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DIVISION OF WATER QUALITY

Attachment E – Notice of Intent

WATER QUALITY ORDER NO. 2013-0002-DWQ
GENERAL PERMIT NO. CAG990005

STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES TO WATERS OF THE UNITED STATES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATIONS

I. NOTICE OF INTENT STATUS (see Instructions)

Mark only one item A. ☑ New Applicator B. Change of Information: WDID# 3 27AP00001
C. ☐ Change of ownership or responsibility: WDID# _____

II. DISCHARGER INFORMATION

A. Name Resource Conservation District of Monterey County			
B. Mailing Address 744-A LaGuardia Street			
C. City Salinas	D. County Monterey	E. State CA	F. Zip 93905
G. Contact Person Paul Robins	H. E-mail address paul.robins@rcdmonterey.org	I. Title Executive Director	J. Phone (831) 424-1036 ext. 124

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: Salinas River watershed (emergent vegetation only).

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

V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms: ____

Emergent, terrestrial invasive non-native plants, primarily Arundo donax (giant reed) and Tamarix spp. (salt cedar)

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

Aquamaster® and Rodeo® and other aquatic approved formulations: active ingredient is glyphosate.

C. Period of Application: Start Date August 1st End Date November 15th

D. Types of Adjuvants Used:
ProSpreader®, Magnify®, NoFoamA®

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: Paul Robins

B. Signature: _____ **Date:** 5/8/2014

C. Title: Executive 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** _____

Aquatic Pesticide Application Plan

For Application of Aquatic Pesticides to Portions of the Salinas River Watershed

Consistent with Statewide General NPDES Permit for the Discharge of Aquatic Pesticides for Weed Control in Waters of the United States

Water Quality Order No. 2013-0002-DWQ

Submitted by:

Resource Conservation District of Monterey County

May 2014

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Project Summary

The objective of this project is to remove *Arundo donax* (hereafter: *Arundo*) from the Salinas River watershed. This will conserve water, normalize fluvial and geomorphologic processes, reduce fire risk and improve habitat for steelhead (*Oncorhynchus mykiss*) and other sensitive wildlife species. This watershed-wide eradication program involves biomass reduction and removal, and chemical treatments of Arundo. The watershed-wide effort is being addressed with an approach that works upstream to downstream in order to prevent re-introduction of Arundo.

The California Invasive Plant Council (Cal-IPC) has placed Arundo on their A-1 list of most invasive plants. Due to its impacts on local ecology and its ability to thrive in the local environment, it is listed as a high priority project in the Watershed Management Plans for the streams included in this project.

Inquiries about the Resource Conservation District of Monterey County's (RCDMC) Arundo Management Plan or The Aquatic Pesticide Application Plan can be directed to:

Resource Conservation District of Monterey County

744-A LaGuardia Street

Salinas, CA 93905

(831) 424-1036 ext. 124

Attention: Paul Robins, Executive Director

1.0 Description of Water System

The watershed of the Salinas River and its tributaries covers approximately 4,600 square miles (nearly 3 million acres) and lies within San Luis Obispo and Monterey Counties (Figure 1). The Salinas River, which originates in San Luis Obispo County, flows northwestward into Monterey County, through the entire length of the Salinas Valley and empties into Monterey Bay. The watershed's main tributaries are the Arroyo Seco, Nacimiento, San Antonio, and Estrella Rivers.

The Salinas River drains a large watershed with a number of distinct tributaries; and although it is considered a single hydrologic unit, geographic, political, land use and ground water divisions facilitate discussion of the Salinas River watershed in terms of an upper and a lower watershed. The upper watershed begins at the headwaters of the Salinas River in the La Panza Range southeast of Santa Margarita Lake in San Luis Obispo County and flows to the narrows area near Bradley, just inside Monterey County. The upper watershed includes drainages of the Estrella, Nacimiento and San Antonio Rivers. The upper watershed overlies the Paso Robles Ground Water Basin and lies mainly in San Luis Obispo County. The lower watershed extends from the Bradley narrows area to Monterey Bay and includes the drainage of the Arroyo Seco River. The lower Salinas River watershed overlies the Salinas Ground Water Basin and is entirely within Monterey County.

2.0 Description of the Treatment Area

The Salinas watershed is illustrated in **Figure 1**. The watershed based treatment program will focus on controlling Arundo on the main stem of the Salinas River. An earlier phase of the program treated the middle portion of the watershed from the San Luis Obispo County line to King City (**Figure 2**). Any remaining Arundo in this area will be retreated using BMPs that assure that no application to water occurs (cut and paint, no treatment in or over standing water). No NPDES monitoring will occur in this area. The lower 52 miles of the Salinas river, between King City and Salinas, have extensive stands of Arundo (over 1,400 acres) some of which occurs in and adjacent to the low flow channel (**Figure 2**). This area will be the focus of Arundo treatments and NPDES monitoring.

Two initial treatment areas will be the primary focus of work activities:

1) 21 miles of the Salinas River from King City to Soledad, through grant funded work (initially Wildlife Conservation Board and NRCS, and eventually IRWM and others, **Figure 3**)

2) 31 miles of the Salinas River from Soledad to Salinas, by private entities participating in the RCD Arundo control program and CMP (lead by MCWRA) (**Figure 4**).

3.0 Description of Invasive Plants to be Controlled

3.1 Arundo donax

3.1.1 Biology and Distribution

Arundo is a robust perennial grass that reaches heights up to thirty feet, growing in many-stemmed, cane-like clumps, spread from horizontal rootstocks below the soil (rhizomes), and often forms large colonies many feet across. Individual stems or culms are tough and hollow, divided by partitions at nodes similar to bamboo. First-year culms are unbranched, with single or multiple lateral branches from nodes in the second year. The pale green to blue-green leaves, which broadly clasp the stem with a heart-shaped base and taper to the tip, are up to two feet or more in length. Leaves are arranged alternately throughout the culm, distinctly two-ranked (in a single plane). Arundo produces a tall, plume-like flowerhead at the upper tips of the stems, the flowers closely packed in a cream to brown cluster borne from early summer to early fall. Seed production is not a factor in its spread, however, as seeds are not viable in California. Culms may remain green throughout the year, but often fade with semi-dormancy during the winter months or in drought. Arundo can be confused with cultivated bamboos and cord, and in earlier stages with some large-statue grasses such as giant wild rye (*Leymus condensates)* and especially with common reed (*Phragmites australis)*.

Arundo occurs in low elevations throughout California and in Baja California, usually below 1,000 feet (350 m) elevation. It has invaded central California river valleys in San Luis Obispo

and Monterey counties, the San Francisco Bay Area, and in the Sacramento and San Joaquin River valleys, and is also increasing in the North Coast region (Dudley and Collins 1995). Arundo has been a serious problem in coastal river drainages from southern California to Monterey, especially in the Salinas, Santa Clara, Santa Ana, Santa Margarita, San Luis Rey, and other major and minor watersheds, where it sometimes occupies entire river channels from bank to bank (Giessow 2011, Jackson et al. 1994, Bell 1998).

Arundo is naturalized and invasive in many regions, including southern Africa, subtropical United States through Mexico, the Caribbean islands and South America, Pacific Islands, Australia, and Southeast Asia (Hafliger and Scholz 1981). In California, the largest colonies occur in riparian areas and floodplains of medium-sized to large rivers, from wet sites to dry river banks far from permanent water. Arundo tends to favor low-gradient (less than 2 percent) riparian areas over steeper and smaller channels, but scattered colonies are found in moist sites or springs on steeper slopes.

Arundo populations also occur in the upper reaches of coastal streams. Additionally, it is often found along drainage ditches, where the plant has been used for bank stabilization, and in other moist sites, including residential areas where it is used horticulturally. While it is usually associated with rivers that have been physically disturbed and dammed upstream, Arundo can also colonize within native stands of cottonwoods, willows, and other riparian species, even growing in sites shaded by tree canopy. Plants establish primarily in streamside sites, but expand beyond the margins of riparian vegetation.

Soil preferences are broad, as Arundo is known to establish in coarse sands to gravelly soil to heavy clays and river sediments. It grows best in well drained soil with ample moisture, from freshwater to semi-saline soils at margins of brackish estuaries. In Egypt, Rezk and Edany (1997) found that Arundo tolerates both higher and lower water table levels than common reed, which is native to California.

Arundo in North America does not appear to produce viable seed, and seedlings are not seen in the field. Population expansion here occurs through vegetative reproduction, either from underground rhizomes extending from a colony (stand growing laterally) or from plant fragments (primarily rhizomes) carried downstream, primarily during floods, to become rooted and form new clones. New shoots arise from rhizomes in nearly any season, but are most common in spring. Growth likewise occurs in all seasons, but is highly sensitive to temperature and moisture (Perdue 1958). During warm months with ample water culms are reported to attain growth rates of 2.3 ft (70 cm) per week or about four inches (10 cm) per day, putting it among the fastest growing terrestrial plants. For mature stands above ground biomass production is estimated at 69 tons dry weight per acre and average cane density is $41.5/m^2$ (Giessow 2011). Young stems rapidly achieve the diameter of mature canes, with subsequent growth involving thickening of the walls (Perdue 1958). Age of individual culms is certainly more than one year, and branching seems to represent stem growth in later years, while rhizomes show indeterminant growth. Dieback is infrequently observed, but culms fade or partially brown out during winter, becoming

dormant under cold conditions. The outstanding growth trait of this plant is its ability to survive and grow at almost any time under a wide variety of environmental conditions.

