public and governmental agencies been notified? ☑ Yes ☐ No

VIII. FEE

Have you included payment of the filing fee (for first-time enrollees only) with this submittal?
☐ YES ☐ NO ☑ NA

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: Sylvia Ortega Hunter

B. Signature: Sylvia Ortega Hunter **Date:** 11/19/13

C. Title: Deputy Director

XI. FOR STATE WATER BOARD STAFF USE ONLY

WDID:	**Date NOI Received:**	**Date NOI Processed:**
Case Handler's Initial:	**Fee Amount Received:** **$**	**Check #:**
☐ **Lyris List Notification of Posting of APAP**	**Date** ______	**Confirmation Sent** ______

CALIFORNIA DEPARTMENT OF PARKS AND RECREATION, DIVISION OF BOATING AND WATERWAYS

Water Hyacinth Control Program and Spongeplant Control Program Aquatic Pesticide Application Plan

November 2013

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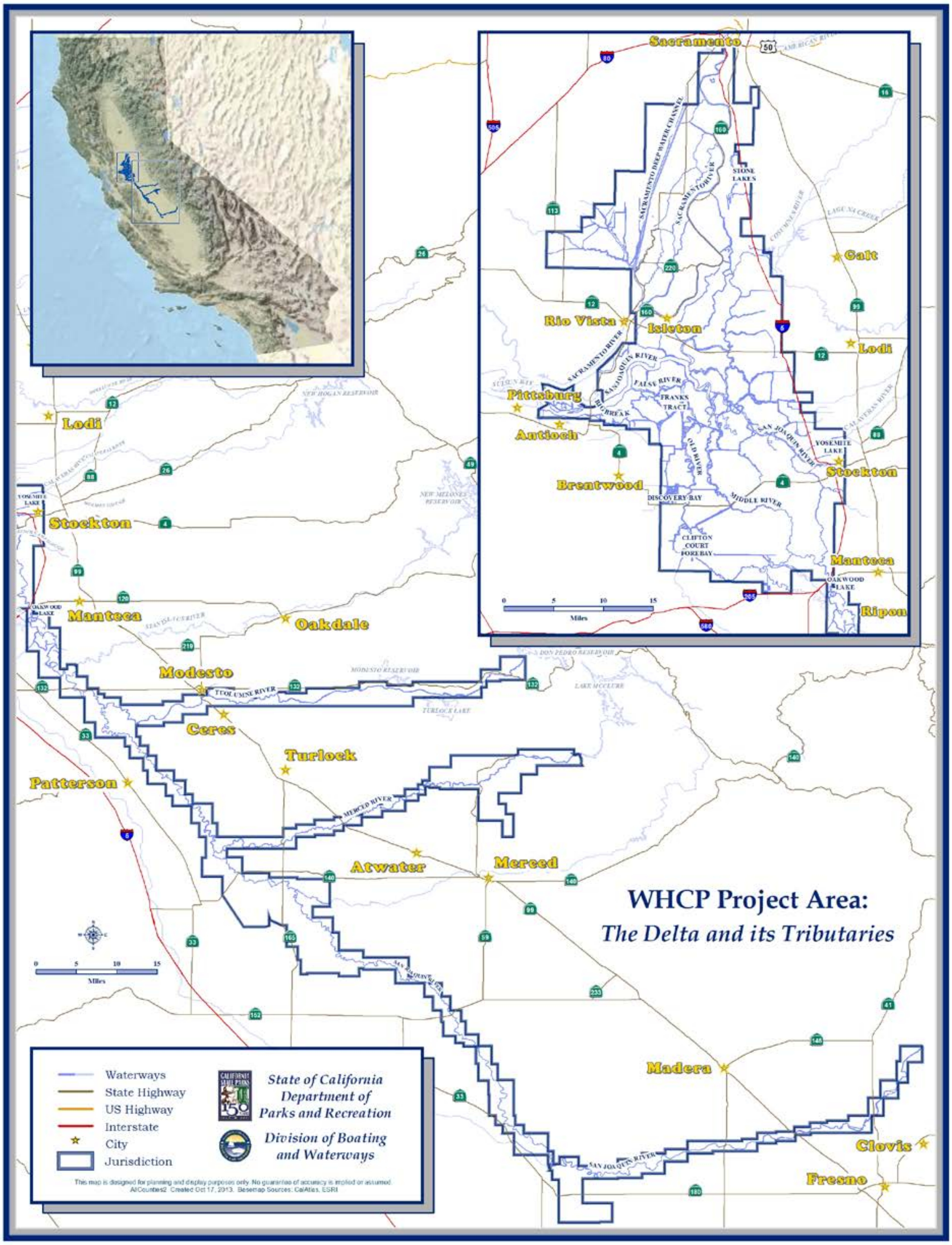
A. PROGRAM AREA

The Water Hyacinth Control Program (WHCP) and Spongeplant Control Program (SCP) cover an eleven-county region encompassing much of the Sacramento-San Joaquin Delta (Delta) and upland tributaries. The eleven counties are: (1) Alameda, (2) Contra Costa, (3) Fresno, (4) Madera, (5) Merced, (6) Sacramento, (7) San Joaquin, (8) Solano, (9) Stanislaus, (10) Tuolumne and (11) Yolo. All proposed sites where aquatic pesticides are applied are located in the Delta and its tributaries within the following general boundaries:

- 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 and Kings 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 La Grange Reservoir, below Don Pedro Reservoir; and
- East along the Merced River to Merced Falls, below Lake McClure.

The DBW conducts treatments in all counties with the exception of Merced County (treating the Merced River and portions of the San Joaquin River) and Fresno County (treating portions of the San Joaquin River and Kings River). These other two counties are treated under contract with the Merced and Fresno County Agricultural Commissioners, respectively. Figure 1, on the next page, illustrates the Delta and its tributaries in the eleven counties covered by the WHCP and SCP.

Figure 1. WHCP and SCP Project Area: The Delta and its Tributaries



B. TARGET SPECIES FOR CONTROL

The California Department of Parks and Recreation, Division of Boating and Waterways (DBW) implements WHCP and SCP which is an aquatic weed program designed to control the growth and spread of water hyacinth and spongeplant in the Delta and its tributaries.

Water hyacinth

Water hyacinth (*Eichhornia crassipes*) is a non-native, invasive, free-floating aquatic macrophyte. Water hyacinth is often noted in the literature as one of the world's most problematic weeds (Gopal 1987, Cohen and Carlton 1995, Batcher 2000). Native to the Amazon region of South America, it has spread to more than 50 countries on five continents and creates significant problems in Africa and Southeast Asia (Cohen, Carlton 1995).

Water hyacinth was introduced into the United States in 1884 at the Cotton States Exposition in New Orleans when display samples were distributed to visitors and extra plants were released into local waterways. By 1895, water hyacinth had spread across the Southeast and was growing in 40-km long mats that blocked navigation in the St. Johns River in Florida (Cohen and Carlton 1995).

Water hyacinth was first reported in California in 1904 in a Yolo County slough. It spread gradually for many decades, and was reported in Fresno and San Bernardino Counties in 1941 and in the Delta in the late 1940s and early 1950s. There were increased reports of water hyacinth in the Delta region during the 1970s, and by 1981, water hyacinth covered 1,000 acres of the Delta, and 150 of the 700 miles of waterways (USACE 1985). The invasion of water hyacinth in the Delta was slower than in the southeast, probably due to water flow stabilization and the more temperate climate in the Delta (Toft 2000).

Water hyacinth is characterized by showy lavender flowers and thick, highly glossy leaves up to ten inches across. These features have made water hyacinth a favorite in ornamental ponds and it can be readily purchased at aquatic nurseries. The plant grows from 1.5 to 4 feet in height, and the floating portion of a single plant can grow to more than four feet in diameter. As much as 50 percent of a single water hyacinth's biomass can be roots, which extend to a depth of up to two feet in the water (Batcher 2000).

Water hyacinth grows in wetlands, marshes, shallow ponds, slow-moving waters, large lakes, reservoirs, and rivers (Batcher 2000). Water hyacinth often forms monospecific mats across sloughs and other waterways (Batcher 2000, Cohen and Carlton 1995). The mats are dispersed by winds and currents (Batcher 2000). In the Delta, water hyacinth is found in sloughs, connecting waterways, and tributary rivers. The growing season for water hyacinth in the Delta is typically from March to October. Plants reduce growth and frost can kill foliage during the cold winter months. However, the majority of plants do not die; stem bases often survive and begin to develop new foliage in spring as the weather warms (DiTomaso and Healy 2003). Plants can tolerate extremes of water level fluctuation and seasonal variations in flow velocity, extremes of nutrient availability, pH, temperature, and toxic substances (Gopal 1987). However water hyacinth cannot tolerate salinity above 16 ppt (DiTomaso and Healy 2003).

Water hyacinth reproduces both vegetative and sexually. Seeds often sprout along the muddy shorelines, and drop into the water with high tides. In vegetative reproduction, short runner stems (stolons) radiate from the base of the plant to form daughter plants (Batcher 2000). Nursery areas include slow moving waterways, temporarily isolated oxbow lakes, Tule stands along channel margins, and stagnant, dead-end sloughs. Small colonies of plants separate and form floating mats that drift downstream, infesting new areas. When water hyacinth extends into faster channels, or when higher flows occur, plants are torn away from their mats and moved by currents and wind until they encounter obstructions such as marinas, irrigation pumps, or backwater areas (USACE 1985). Water hyacinth spreads and grows rapidly under favorable temperature and nutrient conditions (warmer temperatures and higher nutrient levels). Mats weigh up to 200 tons per acre and surface area may double in size in six to fifteen days (Harley et al. 1996).

Spongeplant

South American spongeplant (*Limnobium laevigatum*) is a non-native, invasive, floating to rooted perennial with foliage that may be confused with that of water hyacinth (DiTomaso and Healy 2003). It is native to tropical and subtropical Central and South America. Spongeplant seeds produce extremely small, floating seedlings that appear similar to duckweed (*Lemna* spp.). Spongeplant has a juvenile form that has thick, spongy, floating, spatula-shaped leaves, usually with rounded tips on stalks. At maturity, small white flowers may develop in spring or summer. Like water hyacinth, spongeplant spreads vegetatively, as well as through seed production.

Currently, California is the only state with a South American Spongeplant invasion. The eastern US has issues with a similar plant American frogbit (*Limnobium spongia*), which is a native perennial of the southern and eastern US. American frogbit is not known to occur in any western states. South American spongeplant was first seen in California near Arcata and Redding in 2003. This highly invasive aquatic plant has since spread as far south as Fresno County, and was seen in the Sacramento-San Joaquin Delta in 2008.

Spongeplant has many similarities to water hyacinth, and if it spreads in the Delta it would be expected to be at least as problematic and difficult to manage, if not more so. Several characteristics make spongeplant a concern: (1) spongeplant is a prolific seed producer, (2) spongeplant seeds are able to survive at least three years, making control extremely difficult, (3) spongeplant is much smaller than water hyacinth, with 2,000 to 2,500 plants per square meter, (4) spongeplant disperses readily by wind, currents and tidal action, (5) spongeplant's smaller size makes it more difficult to exclude from irrigation pumps, potable water intakes, and other areas than water hyacinth, (6) spongeplant has a relative growth rate nearly twice as fast as water hyacinth, (7) spongeplant forms characteristic dense mats that outcompete native plants, and (8) spongeplant mats may result in low dissolved oxygen, affecting pH and nutrient cycling. Spongeplant seedlings are approximately 1/8th inch in diameter, can easily stick to waterfowl or watercraft and be transported to new locations, or can become hidden among other vegetation until they have grown to their mature size of 8 to 12 inches.

B.1 PROBLEMS ASSOCIATED WITH WATER HYACINTH AND SPONGEPLANT

Water hyacinth creates serious problems in the Delta and worldwide. The DBW has spent approximately $5.3 to $6.0 million a year for Delta water hyacinth control in recent years. South American spongeplant is still in an early invasion state in California. DBW's approach will be to keep spongeplant from becoming a significant problem. Adverse impacts of water hyacinth and spongeplant fall into three general categories: (1) boating and recreation; (2) agriculture; and (3) ecosystems.

B.2 PROBLEMS RELATED TO BOATING AND RECREATION

In the 1970s and early 1980s, there were a growing number of complaints about water hyacinth by boaters and marina operators in the Delta (USACE 1985). Delta marina operations lost an estimated $600,000 in 1981 due to unusable slips and launch ramps, reduced sales, increased rental boat repairs, and labor and equipment to deal with the water hyacinth problem according to the San Joaquin Delta Marina Association (USACE 1985).

Water hyacinth blocks waterways, impedes navigation, presents a safety hazard to boating and water recreation, and leads to hull damage when boats collide with obstructions hidden under water hyacinth (USACE 1985). Many Delta harbors and marinas have been forced to restrict operations because water hyacinth blocked facilities and damaged boats. Boats are unable to launch due to closed ramps and boat motors are damaged by overheating when water cooling systems become plugged with plant material. The houseboat rental industry and other marina businesses have reported reductions in the use of their facilities due to water hyacinth (USACE 1985).

After halting the control program in 2000 in response to the Delta keeper's lawsuit, DBW received new complaints from marina operators that were unable to launch boats and were losing revenue due to water hyacinth.

Without a coordinated effort by the DBW to treat water hyacinth and spongeplant, the potential exists for private citizens and marina operators to use their own control methods. These *ad hoc* treatments result in: 1) potentially inappropriate selection of control methods that may not be efficacious; 2) improper application rates for aquatic herbicides; and 3) significant adverse impacts to fish, wildlife, and water quality.

B.3 PROBLEMS RELATED TO AGRICULTURE

Water hyacinth has significant negative impacts on agriculture and water conveyance systems in the Delta. The plant blocks pumping facilities, including those at the Delta Mendota Canal, the Tracy Pumping Plant, and the California Aqueduct near Clifton Court Forebay (USACE 1985). In the early years of the control program, the Bureau of Reclamation estimated that the DBW program saved the Bureau $400,000 a year in reduced operating and maintenance costs associated with removing water hyacinth from the Tracy Pumping Plant (DBW 1991).

