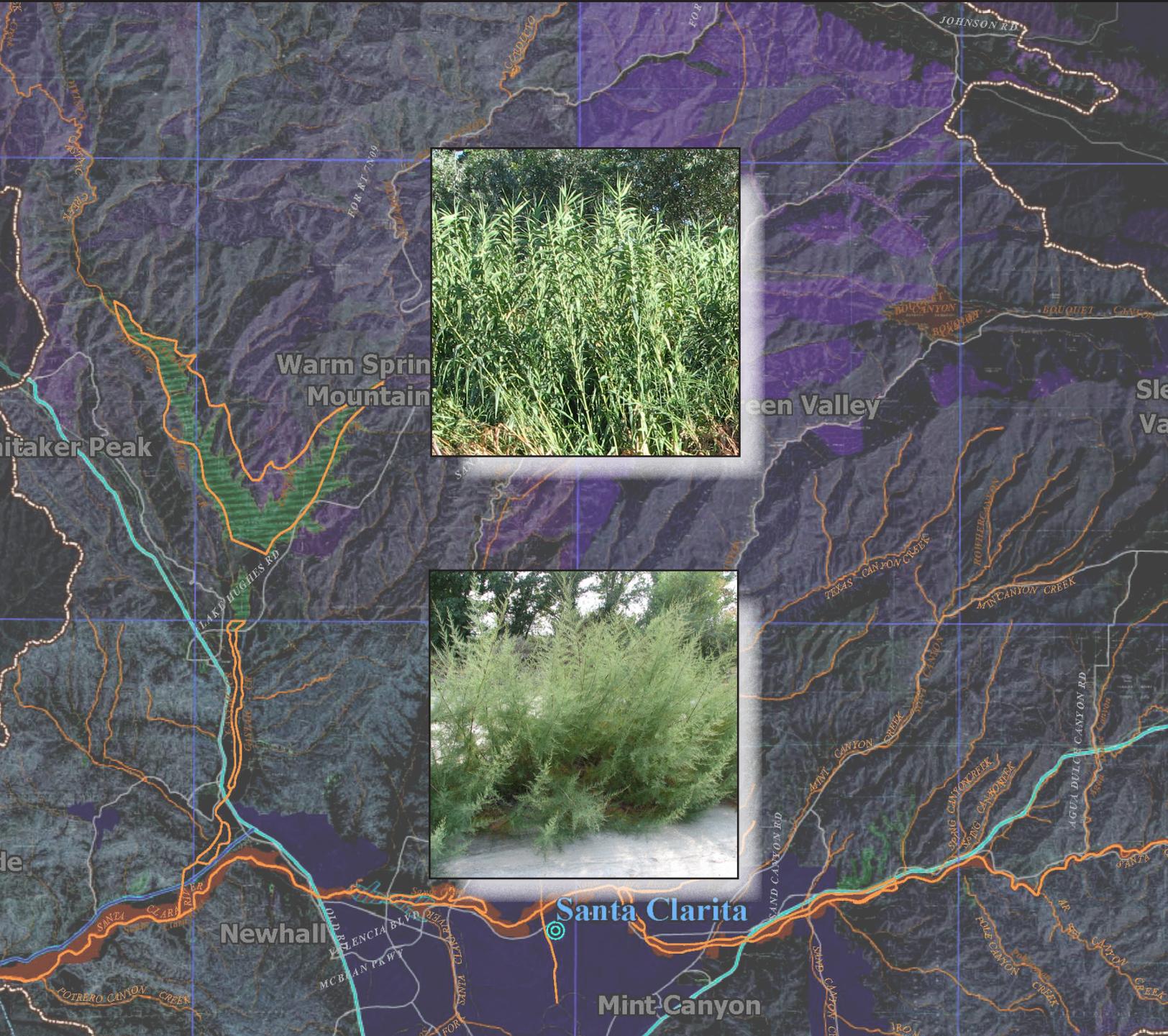


# UPPER SANTA CLARA RIVER WATERSHED ARUNDO AND TAMARISK REMOVAL PROGRAM

## LONG-TERM IMPLEMENTATION PLAN



VENTURA COUNTY RESOURCE CONSERVATION DISTRICT

JUNE 2006



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**LIST OF ACRONYMS**

<b>Acronym</b>	<b>Definition</b>
°C	degrees Celsius
af	acre-feet
BMP	best management practices
Cal-IPC	California Invasive Plant Council
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CA Parks/Rec	California Department of Parks and Recreation
CDPR	California Department of Pesticide Regulations
CESA	California Endangered Species Act
CLWA	Castaic Lake Water Agency
CNDDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CWA	Clean Water Act
DWR	California Department of Water Resources
FSCR	Friends of the Santa Clara River
FESA	Federal Endangered Species Act
I-5	Interstate 5
LADPW	Los Angeles County Department of Public Works
LBV	least Bell's vireo
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
msl	mean sea level
NGO	Non-governmental organization
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
QAPP	Quality Assurance Project Plan
RGP	Regional General Permit
RWQCB	Regional Water Quality Control Board
SARMB	Santa Ana River Mitigation Bank
SCARP	Santa Clara River Arundo and Tamarisk Removal Program
SCREMP	Santa Clara River Enhancement Management Plan
SMSLRWMA	Santa Margarita and San Luis Rey Watershed Weed Management Area
SWFC	Southwestern willow fly-catcher
TADN	Team Arundo del Norte
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWCD	United Water Conservation District
VCRC	Ventura County Resource Conservation District
VCWPD	Ventura County Watershed Protection District



## 1.0 INTRODUCTION

The Santa Clara River, its tributaries and the associated riparian or streamside habitats comprise one of the largest natural river systems remaining in Southern California. From its headwaters in the San Gabriel Mountains southeast of the town of Acton, the Santa Clara River flows for 84 miles through Los Angeles and Ventura Counties terminating at the Pacific Ocean. The 45-mile-long portion of the Santa Clara River and its associated tributaries within Los Angeles County are referred to as the upper Santa Clara River. Along this 45-mile course, the