3.1.2 Ecological Impacts

Arundo infestations impact both abiotic (geomorphic, fluvial, hydrologic, fire, nutrients) and biotic (flora, fauna) functions of riparian systems. Arundo displaces native plants and associated wildlife species because of the massive stands it forms (Bell 1994, Gaffney and Cushman 1998, Giessow 2011). Competition with native species has been shown to result from monopolization of soil moisture and by shading (Dudley and Collins 1995). As Arundo replaces riparian vegetation in semi-arid zones, it reduces habitat and food supply, particularly insect populations, for several special status species such as least Bell's vireo (*Vireo bellii pusillus*), southwestern willow flycatcher (*Empidonax traillii extimus*), and yellow-billed cuckoo (*Coccyzus americanu*) (Frandsen and Jackson 1994, Dudley and Collins 1995). Unlike native riparian plants, Arundo provides little shading of stream channels, leading to increased water temperatures and reduced habitat quality for aquatic wildlife, particularly the California red-legged frog (*Rana draytonii*) and salmonid species.

Arundo's impacts on abiotic processes can have large impacts on how the entire riparian ecosystem functions, because these processes regulate the system. Large stands of Arundo create alter the riverine fluvial processes in a way that changes vegetation succession following flow events, sediment transport budgets and the geomorphic structure. Arundo impacts fire frequency and intensity due to its tall, high fuel load that can burn year round. The presence of Arundo in riparian systems can also unnaturally carry fire into the wetland habitat by acting as a conduit from upland fires. Large stands of Arundo have high water use compared to native vegetation. Removal of Arundo stands has a large potential water use reduction that could have significant implications for both the ecosystem and human water use.

3.2 Tamarisk

3.2.1 Biology and Distribution

Four invasive Tamarix species have been identified in California: *T. ramosissima*, *T. chinensis*, *T. gallica*, and *T. parviflora*. All four are many-branched shrubs or trees less than twenty-six feet tall with small scale-like leaves, and salt glands. For this description salt cedar will be used to generally describe these species.

Saltcedars are large shrubs or small trees 8-16 feet tall and usually less wide. They have tiny, triangular, scale-like leaves that are winter-deciduous. The flowers are pink to near-white, densely crowded along branched terminal spikes; they appear from January to October. Fruit and seeds are tiny, brown, inconspicuous. Seeds are dispersed by wind to new locations.

Seedlings require extended periods of soil saturation for establishment. Once established salt cedar can form monotypic, dense thickets.

Saltcedar is widely distributed throughout the Mojave and Colorado deserts, Owen's Valley, the Central and South coasts, and the San Joaquin Valley. It occurs in parts of the San Francisco Bay Area and the Sacramento Valley, particularly Yolo and Solano counties. Saltcedar is abundant where surface or subsurface water is available for most of the year, including stream banks, lake and pond margins, springs, canals, ditches, and some washes. Disturbed sites, including burned areas, are particularly favorable for saltcedar establishment. It survives, and even thrives, on saline soils where most native, woody, riparian plants cannot.

Salt cedar was originally planted widely for erosion control, as a windbreak, for shade, and as an ornamental. It spreads by seed and vegetative growth. Individual plants can produce 500,000 tiny seeds per year (DiTomaso 1996), which are easily dispersed long distances by wind and water.

Saltcedar can reproduce both vegetatively and by seed. Plants can regenerate from cuttings that fall on moist soil. Plants can flower by the end of the first year of growth (DiTomaso 1996). Studies in Arizona demonstrated that dense saltcedar stands can generate 100 seeds per square inch. Seed production occurs over a 5.5-month period, with one major and one minor peak (Warren and Turner 1975). Germination can occur within twenty-four hours in warm, moist soil (Merkel and Hopkins 1957). Following germination and establishment, the primary root grows with little branching until it reaches the water table, at which point secondary root branching is profuse (Brotherson and Winkel 1986). Under favorable conditions, salt-cedar shoots reportedly grow to heights of 3-4 meters in one growing season (DiTomaso 1996).

3.2.2 Ecological Impacts

There is debate as to whether saltcedar is a consequence (Anderson 1996) or a cause (Lovich and de Gouvenain 1998) of environmental changes associated with its presence and proliferation. Regardless, the presence of saltcedar is associated with dramatic changes in geomorphology, groundwater availability, soil chemistry, fire frequency, plant community composition, and native wildlife diversity. Geomorphological impacts include trapping and stabilizing alluvial sediments, which results in narrowing of stream channels and more frequent flooding (Graf 1978). Saltcedar has been blamed for lowering water tables because of its high evapotranspiration rate, and, on a regional scale, dense saltcedar groves use far more water than native riparian plant associations (Sala et al. 1996).

Soil salinities increase as a result of inputs of salt from glands on saltcedar leaves. The dome-shaped glands consist of at least two cells embedded in the epidermal pits (Decker 1961). Increased salinity inhibits growth and germination of native riparian species (Anderson 1996). Leaf litter from drought-deciduous saltcedar increases the frequency of fire. Saltcedar is capable

of resprouting vigorously following fire and, coupled with changes in soil salinity, ultimately dominates riparian plant communities (Busch 1995).

Although saltcedar provides habitat and nest sites for some wildlife (e.g., white-winged dove, *Zenaida asiatica*), most authors have concluded that it has little value to most native amphibians, reptiles, birds, and mammals (Lovich and de Gouvenain 1998). The majority of birds do not use saltcedar in high proportions compared with native plant communities. Frugivores and insectivores, abundant in native riparian vegetation, almost completely avoid saltcedar. Studies showed that several species had a higher affinity for the cottonwood-willow association, including common flicker, yellow-bellied sapsucker, porcupine and beaver. With the exception of desert woodrat and desert cottontail, no native mammal species are known to feed upon saltcedar. When consumed by wildlife, only young growth is utilized. Although certain wildlife species may find saltcedar beneficial to their survival, the encroachment of saltcedar has most certainly altered the native habitat that was apparently of great benefit to wildlife. Although the southwestern willow flycatcher can nest in saltcedar, infestation have a negative impact on most other birds that would normally use the native vegetation. (Lovich 1998)

4.0 Herbicide and Surfactant/Adjuvants Descriptions and Effects

Aquatic herbicide formulations, such as those used by the RCDMC program, must be combined with a suitable surfactant to facilitate uptake and translocation of the herbicide down into the rhizomes. An inert marker dye or colorant is also added to the tank mix to assist the applicator at achieving full coverage and assuring that over-application and drift are not occurring. The following discussion addresses glyphosate herbicide (Aquamaster®, Rodeo®), imazapyr herbicide, surfactants (ProSpreader®, No Foam A, Magnify®) and colorants (Mark-It Blue®, Blazeon®). Detailed descriptions of the chemical properties, degradation rates, environmental fate, and toxicity of glyphosate, and all of the aquatic surfactants evaluated are provided in **Appendix 4 (Label and MSDS)**.

4.1 Herbicide to be Used

The aquatic formulation of glyphosate (as known as Aquamaster®, Rodeo®, or other registered product) will be used. Aquamaster® is an aqueous solution containing 53.8% glyphosate in its isopropylamine salt form or 4 lbs. acid per gallon, and contains no inert ingredients other than water. Glyphosate inhibits an enzyme needed to synthesize an intermediate product in the biosynthesis of the aromatic amino acids, essential for protein synthesis and to produce many secondary plant products such as growth promoters, growth inhibitors, phenolics, and lignin. Animals do not synthesize these aromatic amino acids and glyphosate therefore has low toxicity to these receptors. (Schuette 1998).

The primary decomposition product of glyphosate is aminomethylphosphonic acid (AMPA), and the commercial product contains an impurity, 2, 4-nitrosoglyphosate (NNG). The potential effects of AMPA and NNG are encompassed by the available toxicity data on glyphosate and glyphosate formulations (SERA 1997).

4.2 Environmental Fate of Herbicide

Herbicide mixtures may be indirectly discharged to surface waters by rainfall that rinses the herbicide solution from the plants. Rainfall is unlikely to occur during the planned application season, and herbicide applications would be postponed if rainfall were predicted (48 hours). Applications to invasive Arundo along stream banks will result in a small percentage (trace amount) of the herbicide directly entering the water column.

Food-web exposures become significant only with chemicals that have a tendency to bioaccumulate or biomagnify. The adverse effects associated with bioaccumulative chemicals relate to their propensity to transfer through the food web and accumulate preferentially in adipose or organ tissue. For upper-trophic-level species, ingestion of contaminated prey is the predominant route of exposure, especially for hydrophobic chemicals.