Water hyacinth also interferes with pumping at numerous smaller water diversion structures. There are approximately 1,800 irrigation intakes throughout the Delta in which water hyacinth has the potential to clog, resulting in inefficient pumping, increased pumping costs, and possible mechanical failure of pumps. In a letter to the U.S. Army Corps of Engineers (USACE) in 1981, the San Joaquin Farm Bureau Federation stated that growers were facing increased costs from efforts to unclog channels where water hyacinth decreased water flow to pumps and clogged screens. Water hyacinth also spreads into irrigation and drainage systems (USACE 1985), and impairs the use of fish protective devices such as fish screens (CALFED 2000).

The Army Corps of Engineers report also noted that water hyacinth interferes with swimming, fishing in infested areas, and the aesthetic enjoyment of the waterway. In addition, real estate values are reduced in areas adjacent to water hyacinth covered waterways (USACE 1985). Spongeplant has the potential to negatively impact agriculture and water conveyances in a similar way to water hyacinth if not worse.

B.4 PROBLEMS RELATED TO ECOSYSTEMS

The Delta ecosystem is a critically important part of California's natural environment and the ecological hub of the Central Valley. In addition, it is perhaps one of the most invaded ecosystems worldwide, with over 200 invasive non-native species (Cohen and Carlton 1995). Cohen and Carlton found that non-native species accounted for 40 to 100 percent of common species at many sites (Cohen and Carlton 1995). Water hyacinth and spongeplant are part of a nationwide invasion of non-native species. Spongeplant is still in its early dispersal and establishment phase. However, controlling the infestation in the Delta will be challenging due to tidal flows, river flows, and the likelihood of dispersed populations being hidden behind taller plants (Anderson 2011).

Water hyacinth is labeled as an invasive habitat modifier. It provides a structurally complex canopy; roots in the water column and leaves above water provide habitat for both native and non-native species. The CALFED Ecosystem Restoration Program Plan states that "these weeds [water hyacinth] are extremely dangerous because of their ability to displace native plant species, harm fish and wildlife, reduce food web productivity, or interfere with water conveyance and flood control systems" (CALFED, 2000). Similarly, the U.S. Fish and Wildlife Service (USFWS) notes that excessive water hyacinth growth outcompetes native vegetation and clogs waterways, impeding and impairing aquatic life (USFWS 1995). The dense mats block sunlight, inhibiting photosynthesis in algae and submersed vascular plants (CALFED 2000, USFWS 1995). Water hyacinth increases sedimentation and accretion of organic matter, inhibits gaseous interchange with the air, reduces water flow, and depletes oxygen, all of which harm other aquatic organisms (CALFED 2000). In addition, organic fallout can influence the benthic zone (Toft 2000) and alter ecosystem processes such as nutrient cycling, hydrologic conditions, and water chemistry (CALFED 2000).

In the Stone Lakes National Wildlife Refuge in Sacramento County, the USFWS found that fish and wildlife habitat would be "greatly degraded or lost completely on shorelines, shallow water, and deepwater areas" if water hyacinth was allowed to grow unchecked (USFWS 1995). Even smaller infestations of water hyacinth along shorelines can prevent ducks, turtles, snakes, and frogs from seeking shelter (USFWS 1995).

Toft found significant differences in insect densities in water hyacinth and pennywort (a native aquatic plant), with increased taxa richness and diversity of invertebrates in pennywort in the early summer. While water hyacinth had a greater number of species later in the summer, there were fewer native species (Toft 2000). Water hyacinth increases mosquito habitat by providing larval breeding sites where mosquito predators cannot reach (CALFED 2000), creating microhabitats for the vectors of malaria, encephalitis, and schistosomiasis (USFWS 1995). Water hyacinth also competes with native plants, including Mason's lilaeopsis, a special status species (CALFED 2000).

Toft and others have found lower levels of dissolved oxygen under water hyacinth canopies. Average spot measures were below 5 mg/L in water hyacinth (the minimum level for fish survival) and above 5 mg/L in pennywort (Toft 2000). These results were supported by a study in Texas which found lower dissolved oxygen in water hyacinth compared to other aquatic weeds, and a University of California Davis study which found dissolved oxygen levels of as low as 0 mg/L below a solid water hyacinth mat (Toft 2000). Toft hypothesizes that the lower dissolved oxygen levels explain the absence of epibenthic amphipods and isopods beneath the water hyacinth canopy at one of the test sites (Toft 2000).

C. CONTROL TOLERANCES

The DBW has taken an approach where action is necessary if water hyacinth and/or spongeplant are visible anywhere in a Delta waterway. Water hyacinth is constantly moving throughout the Delta with river currents and diurnal tidal movement. Due to its rapid growth and ability to spread, water hyacinth is present everywhere in the Delta. Similarly, spongeplant can quickly and easily disperse throughout the Delta. The DBW will prioritize treatment sites based on the extent of the water hyacinth and spongeplant growth and the degree of navigational impairment to the public waterway. The DBW will make an attempt to treat water hyacinth and spongeplant, subject to permit terms and conditions, label restrictions, and DBW manpower constraints.

D. AQUATIC PESTICIDES IN REGARDS TO CONTROL TOLERANCES

The DBW has divided the Delta and tributaries into zones (generally within west, north, central and south). Annually, each application crew will be assigned an area. The areas are further divided into "sites." Sites vary in size, and may be between one and three miles in length. Each application crew works throughout the year to control those sites contained in their area. Water hyacinth and spongeplant treatments can occur at up to 418 possible treatment sites throughout the Delta, based on where it is observed. To the best extent possible, treatments will be planned using a combination of current field observations, prior infestation history, and DBW staff knowledge.

The Aquatic Weed Unit Program Manager, Field Supervisor, Environmental Scientist and Field Crew work together before each treatment season begins to identify which sites have the highest water hyacinth infestation and any spongeplant infestation. Maps showing the 418 possible treatment sites are provided in Figures 2 and 3.

Because the DBW has manpower constraints, the DBW continuously attempts to prioritize treatment areas based on several factors, including: (1) whether or not the site is a nursery area, (2) current infestation levels, (3) potential for infestation, and (4) whether the site is important for navigation, public safety, recreation, and /or commercial use. To do this, the DBW conducts periodic on-site field surveys to assess water hyacinth and spongeplant infestation at treatment sites. Application Specialists and Application Technicians are asked to conduct field surveys or provide information on current field conditions. These surveys may involve traveling to a site to visually assess the level of water hyacinth or spongeplant infestation.

The Field Supervisor may update, revise, or reprioritize the site list over the course of the treatment year based upon new information about the treatment sites. For example, the DBW receives telephone calls from the public regarding new water hyacinth infestations which may cause a reprioritization of the treatment sites. The Field Supervisor also may reprioritize treatment sites to maximize efficacy based on new information on patterns of water hyacinth movement and spongeplant sightings in the Delta.

Figure 2. WHCP and SCP Project Area - Northern Sites

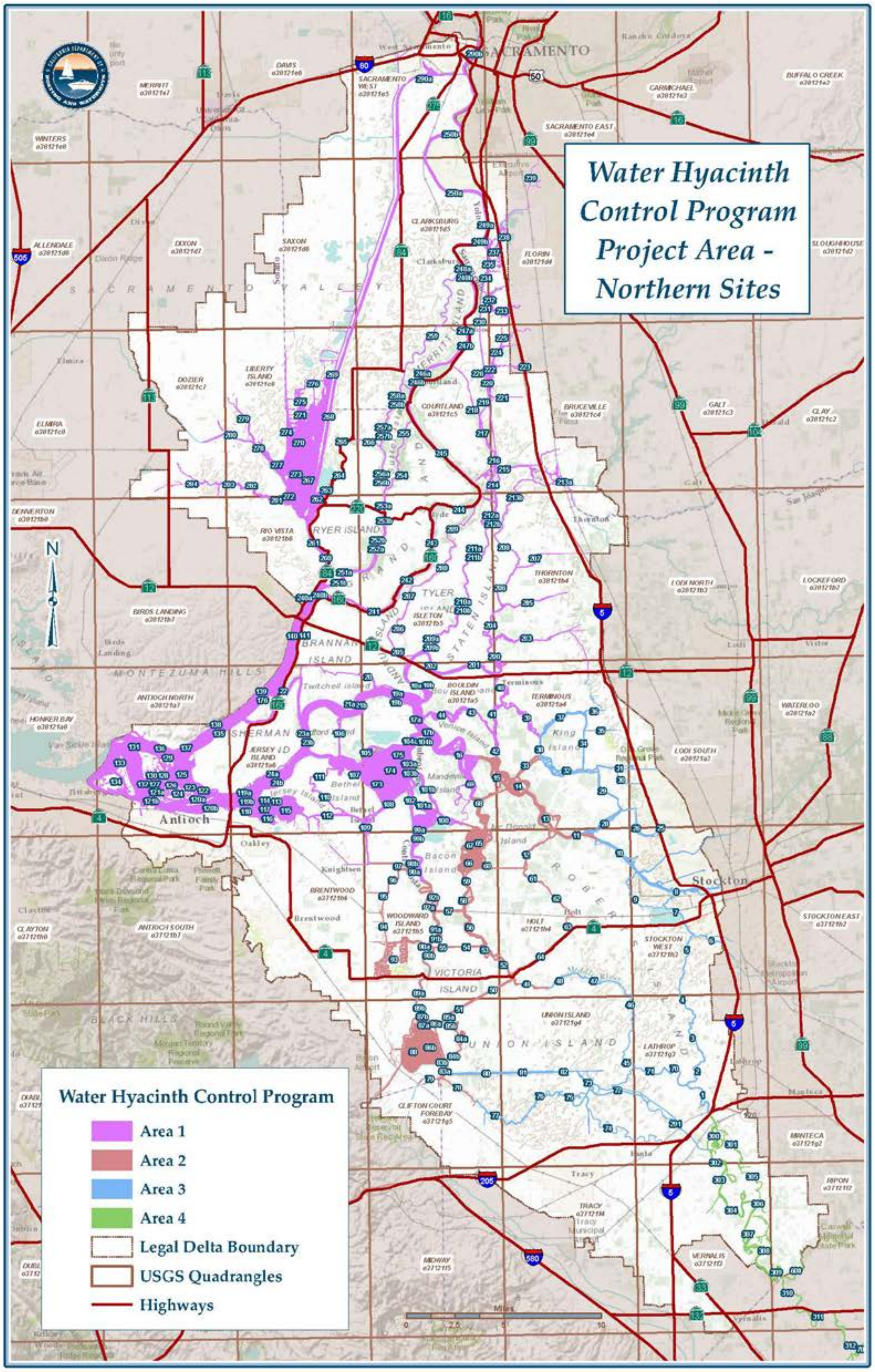
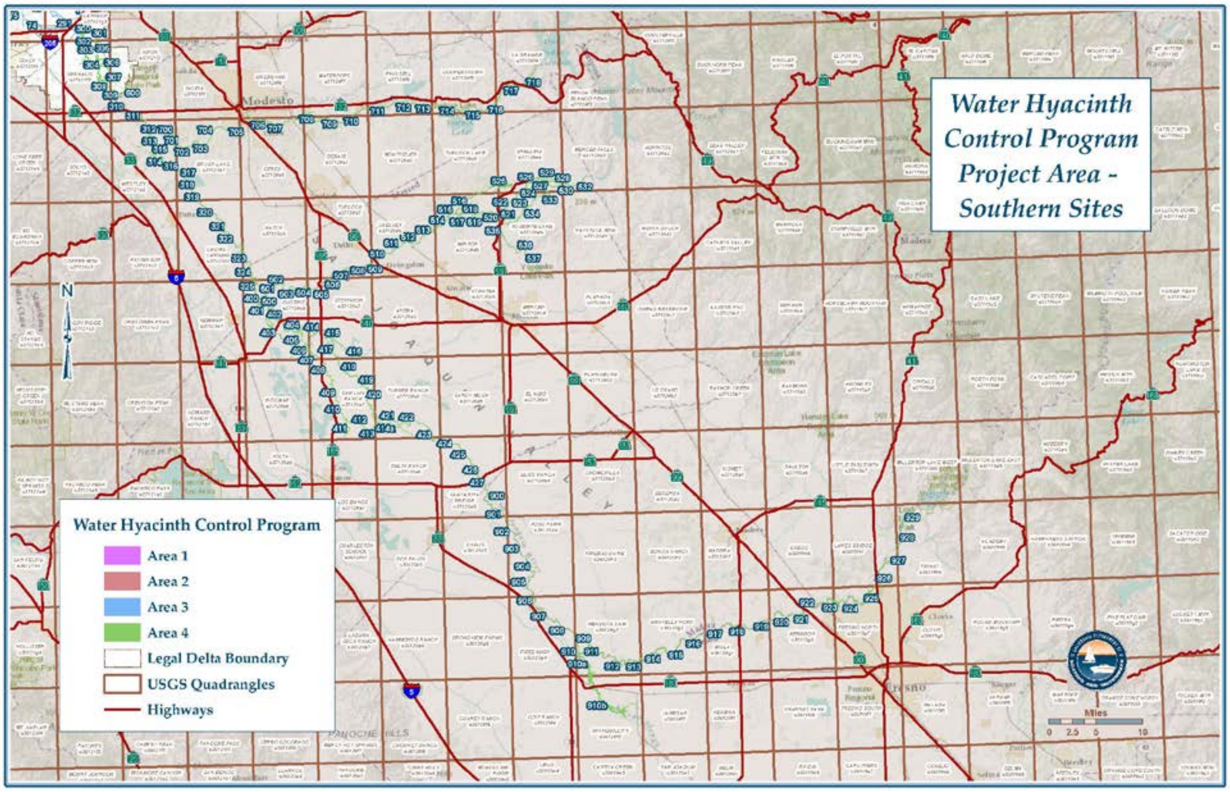


Figure 3. WHCP and SCP Project Area - Southern Sites



E. AQUATIC PESTICIDES, ADJUVANTS, AND APPLICATION METHODS

The DBW reviewed information on available registered aquatic herbicides to determine those that could be used for treatment of water hyacinth in the Delta and its tributaries. Presently, the DBW has selected the following four registered aquatic herbicides, each of which is labeled for the control of water hyacinth and spongeplant. These herbicides are used in combination with the adjuvants Agri-Dex and Competitor. Table 1 and the following sections describe current herbicides and adjuvants used by DBW's WHCP and SCP.