Santa Clara River crosses national forest land, large areas of moderately developed private rural lands, the growing City of Santa Clarita, and then large tracts of rural farmland extending west to the county line. The Santa Clara River and this wide range of adjacent land uses comprise the upper Santa Clara River watershed, which consists of approximately 680 square miles (409,703 acres). This area is the focus of this plan (Fig. 1).

The Santa Clara River system and its associated riparian habitats provide major benefits to the surrounding communities including groundwater recharge, urban and agricultural water supplies, flood conveyance, visual relief, and recreational opportunities. In addition, the types of habitat found in the Santa Clara River's riparian areas are some of the most valuable wildlife habitat in the state, in terms of both species diversity and abundance, and provide habitat for some of the state's most threatened and endangered wildlife. This is especially important since as much as 90 percent of California's streamside riparian plant communities have been eliminated by urban and agricultural development within the last 150 years.

Many threats to the values provided by the Santa Clara River and its tributaries exist, including encroaching development, increased urban runoff, and the spread of invasive, non-native plant species. According to the National Invasive Species Council, an "invasive species" is one that is a) non-native (or alien) to the ecosystem under consideration and b) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

In particular, the widespread establishment of two invasive plant species, arundo or giant reed (*Arundo donax*) and tamarisk or salt cedar (*Tamarix* spp.), severely threaten many of the benefits described above. Arundo and tamarisk have spread throughout the Santa Clara River and most of its tributaries such that their presence has become an important issue for the surrounding communities. Major stands of arundo dominate large sections of the Santa Clara River in northeast Los Angeles County and are even more prevalent throughout its reaches in Ventura County. Although less prevalent than arundo, tamarisk is also a major problem in some portions of the central and upper watershed.