Glyphosate. Under typical environmental conditions of pH 5-9, glyphosate is ionized. Glyphosate and its salts are readily soluble in water with a solubility of about 12,000 mg/L. Interactions with soil and sediment are primarily ionic, rather than hydrophobic and pH dependent. Laboratory and field studies indicate that glyphosate is strongly and reversibly adsorbed by soil, sediment, and suspended sediment. Glyphosate is deactivated through soil adsorption. Because glyphosate adheres strongly to particles, it does not readily leach to waters (Sprankle 1975), and potential movement of glyphosate to groundwater is unlikely. Due to its negligible vapor pressure (7.5×10^{-8} mmHg) and its ionic state in water, glyphosate is not expected to volatilize from water or soil. Glyphosate's K_{ow} has been reported at 0.00033, indicating its high solubility in water, low solubility in lipids, and thus low potential to bioconcentrate.

All reported bioaccumulation factor values for glyphosate in aquatic organisms are well below 100 (Ebasco 1993; Heyden 1991; Wang et al. 1994). The highest bioaccumulation factor of 65.5 was reported for tilapia (a species of fish) in fresh water (Wang et al. 1994). Other studies report much lower bioaccumulation factors in the range of 0.03 to 1.6 for fish (Ebasco 1993). Most studies report rapid elimination and depuration from aquatic organisms after exposure stops (Ebasco 1993). Therfore, bioaccumulation of glyphosate is considered to be low and food-web transfer is not considered to be a significant exposure route.

Soil studies have determined glyphosate half-lives ranging from 3 to 130 days. In the soil environment, glyphosate is resistant to chemical degradation, is stable to sunlight, is relatively non-leachable, and has a low tendency to runoff (except as adsorbed to colloidal matter). It is

relatively immobile in most soil environments as a result of its strong adsorption to soil particles. Glyphosate is rapidly and strongly adsorbed to sediment, which appears to be the major sink for glyphosate in aquatic systems. Like in soils, the herbicide is inactivated and biodegraded by microorganisms.

Several studies indicate that glyphosate is stable in water at pH ranging from 3 to 6. The photolytic half-life of glyphosate in deionized water exposed outdoors to sunlight was approximately 5 weeks at 100 ppm and 3 weeks at 2000 ppm. Glyphosate shows little propensity toward hydrolytic decomposition. Its hydrolysis half-life is greater than 35 days. It is also stable to photodegradation under visible light but photolyzes when exposed to UV radiation. Glyphosate's loss from water occurs mainly through sediment adsorption and microbial degradation. The rate of microbial degradation in water is generally slower because there are fewer microorganisms in water than in most soils. Studies conducted in a forest ecosystem found that glyphosate dissipated rapidly from surface water ponds high in suspended sediment, with first order half-lives ranging from 1.5 to 11.2 days. In streams, residues were undetectable within 3 to 14 days. Other studies using water from natural sources determined glyphosate's half-life ranging from 35 to 63 days. For all aquatic systems, sediment appears to be the major sink for glyphosate residue. A review of the literature on glyphosate dissipation applied under estuarine conditions suggests that 24 to 48 hours after applications, glyphosate concentrations in water were reduced by more than 60-fold.

In summary, the use of glyphosate combined with a surfactant to treat infestations of non-native Arundo would result in less than significant impacts on water quality due to the rapid degradation rate and controlled application of herbicides only on target plants.

4.3 Method of Herbicide Application

Impacts to water quality from herbicide application depend on environmental fate, degradation rates of active agents and decomposition products of the herbicides. The primary route by which herbicide solution may contact water is by overspray directly onto the water surface. Herbicide may also be washed off plants by precipitation.

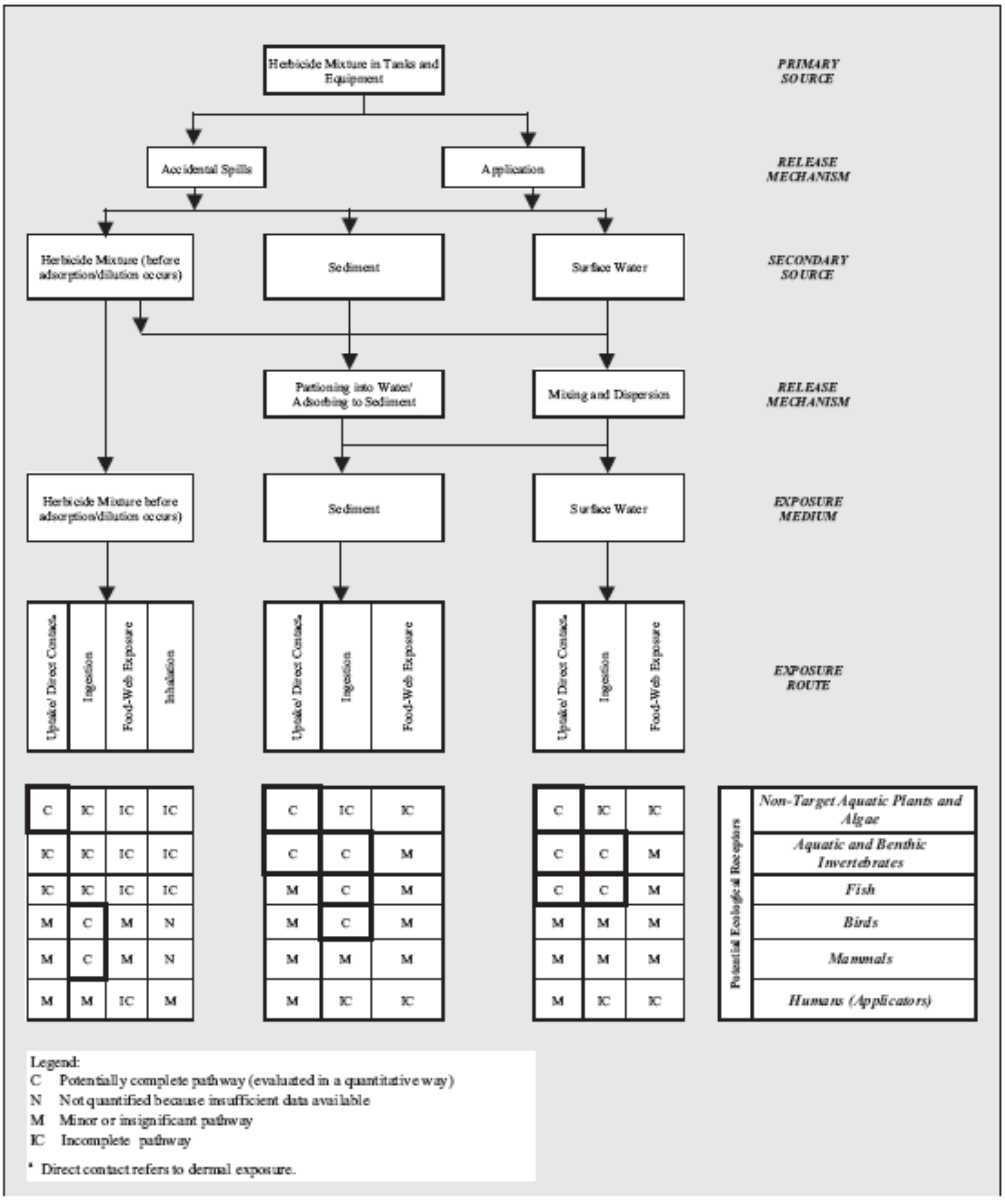
Glyphosate solutions will be applied as sprays to Arundo foliage for control of this invasive plant. Spray mixtures will be dispersed by manual application (backpack sprayers and hand held power sprayers). Application rates will be consistent with the product labels. Prior to herbicide treatments, Arundo stands are prepped by physically separating Arundo from native woody vegetation (non-target). Application from backpack sprayers entails workers walking through the riparian zone and applying herbicide directly to target plants, with limited overspray to surrounding plants or water surfaces.

4.4 Potential Biological and Ecological Effects

The known properties of the herbicides, potential methods of application, and the ecological characteristics of the waterways were evaluated to develop a conceptual model and identify likely receptors and exposure pathways. This model includes identification of primary and secondary herbicide sources, release mechanisms, exposure media, exposure routes, and potential ecological receptors.

For effects to occur, a receptor and a complete exposure pathway must be present. An exposure pathway is only considered complete when all four of the following elements are present: project-related source of a chemical, a mechanism of release of the chemical from the source to the environment, a mechanism of transport of the chemical to the ecological receptor and a route by which the receptor is exposed to the chemical.

The exposure routes associated with the complete pathways include direct contact with the herbicide mixture during and immediately after application, ingestion of contaminated surface water and sediments, direct contact with contaminated surface water and sediments, and food-web exposure. The conceptual model illustrates the links between sources, release and transport mechanisms, affected media, exposure routes, and potentially exposed ecological receptors. Although several complete exposure pathways may exist, not all pathways are comparable in magnitude or significance. The significance of a pathway as a mode of exposure depends on the identity and nature of the chemicals involved and the magnitude of the likely exposure dose. For birds and mammals, ingestion is generally the most significant exposure pathway. Dermal contact is expected to be insignificant and unquantifiable due to the nature of the sites and frequent movement, ranging habits, and furry or feathery outer skin of most wildlife species.