Table 1. Herbicides, Ingredients, and Degradation By-Products

Herbicide	Active Ingredient	Degradation by-products	Adjuvant	Application Method
Weedar 64	2,4-D	See Section E.1	Agri-Dex or Competitor	Hand spot
Roundup Custom	Glyphosate	Aminomethylphosphonic acid, glyoxylic acid, and carbon dioxide	Agri-Dex or Competitor	Hand spot
Galleon	Penoxsulam	See Section E.3	Agri-Dex or Competitor	Hand spot
Clearcast	Imazamox	See Section E.4	Agri-Dex or Competitor	Hand spot

These herbicides and adjuvants are applied at labeled rates in accordance with California laws and regulations. The DBW may substitute the name-brand herbicides identified above with other herbicides containing the same active ingredients to improve the economics or effectiveness of the program. Descriptions of each of the aquatic herbicides and the adjuvants are provided in the following section.

For the SCP, the program will be similar to that of WHCP, but on a smaller scale. In 2013, DBW was authorized to begin treating spongeplant using the same treatment methods, chemicals, monitoring procedures, and conservation measures as for water hyacinth. Currently, DBW is utilizing glyphosate to control spongeplant. Herbicides and adjuvants being evaluated for the SCP include those listed above and also potentially Diquat and Triclopyr. Should the DBW begin to use either Diquat or Triclopyr, the DBW will update this APAP to include the appropriate herbicide descriptions.

In the past the DBW has used the adjuvant R-11 and Placement for the WHCP. Currently, the DBW has elected to use the adjuvant Agri-dex for the WHCP based on its relatively limited environmental impacts.

E.1 2,4-D, DIMETHYLAMINE SALT (WEEDAR 64, EPA REG NO. 71368-1-ZB)

2,4-Dichlorophenoxyacetic acid, dimethylamine (DMA) salt or 2,4-D is a post-emergent, systemic herbicide specific to broadleaf plants. It is most effective in plants with leaf surface area large to absorb sufficient quantities of herbicide. Historically, it was the primary chemical used in the WHCP since the program's inception in 1983, but current restrictions in timing and locations in which 2,4-D can be used are leading to a reduction in overall use. Also, 2,4-D has been used in the United States since the 1940s. The active ingredient in this herbicide is 2,4-Dichlorophenoxyacetic acid dimethylamine salt. The salt formulations of 2,4-D has been shown to be less toxic to aquatic animals. It is water soluble and chemically stable. 2-4-D is absorbed through the leaves and within four to six hours progresses through the plant via the phloem. The herbicide mimics plant the regulating hormone auxin, leading to rapid cell division and abnormal growth patterns. Plant metabolism is affected through modification of enzyme activity, respiration, nucleic acid synthesis, protein synthesis, cell division, and congestion of the phloem blocking food transport. This subsequently leads to plant death.

2,4-D is highly effective for water hyacinth control, especially if applied during warm weather. During periods of warmer weather, water hyacinth shows signs of dying within hours of applying 2,4-D. Usually, within one to two weeks, plants are completely dead, and within three to four weeks water hyacinth mats have either floated away or sank. The 2,4-D chemical has a relatively short half-life, and is considered biodegradable. The herbicide 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 in a set of pools was 10-11 days. The half-life in a study using natural waters ranged from 0.5 to 6.6 days (HSDB 2001). Another study reported an aqueous photolysis half-life for 2,4-D of 13 days and an aqueous aerobic half-life of 15 days (Walters 1999). In normal conditions 2,4-D residues are not persistent in soil, water, or vegetation. Breakdown products of 2,4-D detected in lab experiments included 1,2,4-benzenetriol, 2,4-dichlorophenol (2,4-DCP), 2,4-dichloroanisole (2,4-DCA), 4-chlorophenol, chlorohydroquinone (CHQ), volatile organics, bound residues, and carbon dioxide. 2,4-D degrades to compounds expected to be of low occurrence in the environment and of low to no toxicological significance (Gervais et al 2008).

2,4-D is approved for aquatic use in ponds, lakes, rivers, reservoirs, marshes, bayous, drainage ditches, canals, and streams that are quiescent or slow moving. For treating water hyacinth, 2,4-D is used with drift control agents and is applied using a broadcast spray method. 2,4-D should not be applied when there is a temperature air inversion, or where the herbicide could drift onto grapes, tomatoes, fruit trees, cotton, or other desirable broadleaf crops.

The 2,4-D chemical was first registered for use in the United States in 1948, and by 1978, there were 40,000 scientific articles on the herbicide (Industry Task Force II 2006). Questions about the safety of 2,4-D and other phenoxy herbicides were first raised in the late 1970s when there were thought to be a link with cancer (U.S. EPA 1980). The 2,4-D chemical and another phenoxy herbicide, 2,4,5-T were the two primary ingredients in Agent Orange, the controversial defoliant used in the Vietnam War and linked to serious heath affects, primarily due to the contaminant, dioxin (Munro et al. 1992, USEPA 1980). In 1979, the EPA suspended the use of 2,4,5-T and considered taking action against 2,4-D, but determined that, unlike 2,4,5-T, the continued use of 2,4-D does not pose “an imminent hazard or unreasonable adverse effect when used according to label precautions and directions for use” (U.S. EPA 1980).

The EPA recommended additional studies, which have been ongoing since 1980. The Industry Task Force II on 2,4-D Research Data funded over $30 million in independent scientific research on 2,4-D. These research studies and other studies of 2,4-D, appear to show no link between 2,4-D and cancer. The Science Advisory Panel of the U.S. EPA has given a Class D cancer classification to 2,4-D, meaning “not classifiable as to human carcinogenicity,” and has required additional animal studies of 2,4-D. Another broad review of toxicology data on 2,4-D found that “the adjuvant, impurities, and inert ingredients possibly detected in 2,4-D formulations are of no toxicological concern since they either fall under the EPA regulations or are virtually non-detectable in present day formulations (Munro et al. 1992).” However, the International Agency for Research on Cancer, classified 2,4-D (and the entire family of phenoxy herbicides) as possibly carcinogenic (Cox 2006). Studies of farmers exposed to 2,4-D support this classification. In addition, studies on 2,4-D exposure published since 2000 indicate mutagenicity of the herbicide, significant effects on the immune and reproductive systems (Cox 2006).

The 2,4-D chemical is a restricted use pesticide in California. The DBW has obtained a restricted use permit from each County Agricultural Commissioner in the counties where the program operates. Due to the extensive amount of agriculture in the Delta, to avoid adverse impacts to agricultural crops, all herbicide treatments are closely coordinated with the County Agricultural Commissioners' Office. The DBW uses appropriate safety precautions and applies 2,4-D at rates that are consistent with the protocol described in the herbicide label.

2,4-D is applied with hand held sprayers operated from 19- to 21-foot aluminum air or outboard boats. The boats are equipped for direct metering of herbicides, adjuvant, and water into the pump system of the spraying unit. The pump forces a mixture of the three components through a chemical resistant hose to a handheld spray gun. Trained field crews spray the chemical mixture directly onto the water hyacinth or spongeplant.

E.2 GLYPHOSATE (ROUNDUP CUSTOM, EPA REG NO. 524-343-ZG)

Glyphosate is a broad spectrum, non-selective systemic herbicide active ingredient. It has been utilized since the WHCP’s inception and has recently been applied on more total acreage in response to restriction on 2,4-D. Beginning in 2013, DBW used glyphosate to control spongeplant. Glyphosate is water soluble and mixes readily with water and nonionic surfactant. Glyphosate (Roundup Custom) moves through the plant via translocation from the foliage to the root system. Glyphosate prevents the synthesis of certain amino acids essential for the plant’s survival. It inhibits activity of the acetolactate synthase (ALS) enzyme that regulates the production of valine, leucine and isoleucine. Visible effects are a gradual wilting and yellowing of the plant, advancing to complete browning and eventual decay. Visible effects on water hyacinth and spongeplant typically occur within 3 or more weeks, with complete necrosis and decomposition within 60 to 90 days.

Studies show that glyphosate is not persistent in the water column. The half-life of glyphosate in pond water ranges from 12 days to 10 weeks (EXTONET 1996). When glyphosate comes in contact with sediment it binds to soil particles, removing it from the water column and leaving it unavailable for plant uptake. Glyphosate stays in contact with soil until it is degraded through a biological degradation process carried out by soil micro flora under both aerobic and anaerobic conditions. Glyphosate degradation in soil yields aminomethylphosphonic acid (AMPA) and glyoxylic acid. Both products are further degraded to carbon dioxide (Miller at al. 2010).

Glyphosate is best used during the late growth stages approaching maturity when water hyacinth is growing at or beyond the early bloom stage. Glyphosate is less effective in extremely cool or cloudy weather following treatment. Its efficacy can also be greatly reduced if used with water that contains more than average silt content. Glyphosate will bind to soil and it will lose most of the chemical required to neutralize the target plant. It can be applied in all bodies of fresh water: flowing, non-flowing, or transient. However, there are no restrictions on the use of treated water for irrigation, recreation, or domestic purposes. However, glyphosate should not be applied directly to water within ½ mile upstream of an active potable water intake unless the water intake is turned off for a minimum period of 48 hours after application. Due to the extensive amount of agriculture in the Delta, to avoid adverse impacts to agricultural crops, all herbicide treatments are closely coordinated with the County Agricultural Commissioners' Office. The DBW applies Roundup Custom at rates that are consistent with the protocol identified in the herbicide label.

Glyphosate is applied with hand held sprayers operated from 19- to 21-foot aluminum air or outboard boats. The boats are equipped for direct metering of herbicides, adjuvant, and water into the pump system of the spraying unit. The pump forces a mixture of the three components through a chemical resistant hose to a handheld spray gun. Trained field crews spray the chemical mixture directly onto the water hyacinth or spongeplant.

E.3 PENOXSULAM (GALLEON, EPA REG NO. 67690-47)

Penoxsulam is a broad spectrum systemic herbicide. This herbicide inhibits the enzyme acetolactate synthase, which regulates the production of three essential amino acids: valine, leucine, and isoleucine. ALS inhibitors slowly starve plants of these amino acids, eventually killing the plants by halting DNA synthesis. Penoxsulam is absorbed 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). Penoxsulam has been identified as providing excellent control for water hyacinth in Florida (Langeland et al 2009).

Penoxsulam has low to moderate water solubility, and is very mobile in soil (USEPA 2007). This herbicide degrades into eleven major and two minor degradates: BSTCA, TPSA, 2-Amino TP, BSA, 2-Amino TCA, 5-OH, 2-Amino TP, BSTCA methyl, BST, Di-FESA, 5-OH – penoxsulam, sulfonyl-formamidine, sulfonamide, and 5-OH XDE638 (USEPA 2007). None of these metabolites or degradates have been identified as having a higher toxicity potential than penoxsulam (Washington DOE 2012). In water, penoxsulam breaks down primarily by photolysis, with some microbial degradation. There are several factors that can influence photolytic degradation which include water depth, water clarity, plant density and season. The half-life of penoxsulam in water ranges from 1.5 to 14 days. In sediment, penoxsulam is expected to degrade rapidly through anaerobic degradation (USEPA 2007).

There are no label restrictions for penoxsulam regarding dissolved oxygen, as the slow-acting nature of this herbicide should have minimal impact on dissolved oxygen levels (Washington DOE 2012). However, WHCP and SCP will maintain existing monitoring measures related to dissolved oxygen to evaluate potential reductions in DO. The DBW shall apply Galleon at rates that are consistent with the protocol identified in the herbicide label.

The WHCP and SCP have not previously used penoxsulam for chemical control, however, the DBW currently plans to test and utilize the new herbicide in the future. Penoxsulam is applied with hand held sprayers operated from 19- to 21-foot aluminum air or outboard boats. The boats are equipped for direct metering of herbicides, adjuvant, and water into the pump system of the spraying unit. The pump forces a mixture of the three components through a chemical resistant hose to a handheld spray gun. Trained field crews spray the chemical mixture directly onto the water hyacinth or spongeplant.

E.4 IMAZAMOX (CLEARCAST, EPA REG NO. 241-437-67690)

The active ingredient, imazamox, is in the imidazolinone herbicide family and is a relatively fast-acting systemic herbicide. It is similar to penoxsulam in that it is an ALS inhibitor and blocks the synthesis of three essential amino acids: leucine, isoleucine, and valine. Imazamox is absorbed into the foliage and translocated throughout the plant via 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). Imazamox has been identified as an excellent herbicide for controlling water hyacinth in Florida (Langeland et al 2009).

The primary method of degradation of imazamox in surface water is photolytic. 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). 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 carboxylic acid group (USEPA 2008). Imazamox has a low potential for bioaccumulation and is unlikely to accumulate in sediments.

There are no label restrictions regarding dissolved oxygen, however, DBW will follow the same monitoring procedures as for other herbicides to evaluate potential for low DO level impacts to endangered species. The DBW applies Clearcast at rates that are consistent with the protocol identified in the herbicide label.

The WHCP and SCP have not previously used imazamox for chemical control, however, the DBW currently plans to test and utilize the new herbicide in the future. Imazamox is applied with hand held sprayers operated from 19- to 21-foot aluminum air or outboard boats. The boats are equipped for direct metering of herbicides, adjuvant, and water into the pump system of the spraying unit. The pump forces a mixture of the three components through a chemical resistant hose to a handheld spray gun. Trained field crews spray the chemical mixture directly onto the water hyacinth or spongeplant.