### 1.1 Project Goals and Scope

The Upper Santa Clara River Watershed Arundo/Tamarisk Removal Plan (SCARP) provides guidance to stakeholders for implementing procedures to remove invasive, non native plants. The primary objective of the plan is to guide and facilitate the implementation of arundo and/or tamarisk removal projects within the upper Santa Clara River watershed of Los Angeles County. The SCARP is a living document and will be updated periodically as new technologies become available, regulations change, or new resources/issues are identified. The project focus is on approximately 16,300 acres of land within the 500 year floodplain of the Santa Clara River and its primary, secondary, and tertiary tributaries. These floodplain lands, particularly within the banks and channel of the Santa Clara River and tributaries, are where arundo and tamarisk infestations are primarily contained and where the bulk of removal activities would occur. However, additional activities such as access, equipment staging and storage, transport, and disposal may occur outside of the 500-year floodplain.

The SCARP has been prepared to provide local landowners, municipalities, environmental groups, and other stakeholders with a broad menu of available techniques for removal of arundo and tamarisk and guidance in obtaining proper permits and approval for removal. The SCARP also provides best management practices (BMP) needed to minimize impacts during removal projects. The following factors have been researched and considered in the development of this SCARP:



- Potential eradication methods
- Degree of infestation
- Existing habitats
- Presence of threatened and/or endangered species
- Access
- Land use
- Current work being conducted or planned
- Pre-existing environmental agency restrictions and permits
- Funding mechanisms in place and strategies for future funding

Taken together, these factors provide a framework for a long term eradication program and associated monitoring to facilitate removal of arundo and tamarisk from the upper Santa Clara River watershed and the restoration and maintenance of natural, economic and community values provided by these riparian corridors.

## 1.2 Project Partnerships

The lead agency directing this effort is the Ventura County Resource Conservation District (VCRCD). The VCRCD is one of 104 resource conservation districts in California and is a special district of the state, which receives funding primarily through grants. The VCRCD manages a diversity of programs including soil and water conservation projects, wildlife habitat enhancement and restoration, control of invasive plants species, and environmental education. The VCRCD has developed a