Food-Web Exposure Conceptual Model (Kerr 2010)

Because project applications of herbicides would occur only once or twice a season, and compounds in the herbicide mixture are not expected to persist in significant concentrations for more than several hours, chronic exposure is not likely. Therefore, this evaluation focuses on acute toxicity, which would occur when the compounds are present at relatively high concentrations during and immediately following an application. Herbicide solutions have the potential to affect organisms that live in the water column, including algae, non-target plants, fish, amphibians and aquatic invertebrates. While some other receptors such as mammals and birds may spend a considerable portion of their time in the water, they are generally more likely

to be affected by other exposure routes, primarily dermal contact during application and incidental ingestion of contaminated sediment during foraging.

4.4.1 Potential Effects of Glyphosate Herbicide

Non-Target Aquatic Plants and Algae

Due to its engineered mechanisms of action, glyphosate is toxic to a wide variety of plants. Native plants and algae in the area where herbicides would be applied could be negatively affected. Glyphosate, however, is ineffective for treating submerged aquatic vegetation.

In laboratory growth inhibition studies with submerged aquatic plants no adverse effects on the growth of elodea (*Elodea Canadensis*), water milfoil (*Myriophyllum spicatum*), and wild celery (*Vallisneria americama*) were found with glyphosate concentrations of up to 1 mg/L. (Monsanto Company 2000) These results are consistent with the findings of other investigators who report that submerged plants are either resistant or affected only by very high glyphosate concentrations. (Monsanto Company 2000.) A large number of studies with a variety of green algae, blue-green algae, diatoms, and periphyton indicate that glyphosate is slightly toxic to practically non-toxic to most algae. Most algae tolerate concentrations of glyphosate greater than 1 mg/L. (Monsanto Company 2000.)

Aquatic and Benthic Invertebrates

Glyphosate is slightly toxic to practically non-toxic to marine and freshwater aquatic invertebrates. Acute toxicity for freshwater invertebrates varies from 545 to 780 mg/L for water flea (*Daphnia magna*), to 673 mg/L for mosquito 4th instar (*Anopheles quadrimaculatus*), to 1,157 mg/L for a leech (*Nephaelopsis obscura*). Acute toxicity for marine invertebrates was reported as greater than 10 mg/L for Atlantic oyster larvae (*Crassostrea virginica*), 281 mg/L for grass shrimp (*Palaemonetes vulgaris*), and 934 mg/L for fiddler crab (*Uca pugilator*). (ExToxNet 2005; Henry 1992, Heydens 1991; all in SERA 2004.) The wide variation in the aquatic toxicity of glyphosate has been attributed to the dilution water, temperature, formulation, and the amount of suspended sediment in the water. Toxicity appears to increase with temperature, and decrease with elevated pH and suspended sediment (Schuette 1998).

Fish

Acute toxicity studies with warm and cold water fish indicate that the terrestrial formulation of glyphosate is slightly to practically non-toxic. (U.S. EPA 1993.) Acute toxicity LC_{50} values were reported at 86 mg/L in rainbow trout (*Oncorhynchus mykiss*), 120 mg/L in bluegill sunfish (*Lepomis macrochirus*), and 168 mg/L in harlequin (*Trigonostigma heteromorpha*) (. (ExToxNet 2005.) Chronic toxicity studies with a terrestrial formulation of glyphosate, Roundup®, found no significant adverse effects on growth, carcinogenicity, feeding, and agonistic behavior in

rainbow trout fingerlings. A recent study with the aquatic formulation Rodeo® determined the LC_{50} for juvenile rainbow trout at 782 mg glyphosate a.e./L.

Giesy et al. (2000) reviewed the data available on glyphosate toxicity to fish. Although some data were available for anadromous species, it appears that all tests were conducted using freshwater test methods. Acute toxicity LC_{50} values for glyphosate tested as isopropylamine salt ranged from 97 to greater than 1,000 mg/L and no-observed-effect concentrations (NOEC) values ranged from <97 to 1,000 mg/L. Data compiled by Ebasco (1993) on one-day acute toxicity tests indicate EC50 values ranging from 12.8 mg/L to 240 mg/L.

The lowest of these NOEC and LC_{50} values (12.8 mg/L) for glyphosate or glyphosate/surfactant mixtures is well above the maximum glyphosate concentration of 0.026 mg/L reported by Paveglio et al. (1996) and the immediate maximum geometric mean glyphosate concentration of 0.174 mg/L. Therefore, these data indicate that impacts to fish due to maximum post-application water concentrations of glyphosate are unlikely in experimental conditions.

Birds

Effects of glyphosate on birds have been tested on mallard ducks (*Anas platyrhynchos*) (dabbling ducks which ingest wetland sediment along with seeds, insects, and vegetation) and bob-white quail (*Colinus virginianus*). Glyphosate is no more than slightly toxic to birds. Several single-dose acute oral studies indicate that glyphosate is practically non-toxic to upland birds and only slightly toxic to waterfowl. (U.S. EPA 1993.) As with mammals, very high dietary concentrations of glyphosate (a 4,640 mg/kg dietary concentration) resulted in no adverse reactions such as weight loss or mortality (Ebasco 1993). Chronic exposure studies with glyphosate determined a NOEC of 1,000 ppm in the diet. (Heydens 1991.) Little or no data are available on toxicity of surfactants to birds.

Mammals

Glyphosate has been determined to be practically non-toxic to mammals by ingestion with an acute oral LD_{50} of 5,600 mg/kg b.w. in rats. The no-observed-effect level (NOEL) for chronic toxicity to rats has been determined at 362 mg/kg b.w./day (8,000 ppm) and LOEL at 940 mg/kg b.w./day (20,000 ppm). (Monsanto 1983) The reported acute LD_{50} values for dermal effects range from >5,000 to 7,940 mg/kg for rabbits. Subchronic oral toxicity studies of glyphosate with rats and dogs indicate that oral doses of up to 2,000 ppm do not significantly affect behavior, survival, or body weight. Laboratory studies of the chronic effects of glyphosate show that it is slightly to practically non-irritation to rabbits' eyes. No significant reproductive, teratogenic, mutagenic, or carcinogenic effects from exposure to concentrations of up to 300 ppm were reported in 20-year laboratory studies with rats, dogs, rabbits and mice.

4.5 Surfactants and Adjuvants to be Used

For most foliar applications of aquatic herbicide formulations, adjuvants must be added to spray solutions to improve the performance and minimize variation of herbicide efficacy. Surfactants are designed to improve the spreading, dispersing/emulsifying, sticking, absorbing, and/or pest-penetrating properties of the spray mixture (Tu et al. 2001) The pure herbicide formulation mixed with water will stand as a droplet on the waxy leaf surface and the small area of contact therefore provides little potential for uptake of the active ingredient into the foliage. Water droplets containing a surfactant will spread in a thin layer over a waxy leaf surface and improve herbicide uptake by maximizing herbicide distribution and forcing the fluid into the plant. Aquatic herbicides require the addition of a surfactant for post-emergent applications such as the control of invasive Arundo.

The glyphosate specimen label recommend the use of a non-ionic surfactant containing at least 50% active ingredient at a rate of 2 or more quarts per 100 gallons of tank mix (0.5% v/v).

Magnify® is a surfactant/ water conditioning (spreader, penetrant, and water conditioning) agent formulated with ammonium salts, non-ionic surfactants and anti-foaming agents. Magnify enhances the biological activity and leaf-surface penetration of herbicides, defoliants and desiccants whose labels specify the addition of ammonium sulfate/ nitrate and/ or surfactants. Toxicity studies classified this surfactant as a toxicity category of 3-4 (Caution).

No Foam A® is a surfactant/ water conditioning (spreader) agent formulated with a mixture of nonionic surfactants (Alkyl phenol ethoxylate). It also contains isopropyl alcohol. No Foam A enhances the biological activity and leaf-surface penetration of herbicides, defoliants and desiccants whose labels specify the addition of surfactants. Toxicity studies classified this surfactant as a toxicity category of 3-4 (Caution).

Prospreader® is a surfactant/ water conditioning (spreader) agent formulated with a mixture of nonionic surfactants (Alkyl phenol ethoxylate). It also contains isopropyl alcohol. No Foam A enhances the biological activity and leaf-surface penetration of herbicides, defoliants and desiccants whose labels specify the addition of surfactants. Toxicity studies classified this surfactant as a toxicity category of 3-4 (Caution). This product is similar to No Foam A®.

There are several colorants suitable for use in the riparian environment, all of which are similar in composition and performance. Balzon® and Mark-it Blue®, are typical colorants, and are water-soluble polymeric products. As with most colorant products, the active ingredients in Balzon® and Mark-it Blue® are proprietary; the Material Safety Data Sheets (MSDS) indicate that they are non-hazardous and non-toxic.