E.5 ADJUVANTS

When applicable, the DBW will use the adjuvants Agri-Dex or Competitor to reduce drift, increase deposition, and increase retention of the herbicides described above. Historically, the DBW has used Bivert, R-11, and Placement as adjuvants. Currently these adjuvants are not being used in favor of Agri-Dex.

Agri-Dex and Competitor will be applied with hand held sprayers operated from 19- to 21-foot aluminum air or outboard boats. The boats are equipped for direct metering of herbicides, adjuvant, and water into the pump system of the spraying unit. The pump forces a mixture of the three components through a chemical resistant hose to a handheld spray gun. Trained field crews spray the chemical mixture directly onto the water hyacinth or spongeplant.

E.5.1 AGRI-DEX

Agri-Dex (CA Reg No. 5905-50017-AA) is a nonionic blend of surfactants and spray oil that is designed for use with a broad range of pesticides where an oil concentrate adjuvant is recommended. The active ingredients include a paraffin base petroleum oil and polyoxyethylate polyol fatty acid esters. Agri-dex improves pesticide application by modifying the wetting and deposition characteristics of the spray solution, resulting in a more even and uniform spray deposit. The active ingredients in Agri-Dex are paraffin base petroleum oil and polyoxyethylate polyol fatty acid esters. It will be used with each herbicide at rate of approximately one to four pints per 100 gallons of spray solution. Agri-Dex is applied at rates that are consistent with the herbicide and Agri-Dex labels.

E.5.2 COMPETITOR

Competitor (CA Reg No. 2935-50173) is a modified vegetable oil containing a non-ionic emulsifier system. The active ingredients are ethyl oleate, sorbitan alkylpolyethoxylate ester, and dialkyl polyoxyethylene glycol. It may be based as an adjuvant with aquatically labeled pesticides. Competitor has not been used previously in the WHCP or SCP, however it will be used as alternate adjuvant in the future. Competitor will be used at a rate of one to four pints per acre. Competitor will be applied at rates that are consistent with the herbicide and Competitor labels.

F. HERBICIDE USE REPORTING

F.1 PEST CONTROL RECOMMENDATION

For each season, a licensed Pest Control Advisor (PCA) shall write the Pest Control Recommendation (PCR) for all application areas. DBW may have a pesticide manufacturer representative write a PCR as long as the representative is a PCA and the PCR is reviewed and approved by a licensed PCA DBW staff member.

DBW may write PCRs for contract applicators that are hired to apply restricted pesticides. Contract applicators will operate under all WHCP and SCP permits and this Application Plan. Contract applicators also will be responsible for using all equipment and aquatic herbicides legally, and for filing Daily Logs, weekly NOI's, and monthly Pesticide Use Reports with DBW.

Application crews shall:

- ❑ Have a copy of the appropriate PCR with them at time of application.
- ❑ Understand the PCR before making an application. If clarification is necessary, the Field Supervisor or Assistant Field Supervisor (designee) should be contacted.
- ❑ Follow PCR application rates, hazard and use restrictions, and application protocols.
- ❑ Record the PCR application rate on the Daily Log at the time of application.

F.2 NOTICE OF INTENT

Each week, application crews shall contact Aquatic Weed Unit staff at the DBW Headquarters and provide a Notice of Intent (NOI) and site information for the week they will be spraying. The following information is necessary for NOIs:

- ❒ Application specialist name and program
- ❒ Site number
- ❒ Spray dates
- ❒ County/counties where spraying will occur
- ❒ Chemicals to be used

Before an NOI of application sites is provided, the application crew shall consult with the ES to determine if the presence of Endangered Species will prevent a scheduled application. The ES will consult several different state and federal fish surveys. If listed species are likely to be present, the Field Supervisor will identify alternate treatment sites for that week.

Many factors influence whether a site can be treated. As a result, it is possible applications can be cancelled up until, and including, the day of treatment. Where possible, alternative sites should be included on the list submitted to the DBW Headquarters. DBW Headquarters Office staff will prepare NOIs, submit them to the appropriate CACs, and agencies and send a copy to the field offices (i.e., Stockton).

F.3 PUBLIC NOTIFICATION

The NPDES permit requires notification to potentially affected public agencies at least 15 days prior to the first chemical application. The notification includes the following information:

1. A statement of DBW's intent to apply aquatic herbicides
2. Names of the aquatic herbicides
3. Purpose of use
4. General time period and locations of expected use
5. Any water use restrictions or precautions during treatment
6. A phone number that interested persons may call to obtain additional information from DBW.

G. HERBICIDE APPLICATOR RESPONSIBLITIES

G.1 CERTIFICATION

All DBW application and contracted crews, who apply aquatic herbicides, must have at least one person who has obtained a Qualified Applicators Certificate (QAC). The California Department of Pesticide Regulation (CDPR) is responsible for examining and licensing QACs. All applicator specialists must have a QAC. Applicator technicians also are encouraged to work toward obtaining a QAC.

The QAC signifies proficiency in:

- Reading and understanding pesticide labels
- Proper methods of mixing and applying pesticides
- Handling and disposing of pesticides and pesticide containers
- Recognizing pesticide poisoning symptoms
- Proper use of protective equipment
- Other information related to proper pesticide handling and application.

To obtain a QAC, an individual must pass the Qualified Applicator Certificate examination, category “F” (Aquatic), administered by the CDPR. To assist an applicant with the examination, the CDPR website provides suggested study materials and applicable laws and regulations. Information on QAC testing and requirements, see the CDPR website at http://www.cdpr.ca.gov/docs/license/qac.htm.

To pass the Qualified Applicator Certificate examination, category “F” (Aquatic), applicators must demonstrate competency in:

- Principals of limited area application
- Water use situations and potential for downstream effects
- Secondary effects caused by incorrect formulations and faulty applications
- Competency, practical knowledge, and understanding of pesticide impacts to:
    - Plants
    - Fish
    - Birds
    - Beneficial insects
    - Other organisms present in aquatic environments.

To retain possession of a QAC, the certificate holder must complete at least 20 hours of continuing education every two years (four hours covering the topic of pesticide laws and regulations). Information on continuing education is provided on the CDPR website at http://www.cdpr.ca.gov/docs/license/conted.htm. The CDPR accredits, and posts the schedule for, continuing education classes.

Applicators are trained to apply aquatic herbicides in a manner consistent with labeled rates. Staff is trained to read and understand pesticide labels and to properly handle, mix, and apply pesticides (in accordance with California Food and Agriculture Code and Title 3 of the California Code of Regulations). Applicators are trained to follow pest control recommendations as well as any specific restrictions imposed by the County Agricultural Commissioners.

G.1.1 ENVIRONMENTAL AWARENESS TRAINING

DBW environmental scientists provide environmental compliance training to all chemical application crew members (DBW and contracted). Environmental compliance training consists of training to identify threatened and endangered species associated with the WHCP and SCP, species' life history, associated habitat and conservation measures. Each trainee is provided a species of concern identification manual. Field crew members have received field training on giant garter snake habitat evaluation.

DBW application crews are trained on WHCP and SCP daily protocols, avoidance and minimization measured to protect species under the ESA, and chemical treatment restrictions. Chemical treatment restrictions emphasize dissolved oxygen requirements, specific start dates for WHCP and SCP areas, and types and amount of chemical that can be applied in WHCP and SCP areas. Training also outlines how environmental monitoring activities are integrated into chemical application events.

G.1.2 EQUIPMENT TRAINING

DBW application crews are trained on the use of dissolved oxygen meters, and field data collection tablets and associated software.

G.2 PRE-TREATMENT PROTOCOL

The application crew will record the following information on the Daily Log:

- ❑ Date
- ❑ Crew (names)
- ❑ Boat number
- ❑ Boat hour meter (start)
- ❑ Date regular maintenance performed on boat (and answer associated questions in maintenance box)
- ❑ Site number
- ❑ County
- ❑ Hours (beginning time)
- ❑ Quantity of herbicide and adjuvant taken

The application crew should perform a visual survey for the species of concern and complete the Environmental Observations Checklist. All boxes must be completed on the Environmental Observations Checklist. If no species is observed, the application crew should check "no" in the appropriate box on the form. Application crews will survey and document the applicable species of concern using the provided Species Identification Deck. This is a brief survey. **If any sensitive species are present at the site, the application crew should not perform the treatment.**

The application crew shall utilize a dissolved oxygen meter to take dissolved oxygen and temperature readings and record the following information on the Daily Log:

- ❒ Water temperature (ºF) (beginning of treatment)
- ❒ Dissolved oxygen (DO) concentration (mg/L) (beginning of treatment)
- ❒ Beginning UTM (Easting and Northing) using the GPS device
- ❒ Weather conditions
- ❒ Date of last spray equipment calibration

The application crew should use the wind meter available on each boat to measure the wind speed and record this information in the Daily Log. **If the wind speed is greater than 10 mph, the application crew should not perform the treatment. In Contra Costa County, the wind speed restriction is 7 mph maximum.**

Concurrent with completing the hard copy of the Daily Log, the application crew should also complete electronic data collection using the DBW Aquatic Weed Data Collection System. This program runs on a tablet computer. The program is based on "pull down" menus, and is used by application crews to record the following information:

- ❒ Quantity of chemical – beginning of day
- ❒ Quantity of chemical – end of day
- ❒ Quantity of chemical used during the day (in each site)
- ❒ Date
- ❒ Site number
- ❒ Boat number
- ❒ Personnel names
- ❒ Type of herbicide used
- ❒ herbicide units (i.e., gallons)
- ❒ Herbicide rate and orifice size
- ❒ UTM (Universal Transverse Mercator) data
- ❒ Coordinates of spray line
- ❒ Dissolved oxygen
- ❒ Temperature

- ❒ Wind speed
- ❒ Presence of elderberry shrubs
- ❒ Presence of species of concern
- ❒ Calibration information
- ❒ Leak inspection notes

Based on this pre-treatment data, the application crew should determine whether the application meets applicable NPDES permit conditions for a treatment. **No treatment can be performed when dissolved oxygen is between 3.0 mg/L and Basin Plan Limit as follows:**

- ❒ 7.0 mg/l in the Sacramento River (below I Street Bridge) and in all Delta waters west of the Antioch Bridge
- ❒ 6.0 mg/l in the San Joaquin River (between Turner Cut and Stockton), September 1 through November 30
- ❒ 5.0 mg/l in all other Delta waters
- ❒ 5.0 in the San Joaquin River, south to Mendota Pool
- ❒ 7.0 in the Tuolumne River, east to Site 711
- ❒ 8.0 mg/l in the Tuolumne River from site 711 and east between October 15 and June 15, and 7.0 mg/l between June 16 and October 14
- ❒ 7.0 mg/l in the Merced River, east to Site 512
- ❒ 8.0 mg/l in the Merced River from site 512 and east
- ❒ 7.0 mg/l in the San Joaquin River, east of Mendota Pool, and in Fresno Slough

In cases where the treatment requires water sampling, the application crew should travel to the site with the Monitoring Crew. At the site, the Monitoring Crew and application crew should discuss how the site will be treated (based on tidal factors). The application crew should flag both the start of the application area and the end of the application area. Before the first treatment starts, the Monitoring Crew will take pre-treatment sample upflow of the application area and within the application area (adjacent to a water hyacinth mat). For the WHCP and SCP, the application crew will spray the site for at least one hour. The Monitoring Crew will then take post-treatment samples downflow of the application area, at least one hour following the pre-treatment sample.

The application crew will calibrate the spray equipment as needed and conduct the treatment. The treatment shall be conducted at labeled rates and consistent with the PCR and applicable permit requirements from the (1) United States Fish and Wildlife Service (USFWS), (2) The National Ocean and Atmospheric Administration, National Marine Fisheries Service (NMFS) and National Pollutant Discharge Elimination System (NPDES) General Permit.

G.3 POST-TREATMENT PROTOCOL

The application crew will record the amount and type(s) of herbicides and adjuvant used during each application on the Daily Log. All application crews will complete a Daily Log at the end of the day that will include the following information:

- ❑ Boat hour meter (end)
- ❑ Water temperature (ºF) (end of treatment)
- ❑ Hours (ending time)
- ❑ Dissolved oxygen (DO) (mg/L) concentration (end of treatment)
- ❑ Ending UTM (Easting and Northing) using the GPS device (end of treatment)
- ❑ Total acres treated (each treatment)
- ❑ Amount of herbicide and adjuvant used and rate of application. 2,4-D is recorded in gallons. Glyphosate is recorded in gallons. Consult each site PCR for rate information
- ❑ Orifice size

Once the fieldwork is complete, the application crews submit Daily Logs to the DBW Headquarters office. Headquarters office staff maintains and manages field data as necessary.

Headquarters will regularly (i.e., weekly) download field data collected using the GPS devices. These data are currently cross checked (QA/QC'd) with data from the Daily Logs for accuracy and integrity.

The Field Supervisor should assure the integrity and quality of the Daily Log information which is submitted to DBW Headquarters. The Field Supervisor should review Daily Logs to assure all information is included and the information is accurate.

DBW Headquarters staff will prepare a Pesticide Use Report to the County Agricultural Commissioner that includes the amount of herbicide used, acreage, and number of applications. This report is submitted on a monthly basis.

H. APPLICATION AREA AND TREATMENT AREA

Depending on field conditions, permit restrictions, and the level of water hyacinth and spongeplant infestation throughout the Delta in a given year and treatment season, the DBW will treat up to 418 sites (the total number of sites the DBW has identified in the Delta system and its tributaries). Some of these sites may be treated several times in a given season.

For each application event (as defined in Water Quality Order (WQO) No. 2013-0002-DWQ, General Permit No. CAG990005), there will be a unique application area and treatment area (as shown on pg. A-2 of the WQO No. 2013-0002-DWQ). For a given application event at a site, the application area will represent the area within the site that is actually sprayed by the crew. The treatment area will represent the area within the site impacted by the treatment, and will include both the application area and receiving waters.