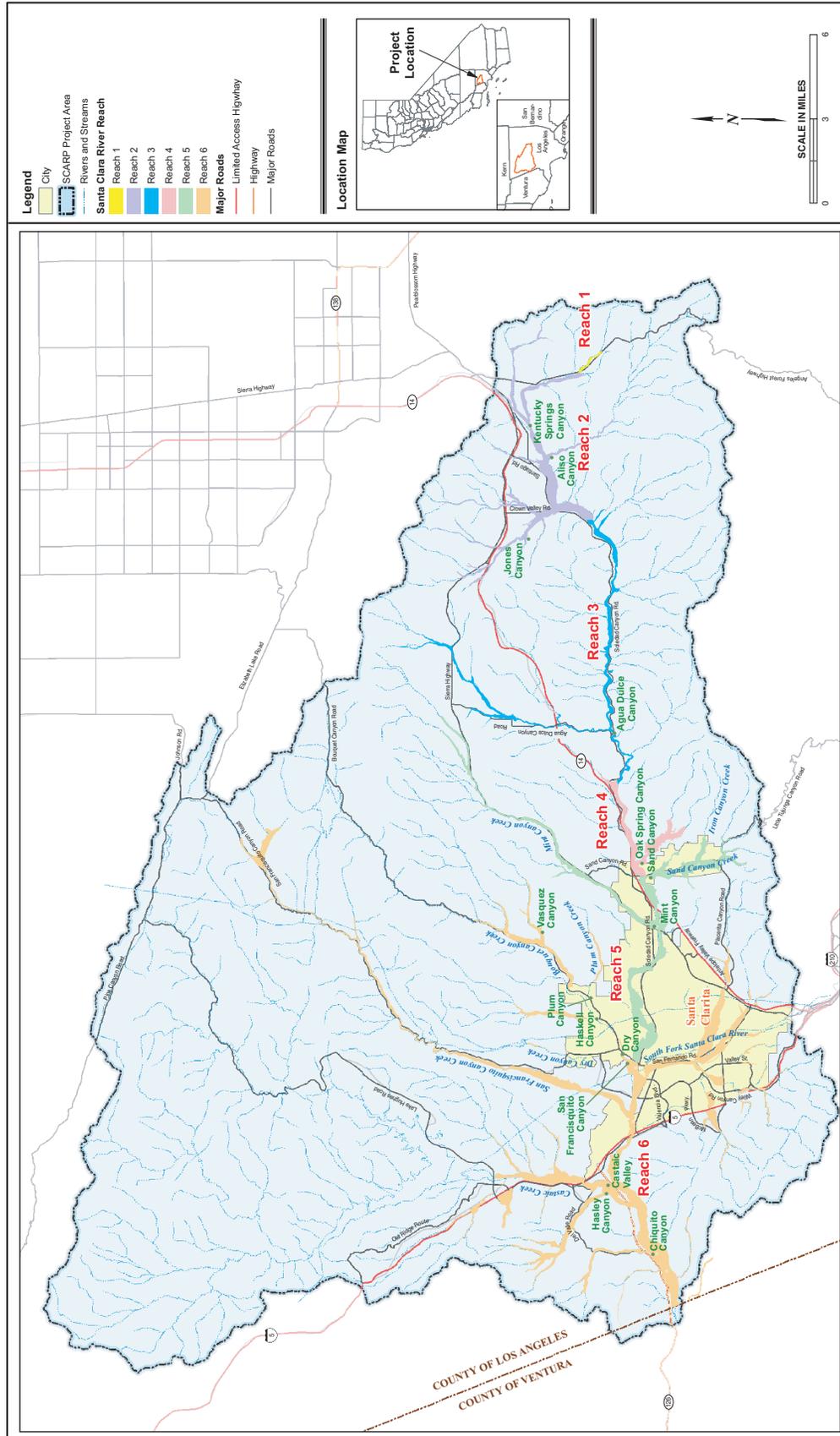
Memorandum of Understanding (MOU) to show support for the SCARP project. The agencies and organizations, which have completed MOUs, are listed below and copies of these memoranda are included in Appendix 1:

- Antelope Valley Resource Conservation District (AVRCD)
- U.S. Forest Service (USFS)
- U.S. Fish and Wildlife Service (USFWS)
- Los Angeles County Department of Public Works (LADPW)
- Los Angeles Agricultural Commissioner's Office
- Los Angeles County Weed Management Area (LAWMA)
- City of Santa Clarita
- Friends of the Santa Clara River (FSCR)
- UC Cooperative Extension

A SCARP Working Group was also created to collaborate with the various organizations and agencies within the upper Santa Clara River watershed. There are many other local agencies and organizations assisting in various ways with the SCARP development such as the U.S. Army Corps of Engineers (USACE), the California Department of Fish and Game (CDFG), the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the Los Angeles Regional Water Quality Control Board (RWQCB), the Ventura County Arundo Task Force, and the Ventura County Watershed Protection District (VCWPD).



Figure 1: SCARP Project Location and Associated River Reaches



Upper Santa Clara River Sub-Watershed – Santa Clara River Reaches

SCARP



## 2.0 **INVASIVE PLANT SPECIES IN THE SANTA CLARA RIVER**

The primary focus of this program is the eradication of arundo and tamarisk from the upper Santa Clara River watershed. These species and the issues involving them are described in detail in this section. However, the SCARP recognizes that arundo and tamarisk are not the only non-native invasive plant species present in the upper Santa Clara River watershed. Other species that have been identified within the project area are listed at the end of this chapter. While the removal methods described in Chapter 10 are primarily listed for their use in eradicating arundo and tamarisk, they may also be used to remove other non-native invasive species that are encountered during an individual eradication project.