5.0 Factors Influencing Decision of Using Herbicide for Weed Control

A detailed evaluation of alternative control methods is presented in Section 11. The only feasible control method for Arundo is application of herbicide (glyphosate). There is no approved (or pending) bio-control agent. Mechanical extraction is costly and causes disturbance of soil. Significant additional regulatory approval would be needed (including ACOE 404, RWQCB 401, and air quality) for mechanical extraction. Follow-up work after mechanical clearing of Arundo stands would be by herbicide of resprouts, so the method does not eliminate the use of herbicide. Additionally, mechanical clearing will likely be approved as a method of control under the 'Channel Maintenance Program' in selected areas (under Monterey County Water Resource Agency, MCWRA). The RCDMC Arundo program is working closely with this effort to assure that Arundo is controlled at all locations on the river over time.

6.0 Gates and Control Structures

6.1 Gates and Control Structures

King City to Salinas

There are no gates or control structures within or adjacent to the application or treatment areas.

6.2 Inspection Schedule of Gates and Control Structures

There are no gates or control structures within or adjacent to the application or treatment areas.

7.0 Projects with SIP Exception

7.1 SIP Status

The project does not have a SIP exception.

8.0 Monitoring Program

8.1 Objective

Conduct water quality monitoring sufficient to achieve compliance with National Pollutant Discharge Elimination System (NPDES) State-wide General Permit requirements.

8.2 Monitoring Site Selection

This project contains two monitored treatment areas: 1) Salinas River from King City to Soledad (**Figure 3**) and Salinas River from Soledad to Salinas (**Figure 4**).

King City to Soledad Treatment Site

The Salinas River from King City to Soledad treatment area covers an area of approximately twenty (20) contiguous miles, as described in Description of the Application Area and the Treatment Area above. Background monitoring, event monitoring, and post-event monitoring will be conducted at this treatment area, pursuant to the requirements of the General Permit. Two sample locations have been designated for this sampling. The first sample location is within the treatment area. This is designated as S1 on **Figure 4**. If the treatment area shifts to a different portion of the river, the sample site will be located at the center of the treatment/active work area (and will be reported in annual report). The second sample location is located immediately downstream of the treatment area, and is designated as S2 on **Figure 4**.

Collection 1: A background sample will be collected within the treatment area at S1 and S2 within 24-hours prior to the herbicide application (two samples).

Collection 2: An event sample will be collected downstream of the treatment area at S1 and S2 immediately after the application event (two samples).

Collection 3: A post-event sample will be collected within the treatment area at S1 and at S2 between three and seven days after the treatment event (two samples).

There will be a total of three collection events, with two samples taken at each event, for a total of six samples. If the river channel is dry no sampling will occur.

Soledad to Salinas Treatment Site

The Salinas River from Soledad to Salinas treatment area covers an area of approximately twenty (20) contiguous miles, as described in Description of the Application Area and the Treatment Area above. Background monitoring, event monitoring, and post-event monitoring will be conducted at this treatment area, pursuant to the requirements of the General Permit. Two sample locations have been designated for this sampling. The first sample location is within the treatment area. This is designated as S3 on **Figure 5.** If the treatment area shifts to a different portion of the river, the sample site will be located at the center of the treatment/active work area (and will be reported in annual report). The second sample location is located immediately downstream of the treatment area, and is designated as S4 on **Figure 5**.

Collection 1: A background sample will be collected within the treatment area at S3 and S4 within 24-hours prior to the herbicide application (two samples).

Collection 2: An event sample will be collected downstream of the treatment area at S3 and S4 immediately after the application event (two samples).

Collection 3: A post-event sample will be collected within the treatment area at S3 and at S4 between three and seven days after the treatment event (two samples).

There will be a total of three collection events, with two samples taken at each event, for a total of six samples. If the river channel is dry no sampling will occur.

8.3 Sampling Design

The sampling events are designed to characterize the potential risk involved with glyphosate applications relative to adjacent surface waters. Consistent with permit requirements, the monitoring program will include background/ pre-treatment sampling up to 24 hours prior to the application, application event monitoring immediately post-treatment, and one-week post-application event monitoring. Sample collection sites have been recorded using GPS and marked to aid RCD staff in locating the point for future sampling events.

8.4 Field Sampling Procedures

The RCD will conduct its own water quality monitoring program. Water samples will be collected using a sampling rod and a pre-cleaned container provided by the laboratory. To collect the sample, the container is attached to the sampling rod with a clamp, extended out over the water at the application site, and lowered to approximately 50% of the water depth. When the container is full it is pulled back out of the water and the cap is affixed to the mouth of the bottle. The sample is labeled in permanent ink with the sample ID number, date, time, and initials of the sampler.

The sample ID number is determined by the following protocol: a four-letter code unique to the site, followed by the site visit number (e.g., 01 for pre-treatment, 02 for treatment, or 03 for one-week post-treatment), followed by the time since the application (e.g., “pre” for the baseline sample, the number of hours since the application for the treatment sample, or “1w” for the one-week post-treatment).

8.5 Equipment Calibration

Temperature, pH , conductivity, and salinity will be measured in the field with a portable Oakton Waterproof Multiparameter Meter, Model JB1-155825, while air temperature will be measured with a portable LaCrosse Technology Hand-Held Wind Meter. To assure accurate and reliable water temperature, pH, conductivity, and salinity, the Oakton Waterproof Mutiparameter Meter will be calibrated, operated, and maintained in accordance with the manual specifications found.

8.6 Field Data Sheets

At each sampling location, the sample ID number, the time of the sampling, the sample depth, and the water temperature, pH, conductivity, and salinity will be entered on a Field Data Collection Form

("FDCF", **Appendix 1**). Also recorded on the FDCF will be site information, including the site ID number, the station location, wind conditions, water color, and the type of herbicide and surfactant that might be present. Any other unusual conditions or concerns will be noted, and any fish, birds, or other wildlife present will be recorded. The FDCFs will be dated and numbered consecutively for each site on that date. On return to the office, the data will be entered into an electronic spreadsheet for processing, and the FDCFs will be compiled into a data log and kept permanently in the office.

8.7 Sample Shipment

Following collection, water samples will be stored on ice packs and delivered to the FGL Environmental Offices in Salinas, CA. If samples are not delivered until the following day, they will be stored in a cooler on ice until they can be transferred to a refrigerator. Samples shall be prepared according to the FGL Environmental document, 'Sampling Instructions for Aqueous Samples'.

8.8 Sample Analysis

Glyphosate will be analyzed using the EPA method 547 (High Performance Liquid Chromatography with post column derivatization using orthophthalaldehyde (OPA) and fluorescence). Turbidity will be analyzed using the SM2130B method and dissolved oxygen (DO) will be analyzed using the SM4500-O G method. A quality assurance/ quality control report is supplied with all of the analyses. Results will be submitted to the Central Coast Regional Water Quality Control Board and kept in the RCDMC office.

8.9 Lab QC & Data Quality Indicators

The contracted analytical laboratory ("lab") is required to provide a Quality Assurance Plan (QAP) that meets USEPA standards prior to initiating analysis. The lab plan must specify the method of analysis to be used, and describe any variations from a standard protocol. The lab QAP is attached at **Appendix 2**.

9.0 Sample Contamination Prevention

Water samples will not be contaminated by personnel or equipment associated with application of herbicide to non-native vegetation. Samples will be collected by MCRCD staff or biological consultants. These personnel do not apply or handle herbicide. Collection of water samples will be by hand or with a pole or rod. This equipment is not used by or for herbicide application and it will not be stored with application equipment or herbicides.

10.0 Best Management Practices

Applicable Water Quality BMPs

The following best management practices were identified in the Arundo Control Program. These measures will be implemented at all herbicide treatment sites and verified by the RCDMC's field staff.

10.1 Herbicide Spills

Herbicides shall be applied by or under the direct supervision of trained, certified or licensed applicators. Storage of herbicides and adjuvants/surfactants on-site shall be allowed only in accordance with the Herbicide Safety and Spill Plan **(Appendix 4)**. Mixing operations shall be confined to areas outside the river (roads and adjacent lands above the river) to minimize spread or dispersion of spilled herbicide or surfactants into surface waters. Spill containment and cleanup is outlined in the Herbicide Safety and Spill Plan **(Appendix 4)**.

10.2 Minimum and Consistent Use of Herbicide

- Herbicides shall be applied by a licensed or certified applicator and those properly trained in the application of herbicides and in accordance with application guidelines and the manufacturer's label.
- The herbicide treatment on Arundo shall be scheduled when the plant is most susceptible to the uptake of herbicides into the roots (Fall).
- Herbicides shall be applied directly to plants when streamflow is low, when there is no forecast for rainfall within 48 hours. This will minimize the potential application of herbicide directly on the water surface, avoid run-off of herbicide, as well as ensure proper dry times.
- Drift will be avoided by calibrating spray pack nozzles to control droplet size and by applying herbicides only when local winds do not exceed 10 miles per hour. If at any time during herbicide application, drift is noticed to be occurring, application will immediately cease until ideal conditions allow the continuation of the application.