It is impossible for the DBW to identify all possible application areas and treatment areas that occur in a given treatment season. However, the DBW can say with certainty that the application and treatment areas in the system will be within the 418 sites in the Delta and its tributaries, and each application area and treatment area will meet the definitions contained within WQO No. 2013-0002-DWQ.

For each application event, the DBW records the location (coordinates) of the application area treated by the crew using a global positioning system (GPS) device. The DBW uses these data in its Pesticide Use Reports and provides these data to the Central Valley Regional Water Quality Control Board (CVRWQCB) in its WHCP and SCP annual reports.

I. ALTERNATIVE CONTROL METHODS AND THEIR LIMITATIONS

During previous years of the WHCP and SCP, the DBW considered and tested a broad range of alternative control methods before selecting the chemical control methods as the primary control method described in Section E. This section describes the alternative control methods that the DBW considered for the WHCP and SCP.

I.1 MANUAL AND MECHANICAL CONTROL METHODS

Alternative control methods for water hyacinth and spongeplant include mechanical and manual removal of plants and the use of floating diversion booms or screens to contain the plants.

Machines that have been used in limited areas to effectively remove water hyacinth include land-based scoops or conveyors, and equipment that utilize cutters and conveyors to physically remove plant from the water, and onto the bed of the equipment. These machines are costly to operate and maintain, usually around $1,500 to $3,000 per acre (Cohen and Carlton 1995). Mechanical harvester evaluations in Florida exhibited costs ranging from $13,200 to $39,500 per hectare. Estimated costs for mechanical control in a Sacramento-San Joaquin River Delta water delivery canal were $47,400 per hectare (Greenfield et al 2006). There are additional problems with mechanical harvesting: (1) plant fragments produced during harvesting can generate new plants; (2) mechanical harvesting is ineffective if weed density is too high; (3) it indiscriminately harms fish and other organisms that reside in the weeds, (4) disposal of water hyacinth is difficult and costly due to the large biomass of the plant and the potential for contamination from heavy metals absorbed by the plant; and (5) it is not effective in infestations dispersed along shorelines.

In December 1983, the Contra Costa Water District conducted mechanical harvesting of water hyacinth in the Contra Costa Canal (DBW 1983). A mechanical harvester, the 20-horse power Altostar, was used with a trailer and truck to remove the water hyacinth and deposit it on a levee. The Water District had difficulty in pulling the trailer down the bank, and the operation was quite slow. In 38 hours of operation, about ½ acre of water hyacinth was removed at a cost of $5,000. The DBW concluded that this mechanical harvesting system was inadequate. Complete removal of water hyacinth from the test area would have required 16 days and cost $17,000. Removal would have resulted in levee damage from the trailer, and lead contamination from the disposal of the water hyacinth on the levee banks (DBW 1983).

During 2003 and 2004, researchers from the San Francisco Estuary Institute (SFEI) tested the use of mechanical shredding as a cost-effective alternative to chemical pesticides. The Institute tested two 100-acre plots at Dow Wetland Preserve in Pittsburg and Stone Lakes National Wildlife Refuge (Greenfield et al 2006; Greenfield et al 2007, Spencer et al 2006). The SFEI studied the costs and impacts of mechanical harvesting efforts, including measuring hyacinth fragmentation, water quality, and environmental benefits and risks. These studies raised concerns about the potential for water hyacinth plant cuttings from mechanical removal to grow and spread within the Delta.

When other treatment methods are not available, two other methods of control have been used in the Delta for spot relief: manual removal (hand picking) and booms. Hand picking is physically difficult, costly, and has low effectiveness.

Booms are useful for diverting water hyacinth, maintaining shoreline access to water and boat landings, protecting infrastructure, and preventing water hyacinth from breaking off and re-infesting new areas. In previous years, the DBW has recommended that dock owners install boom ropes around docks in some areas to keep water hyacinth from clogging docks and reducing the need for pesticide use. Booms are not appropriate for broad control.

I.2 BIOLOGICAL CONTROL METHODS

In some parts of the world, biological control is considered the only control method that offers economical, sustainable control (Harley et al. 1996). Research has been conducted on more than 100 species of insects, fish, and fungi and several species have been found to be effective in controlling water hyacinth. Research to develop long-term management of spongeplant using biological control is currently in the planning stages.

The most widely used species for water hyacinth control are the (1) *Neochetina bruchi*, water hyacinth weevil; (2) *Neochetina eichhorniae*, water hyacinth weevil; and (3) *Niphograpta albiguttalis*, water hyacinth moth.[1] All three species originated in Argentina and were introduced in the United States in the early 1970s. These species have been approved for use in the United States and California, and have been used in this country with mixed success. The biological controls have had most success in Florida and other southeastern states. They are host-specific to water hyacinth. It usually takes three to five years for the insect populations to increase in density to a level where the water hyacinth is in substantial decline. Biological control methods are sensitive to environmental conditions and require monitoring.

Biological control methods were tested in the Delta by the DBW and the USACE. Between 1983 and 1985, the Army Corps of Engineers released different combinations of *Neochetina bruchi*, *Neochetinia eichhorniae*, and *Samoedes albiguttalis* at four locations in the Delta: Old River, Trapper Slough, Veale Tract, and White Slough (Stewart et al 1988). The bio-control agents and water hyacinth biomass were monitored at each site. *Neochetina bruchi* was successfully established at one site, Old River, and the other two species were established to some extent at three of the sites. However, these bio-control agents had only limited success in reducing water hyacinth populations in the Delta, and were not successful in natural dispersion and establishment of a stable population.

Insufficient numbers of weevils and lack of resources for adequate monitoring and evaluation impeded a thorough study of the potential for biological control. Further, even though attempts were made in the mid-1990's to re-introduce weevils, problems with parasites and related mortality of test samples of the weevils precluded introductions. The DBW will continue to explore, in cooperation with the USDA-ARS, the use of *Neochetina* spp. and new biological

[1] Formerly known as *Sameodes albiguttalis*.

control agents that are approved for release in the United States and California. The California Department of Food and Agriculture (CDFA) in July of 2011 released colonies of water hyacinth plant hoppers (*Megamelus scutellaris*) in control plots in the Delta.

Based on the bio-control agents currently available, the DBW has determined that biological control of water hyacinth is infeasible in the immediate future as it could take a certain amount time to quantify populations and the effectiveness of bio-control.

J. DETERMINING PRODUCT QUANTITY FOR EFFICACY

For the seventeen years between 1983 and 1999, the DBW treated between 160 and 2,700 acres of water hyacinth a year with no known measurable water quality or environmental degradation. Treatment levels varied depending on the number of crews available and the extent of water hyacinth infestation.

For the first several years of the WHCP, the DBW had only one or two boat crews treating water hyacinth. Thus, the acres treated in these years were limited by boat time, not the amount of water hyacinth.

In the mid-1990s, the DBW was able to increase the number of crews. By increasing the number of crews the DBW was able to treat a larger acreage of water hyacinth, and by 1999 the WHCP had reached the program's highest level of control. If treatment had occurred in 2000, the DBW estimates they would have only needed to treat about 200 acres.

Under the Maintenance Control (MC) practice, as water hyacinth is controlled, typically fewer acres should require treatment each year, resulting in reduced herbicide use. Figure 4, below, provides a summary of the total water hyacinth acres treated from 1992 to 2012. Table 2, summarizes the total herbicide (gallons) and total adjuvant (gallons) used in the program between 1992 and 2012.

Figure 4. Annual Water Hyacinth Acreage Treated in the WHCP, 1992-2012

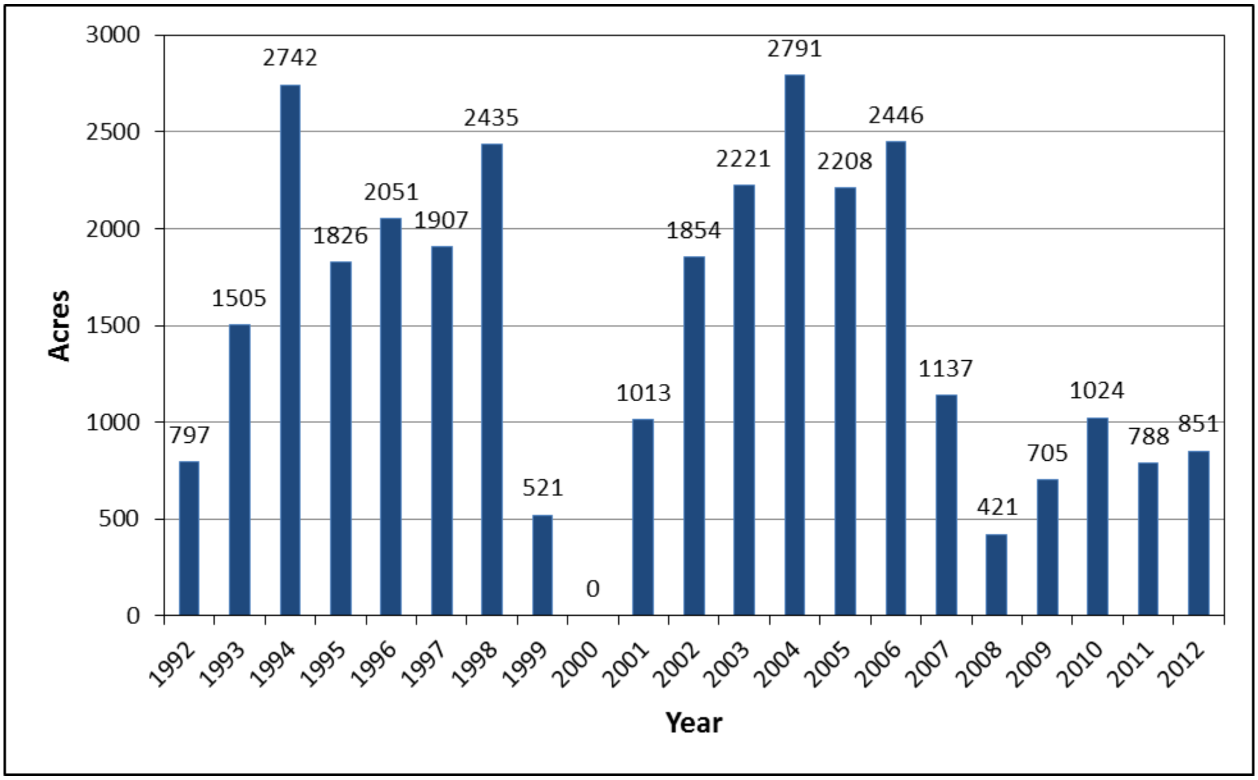


Table 2. Amount of Herbicide and Adjuvant Used in the WHCP, 1992-2012

	Herbicide Gallons				Adjuvant Gallons					
Year	**2,4-D**	**Diquat**	**Glyphosate**	**Total Herbicide**	**Placement**	**R-11**	**Agridex**	**Bivert**	**SurpHtac**	**Total Adjuvant**
1992	387	0	6	**393**	0	0	36	28	143	**207**
1993	963	0	13	**976**	0	119	122	271	274	**786**
1994	1406	0	6	**1412**	0	251	107	388	330	**1076**
1995	981	11	5	**997**	0	211	133	327	265	**936**
1996	1,347	101	110	**1558**	0	209	129	288	17	**643**
1997	1,680	62	7	**1749**	0	335	206	371	0	**912**
1998	2,146	54	8	**2208**	283	476	206	173	0	**1138**
1999	437	13	1	**451**	59	111	39	0	0	**209**
2000	0	0	0	**0**	0	0	0	0	0	**0**
2001	948	0	16	**964**	82	0	0	0	0	**82**
2002	1,763	0	67	**1830**	0	540	0	0	0	**540**
2003	1,719	0	367	**2086**	0	519	0	0	0	**519**
2004	2,062	0	517	**2579**	0	0	751	0	0	**751**
2005	1,903	0	219	**2122**	0	0	736	0	0	**736**
2006	2,176	0	208	**2384**	0	0	918	0	0	**918**
2007	938	0	149	**1087**	0	0	441	0	0	**441**
2008	336	0	64	**400**	0	0	163	0	0	**163**
2009	619	0	64	**683**	0	0	266	0	0	**266**
2010	879	0	109	**988**	0	0	425	0	0	**425**
2011	449	0	253	**702**	0	0	286	0	0	**286**
2012	82	0	577	**659**	0	0	234	0	0	**234**
TOTALS	**23,221**	**241**	**2,766**	**26,228**	**424**	**2,771**	**5,198**	**1,846**	**1,029**	**11,268**

K. MONITORING PLAN AND LOCATION OF REPRESENTATIVE SITES

The DBW has identified and mapped approximately 418 numbered treatment sites that range from approximately 5 to 1,700 water acres and may be between one and three miles in length (Table 3). Not all sites are treated each year. In early spring, the DBW crews will survey the Delta and identify problem areas such as those with the greatest impact on navigation, nursery areas, and sites close to pumps or other structures. These areas will receive higher priority when the crews are able to treat, but the actual sites treated each day will also depend on wind, weather, tides and presence of listed species.

The WHCP and SCP operate under two federal permits required by the Endangered Species Act. These two permits are issued by the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). A third permit, a National Pollutant Discharge Elimination System (NPDES) permit is required by the Central Valley Regional Water Quality Control Board. To fulfill the USFWS, NMFS, and NPDES permit requirements, the DBW must conduct water quality and chemical residue monitoring following WHCP and SCP herbicide treatments. Prior to conducting the actual treatment, the Field Supervisor and Environmental Scientist (ES) discuss which sites will be sampled for the upcoming year. Factors that will be considered when selecting sites for sampling include:

- ❒ Sites picked in prior years (to create time-series data)
- ❒ Sites representative of the entire Delta
- ❒ Sites representative of water types.

K.1 WATER QUALITY MONITORING

Water quality monitoring and sample collection is an integral part of the WHCP and SCP. The ES plans to conduct water quality monitoring over the course of the year so that water samples are representative throughout the sampling season for each aquatic herbicide or herbicide combination in each water types, either tidal or riverine.