### 2.1 **Background on Arundo**

Arundo is native to the Mediterranean region. It was introduced to the western United States by Spanish settlers in the early 1800s and became abundant in the Los Angeles River by the 1820s. It was historically used as a windbreak, soil stabilizer, fodder, and for making reeds for woodwind instruments. Material from this plant was also commonly woven into mats and used as building material. It is no longer widely used or harvested for these traditional products, but is still used in landscaping.

Arundo is a tall, perennial grass that can reach up to 30 feet in height. It is light to dark green in color and has long, broad blades, with large plume-like flowers. Arundo is one of the fastest growing plants in the world and grows quickly in response to elevated nitrogen levels. This plant is tolerant of both drought and flooding, and can survive extended periods of salinity exposure. Arundo reproduces vegetatively from rhizomes (underground stems) and stem segments. Stem segments usually need two nodes or points for both roots and shoots to grow, but shoots have been observed on stem segments with a single node. Once introduced, arundo has the capability to spread rapidly, forming extensive rhizome systems that out-compete native riparian vegetation and require human intervention to remove. A single clump typically has hundreds of stems that grow

very closely together and very rapidly, up to several inches per day during the spring and summer months. Arundo does not usually spread from seed.

Arundo thrives in warm, tropical environments and is most often invasive in coastal riparian areas, where it forms dense monocultures. The invasiveness of arundo substantially affects water quality, water conservation, native biological resources, flooding, erosion hazards, and wildfire risks. Arundo uses at least twice the amount of water as native riparian plants, and can use as much as 17.3 liters/m<sup>2</sup> per day, which is nearly 20 times the amount used by native vegetation (Hendrickson and McGaugh 2005). Arundo is extremely flammable throughout most of the year and is highly adapted to fire. The height of arundo growth spreads fires to tree canopies and the dense growth in the river channels spread fires up and down the river system. The rhizomes also respond quickly after fires, sending up new shoots, and quickly outgrow native species that may have otherwise taken root or sprouted in a burned site (Bell 1997).

### 2.2 **Background on Tamarisk**

Similar to arundo, tamarisk is a native of south Eurasia and may have been introduced by Spanish settlers. It was present in California by the early 1900s. Tamarisk was historically, and is currently, used for windbreaks, firewood, shade, and in landscaping. There are currently five known species of tamarisk in California including *Tamarix ramosissima*, *T. parviflora*, *T. gallica*, *T. aphylla*, and *T. chinensis*. Tamarisk is found in rivers, streams, wetlands, desert alkali sinks, playas, and springs throughout Southern and Central California and the western United States.

Although currently less of a problem than arundo in this watershed, tamarisk may be spreading and has potential to cause substantial long-term effects on the water quality, water conservation, native biological resources, flood control, and fire hazards. Tamarisk is a hardy, perennial shrub or small to medium-sized tree, which under favorable circumstances can reach 30 to 40 feet in height. Tamarisk foliage is light to dark green, with small, alternate scale-like leaves. The bark varies from smooth to rough and is reddish-brown. The plants are able to flower after one year of growth.

Tamarisk spreads by seed dispersal and vegetative reproduction. Full-grown mature trees can produce



500,000 seeds per year. These seeds remain viable up to five weeks after being produced and some may survive to the next spring (DiTomaso 2003). These seeds are extremely small with a terminal tuft of exposed fibers that allows them to travel greater distances via wind or water. Unlike arundo, seed dispersal is tamarisk's primary form of reproduction and spreading. However, under favorable moist conditions, tamarisk can also become easily established from stem and root segments.