10.3 Applicator Education

Herbicides shall be applied by trained, certified or licensed applicators with previous work experience in wetland habitats. All application BMPs as well as regulatory measures to protect flora and fauna will be reviewed at the start of each work season. All applicators will receive training on conditions and measures and will be provided plans and permits. RCDMC staff and/or biological consultants will conduct the training as well as monitor that conditions are being followed.

10.4 Farmer and Agency Notification

Farmers and agencies will be notified at the start of each season. Work is being conducted on lands held by farming operators, so detailed coordination is already occurring. Water agencies are also active partners in the program, so they are also aware of the work that is occurring.

10.5 Fish Kill Prevention

The program is applying herbicide to terrestrial vegetation (Arundo), where there is a possibility that minor drift onto standing water could occur, but at levels that would be extremely unlikely to trigger a fish kill. The program is not making direct applications to water (such as algaecides). An active spill prevention plan also reduces the risk of accidental spills. All mixing and use of concentrated herbicide is outside of the river, where it can not enter water.

11.0 Examination of Alternatives

The Arundo Management Program implements a number of non-chemical control methods in situations where environmental impacts can be reduced. A number of criteria were used in the evaluation of control methods, including efficacy at controlling Arundo, human health and safety, damage to the riparian habitat and/or other aspects of the environment, impacts on water quality, etc. Several non-chemical methods have been incorporated into the Arundo Management Program. The remainder of the methods that were evaluated were found to have significant limitations, and are not part of the Arundo Management Program's current plans. However, some of these methods may be used in conjunction with out selected control methods at a later date. The entire set of possible control methods that were evaluated are discussed below, starting with the methods that were selected and incorporated into the plans.

11.1 Selected Non-chemical Control Methods

No action: Given the extreme impacts associated with Arundo invasion (high water use, flow constraint, flooding, habitat degradation, etc.), taking no action causes more habitat and water impacts than implementing the program. Not feasible.

Prevention: Salinas River watershed has the second highest Arundo acreage in the State, prevention is not an option. Not feasible.

Manual methods: Minor infestations can be controlled by manual methods. Hand pulling is effective with new plants less than six feet (2 m) in height, but care must be taken that all rhizome material is removed. This may be most effective in loose soils and after rains have made the substrate workable. Plants can be dug up using hand tools (pick-ax, mattock, and shovel), especially in combination with cutting of stems near the base with pruning shears, machete, or chainsaw. For larger infestations these

methods are impractical. Stems and roots should be removed, burned, or chipped on site to avoid re-rooting. For larger infestations on accessible terrain, heavier tools (rotary brush-cutter, chainsaw, or tractor-mounted mower) may facilitate aboveground biomass reduction. This however does not 'control' or kill the plant, as rhizomes are still intact belowground. Rhizome removal/extraction could then occur (by grubbing or grading) but this disturbs the soil, increasing the risk of erosion as well as triggering more complicated 404 and 401 permitting review and compliance. Such methods may be of limited use on complex or sensitive terrain. Scraping Arundo stands with a toothed blade can also push biomass (above ground cane and below ground rhizomes) into piles. These piles may then be burned. These methods cause more soil disturbance and trigger air quality permit requirements. These mechanical methods may be approved for portions of the Salinas River under the 'Channel Maintenance Program'. These methods may be restricted to specific portions of the river. The Arundo control program, to be effective, must apply to the entire river system. Not feasible for entire watershed.

Cultural Method- Covering/blanketing: This technique that is aimed at exhausting the reserves of energy and nutrition in Arundo roots and rhizomes and increasing environmental and disease stress. Covering typically involves securing an opaque tarp completely over a cut stand of Arundo. This excludes light essential photosynthesis, and “bakes” the covered Arundo in a tent of high temperature and humidity. This method is not practical at the scale of this program (2,000 acres). It also is difficult to tarp non-uniform/irregular stands or avoid native vegetation. Flood events would also disturb tarps causing debris to enter the river. Given the length of time needed and limited control success, this method is not a first choice in the Arundo Management Program. This technique may be used in discrete stands where chemical treatment is not an option, such as in close proximity to organic farms. Not feasible for entire watershed.

Biological control: There are no approved bio-control agents for Arundo. Those that are being studied are years away from approval. Bio-control agents being studied also seem to have limited effect, merely reducing stand vigor and density. They are unlikely to significantly reduce distribution of the plant or significantly reduce impacts caused by the plant. Not feasible.

Herbicide Control: This method (application of glyphosate) has the best track record for controlling Arundo at the watershed scale. Several watersheds (San Luis Rey, Santa Margarita, Santa Ana) have utilized herbicide application as the primary control method. The watersheds have restored riparian habitat, improved water quality (amount, biological function, and temperature), and normalized fluvial flow regimes (Giessow 2011). Only feasible option for the whole watershed.

11.2 Use of Least Intrusive Method

The most passive control method is targeted application of herbicide. Larger stands will also be controlled using herbicide, with biomass reduction using mowers where appropriate.

11.3 Use of Decision Matrix

The only viable method of control for Arundo on the Salinas River is application of an approved aquatic herbicide (glyphosate) following labeling guidelines. This is the method used by all other programs controlling Arundo at the watershed scale in the state. All other 'alternative methods' can not be used as they are either not feasible or not appropriate at the watershed scale. Imazapyr would be another chemical alternative to glyphosate, but this herbicide is difficult to use on large Arundo stands adjacent to native vegetation due to imazapyr being mobile. This creates the potential for non-target impacts to native vegetation (native trees and shrubs). Imazapyr is also slow acting and has residual activity in soil (pre-emergent properties). For these reasons, imazapyr, although approved for use in wetland systems, will not be used for foliar application of Arundo stands.