The ES closely coordinates monitoring and sampling efforts with each application crew's treatment schedule. If the ES intends to collect water samples at a particular site, the ES will contact the application crew that treats that target site one week in advance of a planned treatment. The Application Specialist makes sure that target sites have had the proper Notice of Intent (NOI) given the week prior to the planned application. The ES also may request that several other sites are included in the NOI in case conditions on the day of treatment (e.g., wind, dissolved oxygen levels) restrict the DBW from treating the target site.

The ES provides a calendar to the Application Specialist at the beginning of the year which shows the tentative schedule for water sampling. This schedule is modified during the year to respond to any unforeseen changes in location of water hyacinth and spongeplant, weather conditions, presence of listed species, and other factors.

Table 3. WHCP and SCP Treatment Sites

County	Location	Site Number(s)	Water Type
San Joaquin	San Joaquin River	1-5	Tidal
San Joaquin	French Camp Slough, Walker Slough	6	Tidal
San Joaquin	San Joaquin River	7	Tidal
San Joaquin	Mormon Slough, San Joaquin River- Stockton Deep Water Channel	8	Tidal
San Joaquin	Burns Cutoff	9	Tidal
San Joaquin	Buckley Cove, San Joaquin- Stockton Deep Water Channel	10	Tidal
San Joaquin	Black Slough, Black Slough Landing, Fourteen Mile Slough, San Joaquin River	11	Tidal
San Joaquin	Turner Cut	12	Tidal
San Joaquin	Heypress Reach, Hog Island Cut, San Joaquin River- Stockton Deep Water Channel, Twenty-one Mile Cut	13	Tidal
San Joaquin	San Joaquin River	14	Tidal
San Joaquin	Empire Tract Slough	15	Tidal
San Joaquin	Mandeville Cut, Mandeville Reach, San Joaquin River- Stockton Deep Water Channel, Three River Reach, Venice Cut, Venice Reach	16	Tidal
Contra Costa	Potato Slough	17a	Tidal
San Joaquin	Potato Slough	17b	Tidal
Sacramento	Mokelumne River	18a	Tidal
San Joaquin	Mokelumne River	18b	Tidal
Contra Costa	San Joaquin River	19a	Tidal
San Joaquin	San Joaquin River	19b	Tidal
Sacramento	San Joaquin River, Seven Mile Cut	20	Tidal
Contra Costa	San Joaquin River	21a	Tidal
Sacramento	San Joaquin River	21b	Tidal
Sacramento	Sacramento River, Three Mile Slough	22	Tidal
Sacramento	Lake Natoma	--	Slow-moving
Sacramento	False River, San Joaquin River	23a	Tidal
Contra Costa	False River, San Joaquin River	23b	Tidal
Sacramento	San Joaquin River	24a	Tidal
Contra Costa	San Joaquin River	24b	Tidal
San Joaquin	Fourteen Mile Slough	25-29	Tidal
San Joaquin	Mosher Slough	30	Tidal
San Joaquin	Bear Creek, Disappointment Slough, Pixley Slough	31	Tidal

Table 3. WHCP and SCP Treatment Sites *(continued)*

County	Location	Site Number(s)	Water Type
San Joaquin	Disappointment Slough	32, 33	Tidal
San Joaquin	Bishop Cut	34	Tidal
San Joaquin	Telephone Cut	35	Tidal
San Joaquin	White Slough	36, 37, 39	Tidal
San Joaquin	Honker Cut	38	Tidal
San Joaquin	Little Potato Slough	40, 41	Tidal
San Joaquin	Little Connection Slough	42	Tidal
San Joaquin	Potato Slough	43, 44	Tidal
San Joaquin	Middle River	45-49, 52, 53, 56, 58, 59, 66-68	Tidal
San Joaquin	North Canal, Victoria Canal	50, 51	Tidal
San Joaquin	North Victoria Canal, Woodard Canal	54, 55	Tidal
San Joaquin	Railroad Cut	57	Tidal
San Joaquin	Empire Cut	60	Tidal
San Joaquin	Whiskey Slough	61, 62	Tidal
San Joaquin	Trapper Slough	63, 64	Tidal
San Joaquin	Latham Slough	65	Tidal
San Joaquin	Connection Slough, Middle River	69	Tidal
San Joaquin	Old River	70, 71	Tidal
San Joaquin	Old River, Paradise Cut	72	Tidal
San Joaquin	Old River, Paradise Cut, Salmon Slough	73	Tidal
San Joaquin	Sugar Cut, Tom Paine Slough	74	Tidal
San Joaquin	Old River	75-78	Tidal
Alameda	Old River	79	Tidal
San Joaquin	Fabian & Bell Canal, Grant Line Canal	80,81,82	Tidal
Contra Costa	Old River, Widdow Lake	83a	Tidal
San Joaquin	Old River, Widdow Lake	83b	Tidal
Contra Costa	Old River	84a, 85a, 87a, 89a, 90a, 91a, 92a, 98a, 99a	Tidal
San Joaquin	Old River	84b, 85b, 87b, 89b, 91b, 91b, 92bm 98a, 99a	Tidal
Contra Costa	Old River, West Canal, Coney Island	86a	Tidal
San Joaquin	Old River, West Canal, Coney Island	86b	Tidal
Contra Costa	Italian Slough	88	Tidal
Contra Costa	Indian Slough	93	Tidal
Contra Costa	Warner Dredger Cut	94-96	Tidal

Table 3. WHCP and SCP Treatment Sites *(continued)*

County	Location	Site Number(s)	Water Type
Contra Costa	Rock Slough	97	Tidal
San Joaquin	Connection Slough, Old River	100	Tidal
Contra Costa	Old River, Mandeville Island	101a	Tidal
San Joaquin	Old River, Mandeville Island	101b	Tidal
Contra Costa	Sheep Slough	102	Tidal
Contra Costa	Old River	103a, 104a	Tidal
San Joaquin	Old River	103b, 104b	Tidal
Contra Costa	False River	105	Tidal
Contra Costa	Fishermen's Cut	106	Tidal
Contra Costa	Piper Slough	107	Tidal
Contra Costa	Roosevelt Cut, Sand Mound Slough	108	Tidal
Contra Costa	Sand Mound Slough	109	Tidal
Contra Costa	Taylor Slough	110, 111	Tidal
Contra Costa	Dutch Slough, Emerson Slough	112	Tidal
Contra Costa	Dutch Slough	113, 114	Tidal
Contra Costa	Big Break	115, 116	Tidal
Contra Costa	Big Break Marina	117	Tidal
Contra Costa	Big Break Wetlands	118	Tidal
Sacramento	San Joaquin River	119a, 120a, 121a	Tidal
Contra Costa	San Joaquin River	119b, 120b, 121b	Tidal
Sacramento	Sherman Lake	122-132	Tidal
Sacramento	Sacramento River	135	Tidal
Solano	Sacramento River	136-138	Tidal
Solano	Rio Vista, Sandy Beach	140	Tidal
Sacramento	Duck Island RV	141	Tidal
Contra Costa	Franks Tract	173-175	Tidal
Solano	Sacramento River-Decker Island	176	Tidal
San Joaquin	South Mokelumne River	200-202, 204, 206, 208	Tidal
San Joaquin	Sycamore Slough	203	Tidal
San Joaquin	Hog Slough	205	Tidal
San Joaquin	Beaver Slough	207	Tidal
Sacramento	North Mokelumne River	209a, 210a, 211a, 212a, 213a	Tidal
San Joaquin	North Mokelumne River	209b, 210b, 211b, 212b, 213b	Tidal
Sacramento	Snodgrass Slough	214, 216-219	Tidal
Sacramento	Lost Slough	215	Tidal

Table 3. WHCP and SCP Treatment Sites *(continued)*

County	Location	Site Number(s)	Water Type
Sacramento	Stone Lakes	220-226, 230-237	Tidal
Sacramento	Morrison Creek, Stone Lakes	238, 239	Tidal
Sacramento	Brannon Island	240a	Tidal
Sacramento	Rio Vista	240b	Tidal
Sacramento	Sacramento River	241-245	Tidal
Solano	Sacramento River	246a, 247a, 248a, 249a, 250a	Tidal
Sacramento	Sacramento River	246b, 247b, 248b, 249b, 250b	Tidal
Solano	Sacramento River, Viera's	251a	Tidal
Sacramento	Sacramento River, Viera's	251b	Tidal
Solano	Sacramento River, Snug Harbor	252a	Tidal
Sacramento	Sacramento River, Snug Harbor	252b	Tidal
Solano	Steamboat Slough	253a, 254, 255	Tidal
Sacramento	Steamboat Slough	253b	Tidal
Solano	Sutter Slough	256a, 257a, 258a	Tidal
Sacramento	Sutter Slough	256b, 257b	Tidal
Yolo	Sutter Slough	258b	Tidal
Yolo	Elk Slough	259	Tidal
Solano	Cache Slough, Sacramento River - Deep Water ship Channel	260-261, 267	Tidal
Solano	Miner Slough	262-266	Tidal
Yolo	Sacramento River - Deep Water Ship Channel	268	Tidal
Solano	Liberty Island	269	Tidal
Solano	Liberty Cut, Toe Drain	270, 271	Tidal
Solano	Cache Slough	272, 273, 277, 278, 280	Tidal
Solano	Shag Slough	274	Tidal
Yolo	Liberty Cut, Liberty Island, Shag Slough	275, 276	Tidal
Solano	Hass Slough	279	Tidal
Solano	Lindsey Slough	281-283	Tidal
Solano	Barker Slough	284	Tidal
Sacramento	Georgiana Slough	285-289	Tidal
Yolo	Sacramento River	290a	Tidal
Sacramento	Sacramento River	290b	Tidal
San Joaquin	Paradise Cut	291	Tidal

Table 3. WHCP and SCP Treatment Sites *(continued)*

County	Location	Site Number(s)	Water Type
San Joaquin	San Joaquin River	300, 302-309	Riverine
San Joaquin	Walthall Slough	301	Riverine
Stanislaus	San Joaquin River	310, 313, 318, 319, 321-325	Riverine
Stanislaus	Finnegan Cut, San Joaquin River	311, 312	Riverine
Stanislaus	Laird Slough	315	Riverine
Stanislaus	Brush Lake	316	Riverine
Stanislaus	Del Puerto Creek, San Joaquin River	317	Riverine
Stanislaus	Lake Ramona	320	Riverine
Merced	San Joaquin River	400, 401, 403, 404	Riverine
Merced	Snag Slough, San Joaquin River	402	Riverine
Merced	Salt Slough	405-410, 412, 413, 415, 417-427	Riverine
Merced	Mud Slough	411	Riverine
Merced	San Joaquin River, Poso Slough, Salt Slough	414	Riverine
Merced	Bear Creek, Bravel Slough	416	Riverine
Merced	Merced River	500-515, 517-524, 526, 527, 530, 532	Riverine
Merced	Ingalsbe Slough, Hope Town Slough	516	Riverine
Merced	Ingalsbe Slough	525	Riverine
Merced	Merced River, North Canal	528, 529	Riverine
Merced	Main Canal	531-537	Riverine
Merced	Merced Falls, Merced River	532	Riverine
Stanislaus	Stanislaus River	600	Riverine
Stanislaus	Tuolumne River	700-718	Riverine
Fresno	San Joaquin River	900-909, 911-929	Riverine
Fresno	San Joaquin River, Mendota Pool	910	Riverine
Fresno	Fresno Slough, Kings River	910a, 910b	Riverine

While each application crew is responsible for treating sites in its area, based on permit conditions, some of these sites cannot be treated until a particular date. The ES provides each application crew with a Delta map that specifies the date when treatment can begin at sites throughout the Delta (Figures 2 and 3). The treatment start dates are as follows:

- ❒ Areas 2-4: March 1 to November 30
- ❒ Area 1: June 1 to November 30

When conducting water sampling, the ES follows the Annual Monitoring Protocol provided in Exhibit 1.

K.2 ADDITIONAL MONITORING

The ES also provides application crews with a map and an Arc-Map layer that defines areas of high value habitat to low value habitat for the giant garter snake. The application crews use this map as a tool for performing pre-application visual inspections for the presence of giant garter snakes.

The ES and application crews have established a strategy of avoidance of elderberry shrubs. To avoid elderberry shrubs, the application crew maintains a 100 foot buffer between a treatment site and shoreline elderberry bushes for most treatment sites. In sites where elderberry shrubs are concentrated, the application crew maintains a 50 foot buffer between selected treatment sites and shoreline elderberry shrubs where the 100 foot buffer would preclude DBW's ability to treat water hyacinth. In this case, treatments using a 50 foot buffer will only occur when winds are less than 3 mph.

Prior to the treatment season, all application crews are trained on the use of the dissolved oxygen meters and PC tablet which contains a built in global positioning system (GPS). These pieces of equipment are used to record water quality parameters and location measurements throughout the treatment season. Aquatic Weed Unit environmental staff is currently assigned the responsibility for training the application crews on the use of new monitoring devices. The Field Supervisor should provide application crews with training on all other equipment.

To minimize potential impacts to sensitive species, the application crew is familiar with the following:

- ❒ Delta smelt avoidance (USFWS Biological Opinion)
- ❒ Chinook salmon, steelhead and green sturgeon avoidance (NMFS Biological Opinion)
- ❒ Giant garter snake and valley elderberry avoidance measures (USFWS Biological Opinion).

If the application crew launches a boat from an unimproved location on a levy, the application crew uses the giant garter snake habitat evaluation maps provided by the ES to identify whether the habitat is a giant garter snake habitat and then to visually check the site to identify whether snakes are present.

Exhibit 1. Water Hyacinth Control Program (WHCP) and Spongeplant Control Program (SCP)

NPDES Annual Monitoring Protocol

For Water Quality Order No. 2013-0002-DWQ
General Permit No. CAG990005

1. Standard Information

The date, time, water body, site number, and exact location will be recorded for all sampling events. The location description shall include the Universal Transverse Mercator (UTM) coordinates as determined using a global positioning system (GPS) device.

1a. Monitoring Site and Treatment Area

The Division of Boating and Waterways (DBW) shall provide a map showing the Treatment Area including:

- ❒ The location of the monitoring locations relative to the Treatment Area
- ❒ The location of the shore
- ❒ The direction of water movement, if in a river. All other areas are subject to tidal influence.
- ❒ Any water pumps or intakes within 100 yards of the treatment site.

1b. Site Selection and Monitoring Frequency

Sites treated under the Water Hyacinth Control Program (WHCP) and the Spongeplant Control Program (SCP) shall be classified by the DBW as falling into one of two water body types: (1) tidal or (2) riverine. Both of these water body types are considered to fall under the environmental setting category of ‘flowing water’.

For each aquatic pesticide used and for each environmental setting (flowing water and non-flowing water), the DBW will monitor a minimum of six application events per year. If there are less than six application events in a year, samples will be collected for each application event for each active ingredient in each environmental setting. The DBW will determine the number of sites that it will monitor in a given year by working closely with the field operations by monitoring the types and amount of chemical used in sites throughout the season. In this way, the DBW will be able to properly plan and schedule its sampling for the treatment year.

The new NPDES permit sampling requirements are materially less than what has been historically measured, in terms of frequency of measurement. To help ensure that the WHCP and SCP maintains environmental quality measures and that monitoring provides independent statistical validity, DBW seeks to maintain a more robust monitoring plan than the minimal NPDES requirements. In addition, The DBW will conduct water quality monitoring in a way that ensures that every chemical (i.e., aquatic herbicides and adjuvant) used for the WHCP and SCP will be subject to chemical residue monitoring at least once each year.

2. Water Sampling Equipment and General Water Collection Procedures

Water samples are taken using a Master Flex E/S Portable Sampler. The Sampler is fitted with about 10 feet of tubing. Water samples are collected in 1000 mL amber glass bottles and stored on ice. All samples are collected using sampling procedures which minimize loss of organic compounds during sampling collection and analysis and maintain sample integrity.

All water samples are collected in the water column location where the greatest amount of residue is anticipated. Each sample is collected at 3 feet below the water surface, or mid-depth if the water body is less than six feet. All water quality parameters are measured at the depth at which the water sample is collected.

3. Sample Quality Control

Contamination from persons, equipment and surface water residues shall be minimized. To prevent sample contamination, boats used for environmental monitoring and water sampling are never used for herbicide applications. Boats are also periodically washed.

All persons collecting water samples shall wear latex gloves to prevent bottle contamination. No part of the sample bottle shall be in contact with the water body surface. After a water sample is collected, excess water shall be dried off the bottle.

Persons collecting samples will ensure the sampler and bottles are “backgrounded to the water at each sampling station”. The sampler shall be run for a minimum of 1-2 minutes before samples are collected. All bottles shall be rinsed once before a sample is collected.

Equipment blanks will be collected before the beginning of each sampling event for each sample (pre & post). Post-treatment samples have an additional equipment blank collected between the inside sampling station and the receiving waters sampling station. An equipment blank is collected by running diluted Liquinox detergent or a Water Board approved equivalent through the sampler for approximately 30 to 60 seconds to clean the sampler and tubing. Following the rinse, clean de-ionized (DI) water is run through the sampler approximately 30 seconds before equipment blank is collected. Bottles are rinsed one time with DI water before an equipment blank sample is collected. Tubing used in the sampler shall be changed before every sampling event.

Ten percent of all samples collected shall be splits or dual analysis. Dual analysis samples shall be submitted to the California Department of Food and Agriculture, Center for Analytical Chemistry (CDFA-CAC) lab as blind samples with different identification numbers. Splits shall be submitted to an approved outside lab.

Ten percent of all sampling events will be accompanied with a field spike and field blank. Water samples for field blank and spike will be collected at the first pre-treatment sample as a dual sample (identical water). One sample will be spiked with the appropriate herbicide standard.

Standards are made up at the beginning of each season by the CDFA-CAC lab. All persons preparing field blanks and spiked will use a new set of gloves. All field blanks and spikes shall accompany regular samples. All standards shall be disposed of properly such that regular samples are not contaminated.

4. Water Quality Monitoring Near Drinking Water Intakes

If water is being pumped at drinking water intakes that are within 0.5 mile of a treatment site, the DBW shall sample for residue of the chemicals applied 2 hours post-treatment within the immediate vicinity of the drinking water intake. The sample will be taken at the midpoint in the water column or at a depth of 3 feet; whichever is closer to the surface. The time, UTM coordinates of the sampling location will be recorded to be subsequently included in a GIS database.

5. Background Monitoring (Pre-Treatment)

Prior to the Application Event, the DBW will take readings for dissolved oxygen, electrical conductivity/salinity, pH, temperature, and turbidity, and will collect water samples for chemical residue. Water quality data and water samples for chemical residue will be taken at the following predetermined locations:

❒ 100 feet upstream of the Treatment Area

❒ Within the Treatment Area adjacent to water hyacinth or spongeplant

Monitoring data will be taken at the midpoint in the water column or at a depth of 3 feet; whichever is closer to the surface. The time and UTM coordinates of the monitoring location will be recorded to be later included in a GIS database.

6. Event Monitoring (Post-Treatment)

Upon completing the application, the DBW will take readings for dissolved oxygen, electrical conductivity/salinity, pH, temperature, and turbidity, and will collect water samples for chemical residue. Water quality data and water samples for chemical residue will be taken at the following predetermined locations:

❒ 25 feet down-flow of the Treatment Area.

Monitoring data will be taken at the midpoint in the water column or at a depth of 3 feet; whichever is closer to the surface. The time and UTM coordinates of the monitoring location will be recorded to be later included in a GIS database.

The following procedure will be used to ensure post-treatment chemical residue water samples adequately capture the initial movement of water from the treatment sites.

1. Before spraying begins, the direction of water flow for the spray-event period will be determined. A monitoring team will visually inspect and (when applicable) consult tide

charts to determine the direction of water flow during the sampling event. The spray crew, when possible, will begin upflow, travel with the current as they spray, and end down-flow.[2] After the monitoring crew has collected the pre-treatment sample, the application crew will mark the starting point with flagging tape before they begin to spray.

2. Upon completion of the treatment, the application crew marks their endpoint and call the monitoring crew to inform them the application is complete. The monitoring crews will then immediately travel to the endpoint and collect a sample 25' down-flow. They will determine the proper location by allowing the boat to drift with water flow approximately one boat length (boat length ~22').

Application crews will estimate the amount of time needed to treat a site. If there is less than an hour's worth of work in a site, an alternate site will be substituted. Work is defined as both searching for and spraying water hyacinth and spongeplant. Collecting a water sample and recording other data takes approximately 15 minutes. Traveling to the next sample collection location generally takes 10 to 20 minutes.

7. Post-Event Monitoring (Follow up)

Within one week (7 days) after the herbicide application, the DBW will take readings for dissolved oxygen, electrical conductivity/salinity, pH, temperature, and turbidity, and will collect water samples for chemical residue. Water quality data and water samples for chemical residue will be taken at the following predetermined locations:

❒ 100 feet upstream of the Treatment Area

❒ Within the Treatment Area adjacent to water hyacinth or spongeplant

❒ 25 feet down-flow of the Treatment Area.

Monitoring data will be taken at the midpoint in the water column or at a depth of 3 feet; whichever is closer to the surface. The time and UTM coordinates of the monitoring location will be recorded to be later included in a GIS database.

8. Additional Follow-up Monitoring

Monitoring team will make a thorough visual inspection of the site and take photos at each location where the water sample was drawn. They will record the following types of information:

❒ Observed dead fish, birds, and animals in/near sprayed water hyacinth or spongeplant? □ Yes □ no if yes, please take photo and specimen.

❒ Native vegetation healthy/vigorous? □ yes □ no other observations?

[2] Tidal changes during a sampling event or physical site characteristics like non-linear spraying (islands) sometimes make it difficult to spray with the flow of water. In such situations monitoring team will note this as they record data. Other conditions such as wind and rough water also impact sampling events. Monitoring crew will adapt as needed and make note of site-specific decisions.

- ❒ Any vegetation burned by herbicide? □ yes □ no If yes, how much?
- ❒ Species of Concern present? □ yes □ no Please take photos, gps, estimate #'s present and note change in condition after spraying has occurred.
- ❒ Changes in coloration of water? □ yes □ no
- ❒ Changes in odor of water? □ yes □ no
- ❒ Additional observations such as species at site at time of visit.

A qualified environmental scientist or biologist will oversee quantitative data collection to ensure a team adheres to the scientific methodology.

9. Protocols for Monitoring and Avoiding Take of Endangered Species

Currently the DBW implements avoidance measures to reduce or eliminate potential impacts on endangered species. These measures are described in detail in Section N (BMP WH #5). One avoidance measure is consideration of timing and location of treatment. USFWS requirements divide the WHCP and SCP program area into 4 USFWS Areas (Figures 2 and 3):

- ❒ Area 1 – primary delta smelt habitat
- ❒ Area 2 – secondary delta smelt habitat
- ❒ Area 3 – tertiary delta smelt habitat
- ❒ Area 4 – non-delta smelt habitat

The DBW protocol for the WHCP and SCP is as follows:

- ❒ Treatment in Area 1 is limited to June 1 to November 30
- ❒ Treatment in Areas 2, 3 and 4 can occur between March 1 and November 30.
- ❒ A survey based approach will be conducted between March through June. The environmental scientist will monitor fish surveys to avoid treating in areas where listed fish are present
- ❒ All treatments end on November 30, or when juvenile salmonids are observed entering the Delta, The environmental scientist will monitor fish surveys to avoid treating in areas where winter-run and spring-run Chinook salmon and steelhead are present.

In addition, the DBW will provide application crews with these tools:

- ❒ Endangered Species Act (ESA) and Species Identification Training
- ❒ Species Recognition Books
- ❒ Chain of Custody (COC) and protocol for collecting take

Before the treatment season begins, a qualified environmental scientist will train application crews on how to recognize threatened and endangered species, why they are of concern, and where and when they may be present in the Delta and associated waterways. Each crew will be provided a book with pictures and descriptions of each species of concern listed in the WHCP and SCP Biological Assessments. They will be educated on the CESA/ESA codes and definitions for take. They will be provided with COC's for incidental take and trained on forms and the legal procedure for handling a species if one should be found.

L. GATES OR CONTROL STRUCTURES AND INSPECTION SCHEDULE

The DBW does not maintain or use gates or control structures as part of the WHCP or SCP. Thus, the DBW does not have an inspection schedule of gates or control structures.

M. SECTION 5.3 EXCEPTION STATUS

The DBW does not have a Policy Section 5.3 exception. A Section 5.3 exception refers to a short-term or seasonal exception that dischargers may be granted, in accordance with Section 5.3 of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California*. The exception allows dischargers to exceed water quality criteria and receiving water limitations during treatment for priority pollutants, acroleine and copper, as set by the California Toxics Rule.

N. BEST MANAGEMENT PRACTICES (BMPs)

The DBW has developed a comprehensive WHCP and SCP Operations Management Plan that it uses as a guide to train application crews and document best management practices (BMPs). The DBW has developed the following BMPs:

BMP #WH1 – HERBICIDE HANDLING REQUIREMENTS

All personnel involved with the application of WHCP and SCP herbicides will be trained in herbicide handling in accordance with Food and Agriculture Code and Title 3 Code of Regulations pertaining to Pesticides and Pest Control Operations.

Storage

All WHCP and SCP herbicides will be stored in a secured warehouse in accordance with the California Food and Agriculture Code and Title 3 Code of Regulations. All herbicides obtained from the storage area will be recorded in the storage area logbook as well as in the individual treatment crew's daily log.

Transport

Herbicides will be delivered by truck or boat to specific treatment sites on the day of treatment. They will be transported in their original containers, securely fastened to the truck or boat, in a manner that will prevent spillage onto or off of the vehicle or vessel. Spill kits and MSDS sheets will be provided when traveling in any vehicle

Mixing, Loading and Applications

DBW staff shall use undiluted herbicides from containers of 5 gallons or less; only the herbicide containers being used will be opened at the application site. All mixing, loading, and application operations will be conducted in accordance with all label requirements and will be performed by licensed pesticide applicators.

Disposal of Herbicide Containers

Herbicide containers will be triple rinsed and disposed of according to herbicide label and applicable regulations.

BMP #WH2 – SPRAY EQUIPMENT MAINTENANCE AND CALIBRATION

Spray equipment used for the WHCP and SCP shall be calibrated at a minimum of once per month. The date of the last spray equipment calibration is recorded on the Daily Log under “Last Calibration.”

The boats used by the DBW have a holding tank on the boat that is used to store Delta water. The boats use a multi-pump system. One pump draws water from the Delta into the holding tank. Another pump draws the aqueous chemical from the herbicide container. Additional pumps draw adjuvants and other additives such as drift control agents.

A tube from each pump meets at the sprayer where the Delta water, the herbicide, and additives are mixed. An orifice on the sprayer can be adjusted to vary the application rate.

Operators should calibrate the spray equipment so that it mixes the water from the Delta with the herbicide and other additives at the desired rates. Operators shall apply herbicides at rates based on the Pest Control Recommendations.

The spray equipment is calibrated as follows:

1. Make sure that each of the pumps is primed. To do this the operator should run water through them for approximately two (2) minutes
2. The 30-gallon holding tank should be marked at the 25-gallon level (for ease of conversion)
3. Fill the 30-gallon holding tank with 25-gallons of water
4. Pour the applicable herbicide into a 32-oz. cup. The amount to pour into the 32-oz. cup will vary depending on the herbicide. The operator should pour the recommended amount of herbicide into the 32-oz. cup per the number of gallons of water required.
5. The operator should turn both pumps on and begin the spray process
6. If the spray equipment is properly calibrated the 25-gallons of water in the holding tank and the herbicide in the 32-oz. cup should be completely gone at the same time. If the spray equipment is not properly calibrated either the 25-gallons of water, or the herbicide in the 32-oz. cup, will be gone before the other is.
7. The operator may need to adjust the orifice size on the sprayer to allow the sprayer to draw chemical at a slower or faster rate.
8. For the adjuvants, the operator should make sure that the appropriate amount is added per the Pest Control Recommendation. The result is that the herbicide is applied using a smooth coating (not droplets or beading). If the application results in beading the operator should add more adjuvant to the mix.