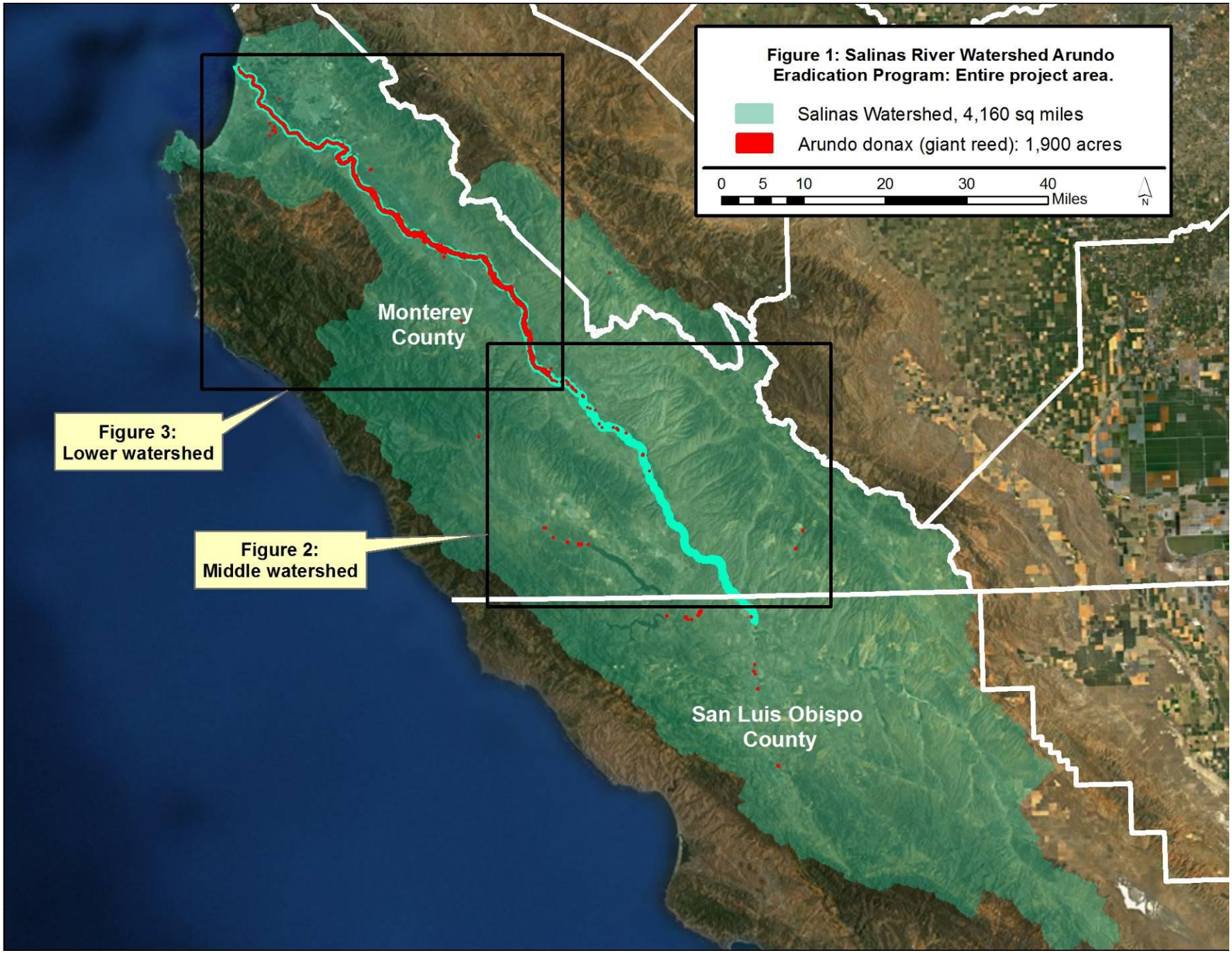
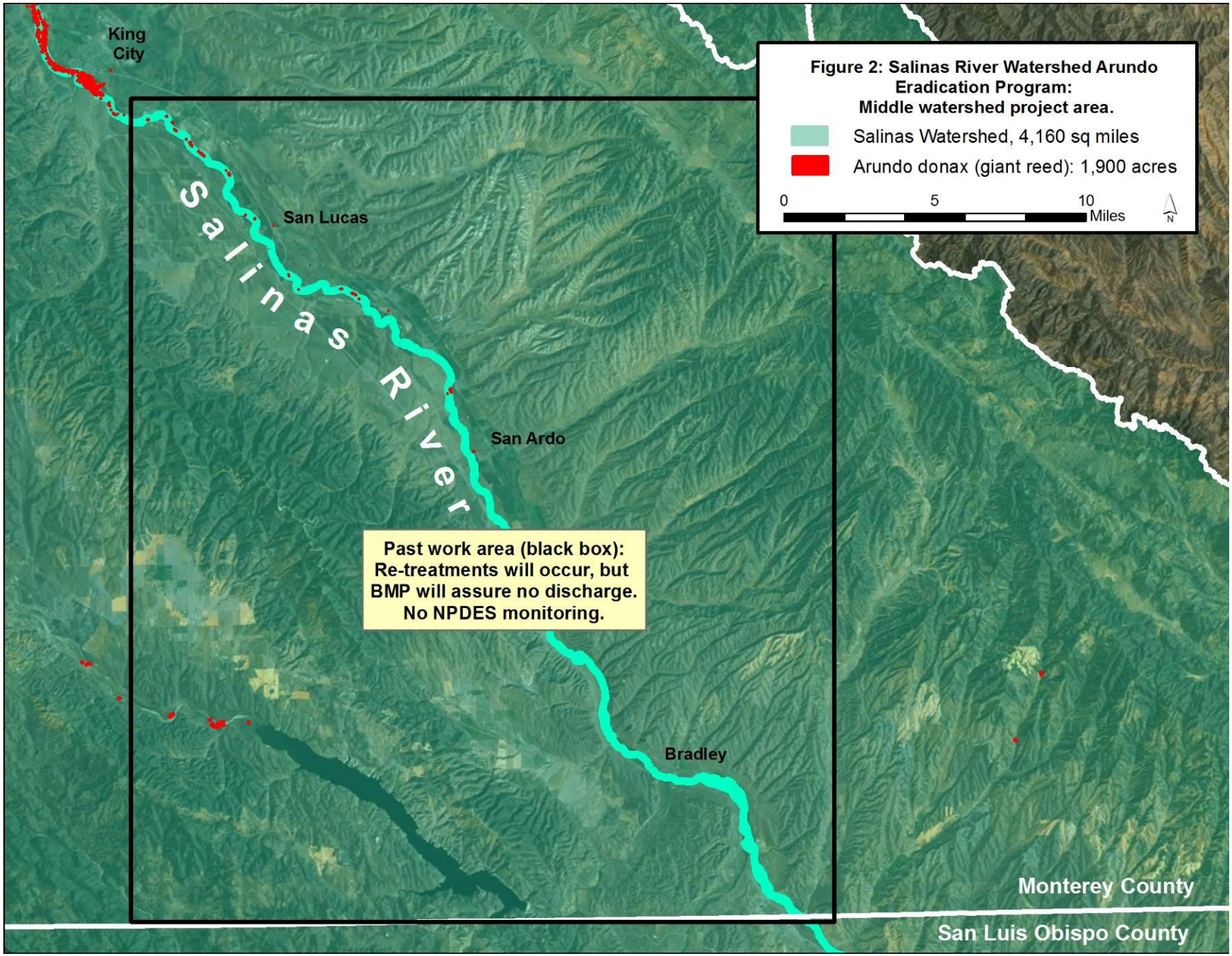


Figure 1: Salinas River Watershed Arundo Eradication Program: Entire project area.
Salinas Watershed, 4,160 sq miles
Arundo donax (giant reed): 1,900 acres
0 5 10 20 30 40
Miles
N
Monterey County
Figure 3: Lower watershed
Figure 2: Middle watershed
San Luis Obispo County


King City
San Lucas
Salinas River
San Ardo
Bradley
Past work area (black box): Re-treatments will occur, but BMP will assure no discharge. No NPDES monitoring.
Figure 2: Salinas River Watershed Arundo Eradication Program: Middle watershed project area.
Salinas Watershed, 4,160 sq miles
Arundo donax (giant reed): 1,900 acres
0
5
10
Miles
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Monterey County
San Luis Obispo County

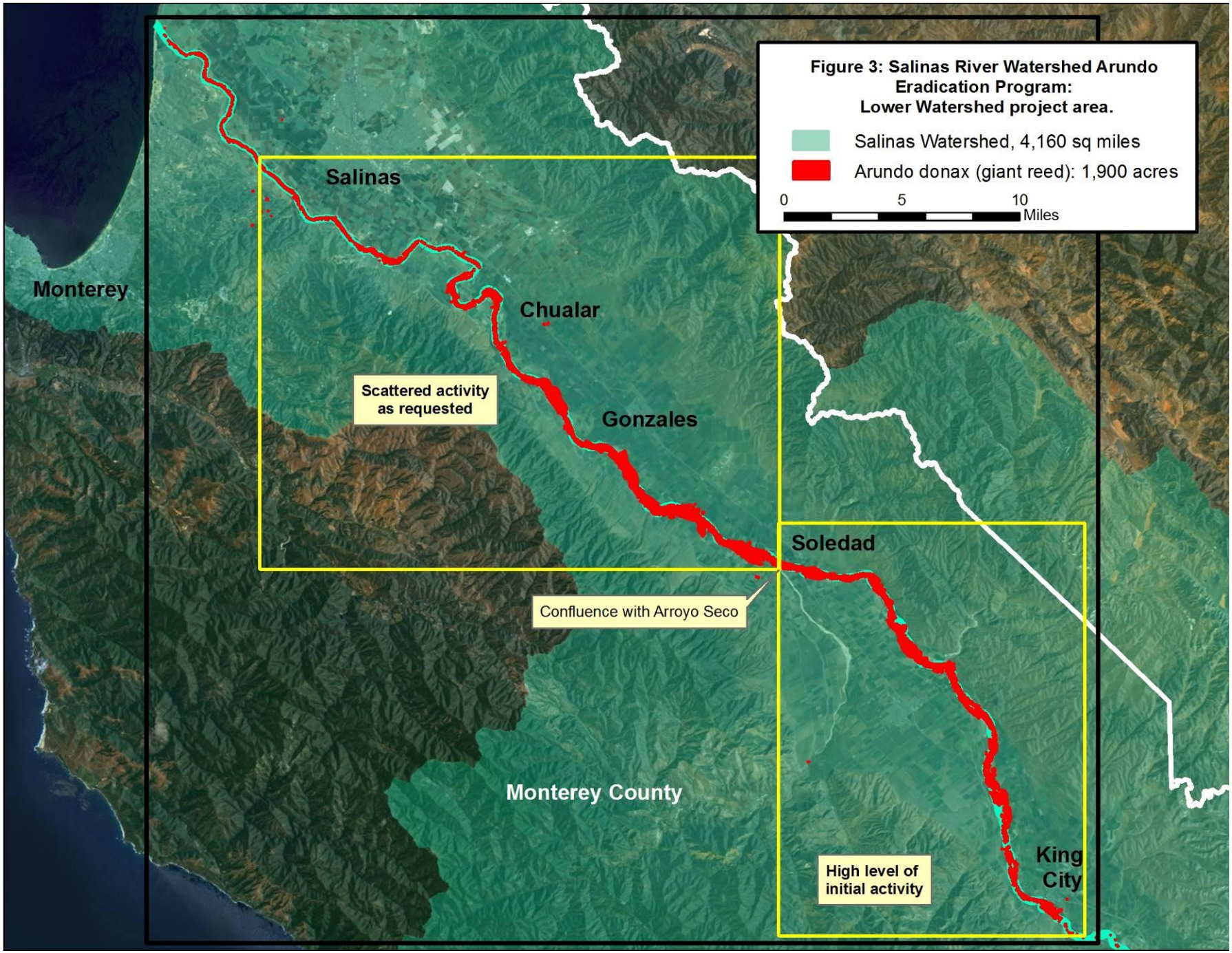
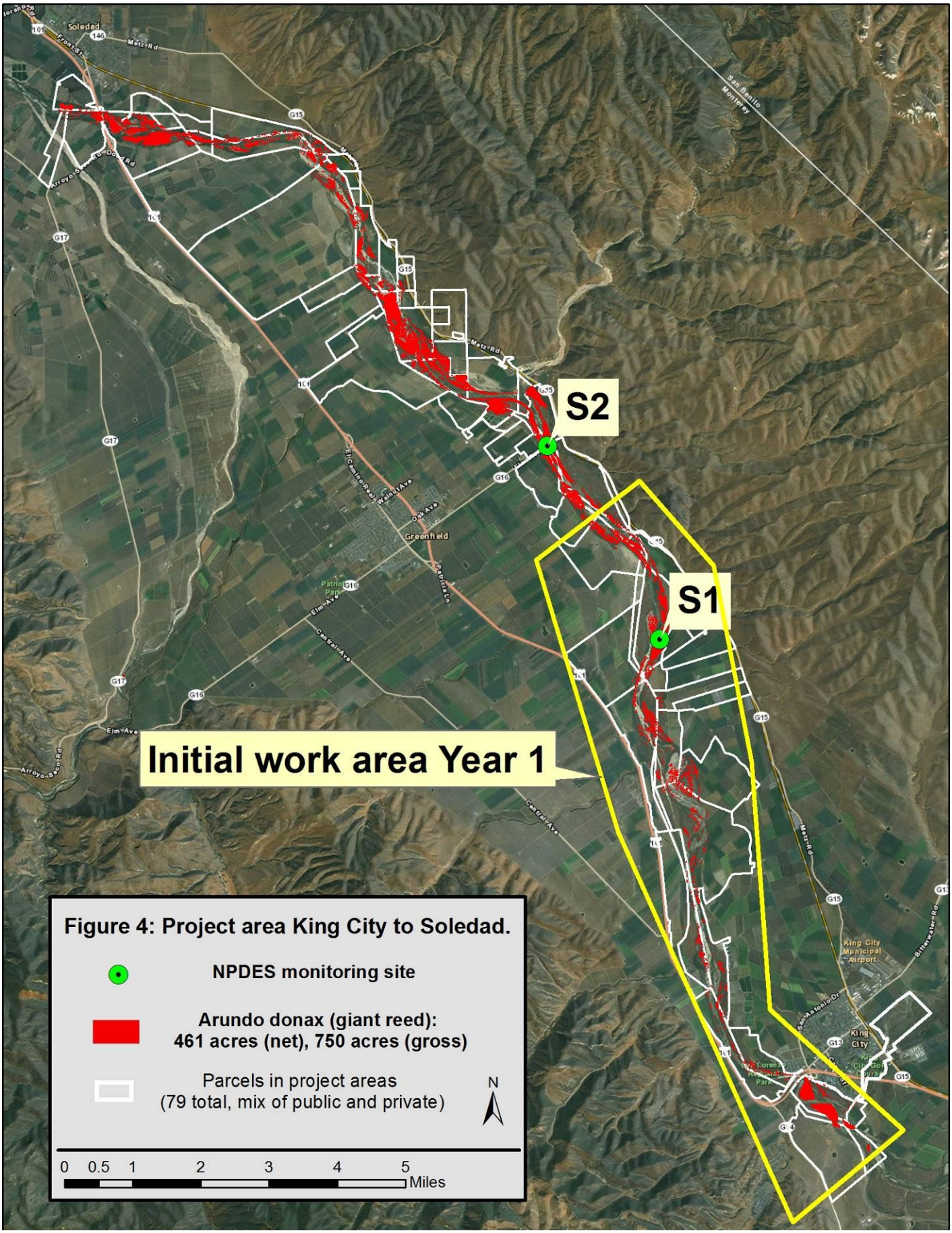
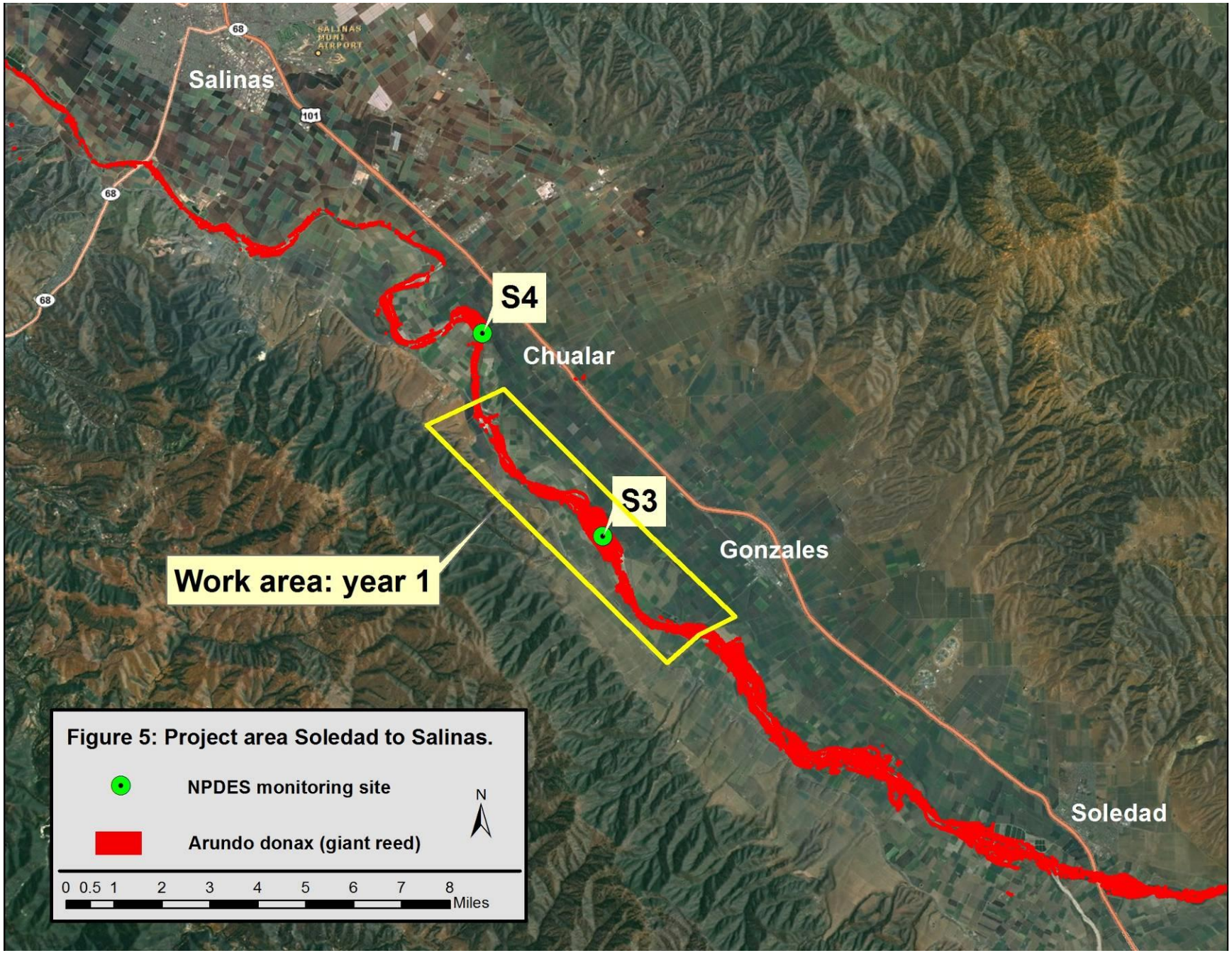


Figure 3: Salinas River Watershed Arundo Eradication Program: Lower Watershed project area.
Salinas Watershed, 4,160 sq miles
Arundo donax (giant reed): 1,900 acres
0
5
10
Miles
Salinas
Monterey
Chualar
Scattered activity as requested
Gonzales
Soledad
Confluence with Arroyo Seco
Monterey County
High level of initial activity
King City


S2
S1
Initial work area Year 1
Soledad
Metz Rd
Greenfield
King City
King City Municipal Airport
Figure 4: Project area King City to Soledad.
NPDES monitoring site
Arundo donax (giant reed):
461 acres (net), 750 acres (gross)
Parcels in project areas
(79 total, mix of public and private)
N
0 0.5 1 2 3 4 5
Miles


Salinas
68
101
68
68
S4
Chualar
S3
Gonzales
Work area: year 1
Soledad
Figure 5: Project area Soledad to Salinas.
NPDES monitoring site
Arundo donax (giant reed)
N
0 0.5 1 2 3 4 5 6 7 8
Miles

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Appendices

Appendix 1- Field Data Collection Form (FDCF)

Appendix 2 – Lab Quality Assurance Plan (QAP)

Appendix 3 – Chemical descriptions: Label and MSDS

Appendix 4 – Chemical description

Appendix 5 – Herbicide Safety and Spill Plan