BMP #WH3 – SPILL AVOIDANCE

All herbicide spills will be treated as emergencies. Concentrated herbicide spills are more dangerous than herbicides diluted with water, and will be treated seriously and immediately. While spills can occur during transporting, storing, or while using herbicides, the DBW will apply the following preventive measures to reduce the potential for a serious spill:

- ❒ For boats – herbicides will be securely fastened to floats in their original, watertight containers. Each boat shall carry a marker buoy with an attached anchor line to mark any herbicide, and water movement from the spill site, in the event of a spill.
- ❒ For vehicles – herbicides will be transported in their original, watertight containers, in a manner that will prevent spillage. MSDS and herbicide labels will be carried during transportation.

In addition, the spray operator will carry a GPS device to reference/record location in the event of a spill.

Reporting Spills in Water

The Applicator Specialist will have a cellular phone in his/her possession and the telephone numbers of the California Department of Parks and Recreation Hazmat Coordinator, California Department of Fish and Wildlife (Office of Spill Prevention and Response), California Regional Water Quality Control Board, State Office of Emergency Services, County Agricultural Commissioner's, County Sheriff's Office, the California Highway Patrol, County Health Departments, and DBW management and staff. Field staff are provided with Spill Emergency Contact Telephone Numbers, provides a list of emergency telephone numbers to use in case of a spill.

Herbicide spills will immediately be reported to the Department of Parks and Recreation Hazmat Coordinator, Aquatic Weed Unit Manager, and Field Supervisor. In the event of a spill in water the following procedures will be employed:

- ❒ The location of the spill will be marked
- ❒ The Aquatic Weed Unit Manager will be immediately notified
- ❒ The amount of herbicide spilled will be assessed

The Specialist will mark the spill location with a marker buoy and an approximate bearing with any permanent land markers. A GPS reading will be taken and photographs of the spill will be taken. If deemed necessary, DBW will monitor the area for herbicide residues and environmental impacts.

Reporting Spills on Land

If a spill occurs on a public roadway, the Specialist immediately notified the Department of Parks and Recreation Hazmat Coordinator, Environmental Program Manager, and Field Supervisor.

In the event a spill occurs, it is of paramount importance that the discharge is stopped at its source and that the spilled material be contained. DBW and contracted personnel will have access absorbent materials that will be used for immediate containment of the spilled material. The following actions will be taken as necessary to contain a spill on ground:

- ❒ Stopping the spill at its source
- ❒ Diking the spill as necessary
- ❒ Using spill absorbent material as appropriate

Contaminated absorbent material shall be placed in a sealable disposable container suitable for transporting. The container will be labeled with its contents, including herbicide name and signal word and disposed of in accordance with the label and all applicable laws and regulations.

The spill and its cleanup will be documented with photos (if possible) and the date/time registered. Copies of these photos will be attached to any spill reports filed.

BMP #WH4 –ENVIRONMENTAL AWARENESS TRAINING

All WHCP and SCP personnel will receive required annual environmental awareness training. This training will be provided by a USFWS approved biologist, typically one of the program environmental scientists. This training is designed to teach treatment crews how to identify special status species and implement the endangered species avoidance measures and other environmental and water quality measures required of the WHCP and SCP. The trainings will inform treatment crews and other WHCP and SCP staff about the presence of delta smelt, giant garter snake, valley elderberry longhorn beetle, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and North American green sturgeon and their associated habitats, and that unlawful take of the animal or destruction of its habitat is a violation of the Endangered Species Act. The training will include instruction on the following species:

- ❒ Species identification and adverse effects avoidance/minimization guidelines for delta smelt, giant garter snake, valley elderberry longhorn beetle, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and green sturgeon
- ❒ Life history of delta smelt, giant garter snake, valley elderberry longhorn beetle, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and green sturgeon
- ❒ Protocol for identification and protection of delta smelt, giant garter snake, valley elderberry longhorn beetle, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, green sturgeon and associated protected habitats
- ❒ The importance of delta smelt migratory routes, the importance of irrigation canals, marshes/wetlands, and seasonally flooded areas to giant garter snake, the importance of elderberry shrubs as habitat for valley elderberry longhorn beetle
- ❒ Procedures for review of maps marking giant garter snake habitat and valley elderberry shrubs as part of WHCP and SCP treatment activities
- ❒ All terms and conditions of the USFWS Biological Opinion for the WHCP and SCP and NMFS letter of concurrence for the WHCP and SCP for protection, avoidance and minimization of adverse effects to protect species under the Act.

The environmental awareness training will consist of 2-3 hours of training. The agenda for the environmental training is as follows:

1. Endangered Species Act

2. Threatened and Endangered Species
3. Avoidance and Minimization Measures
4. Environmental Considerations
5. What to do if There is Incidental Take

The treatment crews will receive additional training each year based on the most recent version of this document. The agenda for this additional environmental training is as follows:

1. WHCP and SCP Objectives
2. What Guides WHCP and SCP Environmental Compliance
3. Role of Aquatic Pest Control Specialists and Technicians
4. Herbicide Application Practices
5. Timing and Location of Treatments
6. Avoidance Measures for Endangered Species
7. Training Requirements
8. Monitoring Requirements
9. Planning, Studies and Reporting
10. Other WHCP and SCP Environmental Compliance Requirements
11. Questions and Suggestions

BMP #WH5 – ENDANGERED SPECIES AVOIDANCE MEASURES

The WHCP and SCP implements avoidance measures to reduce or eliminate potential impacts of the program on endangered species. These measures are specified in the USFWS biological opinion for the WHCP and SCP and the NMFS Letter of concurrence for the WHCP and SCP, and fall into three areas: timing and location of treatments, avoidance measures for endangered species, and mechanical treatment requirements.

A. Timing and Location of Treatments

1. Avoid herbicide applications near special status species and their associated habitat, including sensitive riparian and wetland habitat and other biologically important resources.
2. Conduct treatments according to the four areas defined in the USFWS BO (see Figures 2 and 3)
   a. Area 1 treatments may begin June 1st
   b. Areas 2, 3 and 4 treatments may begin March 1st, subject to the field and fish survey processes described in item #5.
   c. Areas 1 and 2 treatments may utilize 2,4-D and glyphosate, with the adjuvant Agridex.
   d. Areas 3 and 4 treatments may utilize 2,4-D, glyphosate, penoxsulam, and imazamox, with the adjuvants Agridex or Competitor.

3. Conduct 2,4-D treatments according to the June 20, 2011 NMFS BO for the Environmental Protection Agency Registration of Pesticides
    a. 2,4-D may only be used in the legal Delta between June 15th and September 15th
    b. 2,4-D may only be used in all other treatment sites between July 15th and August 15th
4. Conduct 2,4-D treatments to reflect crop requirements
    a. 2,4-D may not be used north of Highway 12
5. Conduct treatments between March 1st and July 1st after consulting fish surveys to determine whether listed fish species are likely to be present, following the procedures below:

    1. For Areas 2,3 and 4:

        a. Begin conducting regular field surveys in late-February to identify re-growing water hyacinth (see as re-greening of winter stunted plants). Focus on back-water and dead end locations and other nursery areas. Document the locations by photographing the sites with areas of more than 100 square feet of re-growing water hyacinth. These sites will be identified as potential treatment sites.
        b. Each week, the Environmental Scientist will check the several State and federal fish survey data to determine whether listed fish species are likely to be near or in any of the potential treatment sites.
        c. Between March 1st and July 1st, the Environmental Scientist will prepare a weekly summary list for USFWS and NMFS that identified treatment sites where listed fish species are not likely to be present.
    2. For Area 1, DBW will implement the same fish survey procedure during the month of June, focusing on NMFS listed species.
6. Report proposed treatment sites to USFWS and NMFS prior to the treatment week through the NOI and fish survey reporting processes.
7. Mechanical removal and herding will not take place in May and June, when listed fish species are most likely to be present in Delta waters.

B. Avoidance Measures for Endangered Species

General Avoidance

1. Provide treatment crews with electronic mapping that identified previously surveyed and sensitive areas for giant garter snake habitat and locations of valley elderberry shrubs.
2. Consult with the Environmental Scientist about upcoming applications to determine whether presence of an Endangered Species in a planned treatment area will prevent a scheduled application.
3. Prior to treating a site, perform a visual survey to determine whether special status plants, animals, or sensitive habitats are present. Complete the Environmental Observations Check list. If any sensitive species are present at the site, the application crew should not perform the treatment.
4. Avoid herbicide application near special status species, and sensitive riparian and wetland habitat; and other biologically important resources.

5. Conduct herbicide treatments in order to minimize potential for drift; do not apply herbicides if winds are greater than 10 mph, or 7 mph in Contra Costa County.
6. Operate program vessels in a manger that causes the least amount of disturbance to the habitat.

Listed Fish Species

7. Implement the Fish Passage Protocol to provide a zone of passage through areas of low DO:
    a. In slow-moving and back-end sloughs infested with water hyacinth, treat up to 30 percent of water hyacinth mats at one time. Treat mats in up to 3 acre strips, leaving at least 100 foot buffer strips between treated areas. Treat the untreated buffer strips and remaining 70 percent of the water hyacinth mat at least three more times following the initial treatment (in 30 percent increments). Conduct follow-up treatments in three week intervals.
    b. In Delta tidal waters, treat up to 50 percent of the water hyacinth mat at one time. Treat mats in up to 3 acre strips, leaving at least 100 foot buffer strips between treated areas. Treat the untreated buffer strips and remaining 50 percent of the mat three weeks following the initial treatment for 2,4-D, and one week following the initial treatment for other herbicides.

Giant Garter Snake

8. Avoid disturbance of upland giant garter snake habitat (through disposal of harvested water hyacinth or land-based treatments) between May 1 and October 1.
9. Dispose of all water hyacinth collected by handpicking outside of the May 1 to October 1 giant garter snake active season at an approved disposal facility to ensure no hibernating giant garter snakes are buried under piles of collected water hyacinth.

Valley Elderberry Longhorn Beetle

10. Conduct all herbicide applications downwind of elderberry shrubs and utilize a coarse droplet size to avoid the potential for drift
11. Maintain a 100 foot buffer between treatment sites and shoreline elderberry shrubs for most treatment sites
12. Maintain a 50 foot buffer between selected treatment sites and shoreline elderberry shrubs where the 100 foot buffer would preclude DBW’s ability to treat water hyacinth. Only treat sites using a 50 foot buffer when winds are less than 3 mph.
13. Conduct pre- and post-treatment surveys of elderberry bushes on an annual basis. Compare the health of elderberry shrubs at control sites (not adjacent to treatment sites) with elderberry shrubs located adjacent to treatment sites. If elderberry shrubs adjacent to treatment sites show signs of adverse effects, develop additional mitigation measures to protect elderberry shrubs.

14. Identify and utilize disposal areas [for handpicking] that are at least 100 feet away from elderberry shrubs.

BMP #WH6 – AGRICULTURAL AND WATER INTAKE COORDINATION

In addition to the public notification described in Section F, the WHCP and SCP implements specific measures to ensure that herbicide treatments do not negatively impact agricultural intakes and potable water intakes. The WHCP and SCP follow all herbicide label requirements as they relate to use of treated water for irrigation or drinking purposes.

Should DBW need to coordinate with a county water district, SWP or CVP regarding water quality impacts, DBW will contact the agency to discuss a protocol for notification of treatment. Generally, DBW will notify an agency in advance of the proposed treatment. For potable water intakes, glyphosate will not 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.

For agricultural irrigation water intakes, the WHCP and SCP identify and maps agricultural water intakes in each treatment site. The WHCP and SCP conduct surveys of crops adjacent to treatment sites, and identify any potential incompatibilities with treatment herbicides to avoid adverse impacts to potentially sensitive crops.

O. EVALUATION OF POSSIBLE ALTERNATIVES

Waste discharge requirements included in Water Quality Order No. 2013-0002-DWQ indicate that "Dischargers should examine the alternatives to algaecide and aquatic herbicide use to reduce the need for applying algaecides and aquatic herbicides. Other available BMPs should be evaluated to determine if there are feasible alternatives to the selected aquatic pesticide application project that could reduce potential impacts to water quality and non-target organism."

Since inception of the WHCP in 1981, the DBW has continuously considered other BMPs to determine if feasible alternatives exist that could reduce potential water quality impacts. Practices which have been attempted, and continue to be in use (albeit to a limited degree), are discussed in detail in Section I of this APAP, including:

- Mechanical control methods (including manual control)
- Biological control methods

Other BMPs potentially available for water hyacinth control that could reduce potential water quality impacts include:

- Combinations of control methods (e.g., mechanical methods followed by chemical methods). In this case, short-term immediate control could be gained using mechanical harvesting so that less aquatic herbicides potentially may be applied.
- New biological control methods, not previously considered. All biological control methods are still in the research stage to determine which native and naturalized insect species will provide long-term control.
- Mycoherbicides (natural fungal pesticide), an approach thought to be more environmentally friendly, is still in the experimental stages.
- Prevention techniques, which are the most straightforward management techniques.
- Other aquatic herbicides labeled for water hyacinth control (i.e., triclopyr and diquat) and combinations of aquatic herbicides (e.g., diquat and complexed copper). These aquatic herbicides are either are not as effective as the selected control methods or would have too great an impact on the Delta environment.

Based on the evaluation of available alternative control options, the DBW has determined there are no feasible alternatives to the selected aquatic weed management measures currently used by the DBW for the WHCP and SCP.

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