Tamarisk is an aggressive invasive plant that has a long taproot capable of extending down to the water table. Because of this long taproot, tamarisk is capable of obtaining water in inhospitable and fluctuating groundwater environments, which allows it to out-compete native vegetation. In particular, tamarisk displaces native woody species, such as cottonwood, willow, and mesquite, especially in disturbed areas. Tamarisk consumes at least twice the amount of water that native vegetation uses, or about 3.3 liters/m<sup>2</sup> per day (Hendrickson and McGaugh 2005). Tamarisk further impacts the environment by its ability to concentrate soil salts. Tamarisk leaves collect salt brought up from the soil by the roots. As leaf litter accumulates under the plant, the surface soil can become highly saline, thereby impeding future colonization by many native understory plant species (Carpenter 1998). In addition, dense stands of tamarisk can be highly flammable and tamarisk is likely to persist following fire and expand its dominance with repeated burning of low-elevation riparian plant communities (Busch 1995).

### 2.3 Long-term Effects of Arundo and Tamarisk Invasion

Both arundo and tamarisk are officially recognized as undesirable invasive plants. Both plants are listed as 'A-1' invaders (the most invasive and widespread wildland pest plants) by the California Invasive Plant Council (Cal-IPC) [formerly known as California Exotic Pest Plant Council] and as noxious weeds by the California Department of Food and Agriculture (CDFA). While the degree and specifics of problems associated with these species vary, general negative effects associated with the establishment of arundo and tamarisk within the watershed.

#### 2.3.1 Water Quality and Supply

Both arundo and tamarisk consume large amounts of water, which negatively affects both instream and groundwater availability. Reduced water availability also adversely affects water-dependent plants and wildlife, and reduces the water available for beneficial urban and agricultural uses. Although native riparian plants have similar transpiration rates per unit of surface area to arundo and tamarisk, arundo and tamarisk have approximately two or more times greater leaf surface area. Therefore, they transpire more water than native plants (Kelly 2003). Water consumption by these species is so high that dense infestations can desiccate riparian areas (seeps, springs, rivers) in arid habitats (Egan and Walker 2000; Dudley 2000). Major arundo infestations can cause an overall increase in water temperature by reducing shade in riparian areas. Increased water temperature can ultimately lead to a reduction of dissolved oxygen, making the water unsuitable for aquatic organisms (Bell 1997). In addition, increased light exposure and temperature may encourage algal blooms, and consequently increase pH levels and severely reduce available habitat for aquatic organisms (Adamus et al. 1997). Increased pH also facilitates the conversion of usable ammonia to a toxic byproduct, which degrades water quality. All of these changes can adversely affect wildlife, including rare and sensitive species.

#### 2.3.2 Flooding and Erosion

Both arundo and tamarisk are known to increase flood hazards and the potential for erosion of adjacent lands, particularly for farmland along the Santa Clara River. Both plants can alter stream geomorphology by trapping and stabilizing sediment, which narrows stream channels, widens floodplains, and causes increased flooding (Carpenter 1998; Lovich 2000; Zouhar 2003). Large stands of arundo and tamarisk may also obstruct flows and shunt floodwaters into areas that historically have not experienced water flow. This can exacerbate bank erosion problems and lead to an unnatural increase in the loss of adjacent public and private property that is often valuable farmland. Arundo provides less protection for stream banks from erosion, because its dense but shallow root masses are more easily undercut than



deep-rooted native riparian vegetation. In addition to increasing flood magnitudes, arundo and tamarisk debris may accumulate downstream of the infestations, trapping sediments, and impeding natural water flow. Arundo debris can create new establishments downstream and on the beach. In many cases, costly clean up efforts or repairs are required.

### 2.3.3 *Fire Hazards*

Both arundo and tamarisk contribute to increased fire hazards. Under natural conditions, riparian areas act as firebreaks, but as they are overcome by invasive species, they not only enable wildfires to spread more rapidly, but they can also become sites where fires may originate. Arundo, in particular, is highly flammable and burns more intensely than native riparian vegetation even when green (Bell 1997; Dudley 2000). Because arundo is able to grow to substantial heights, it can act as a ladder fuel, effectively carrying fire into tree canopies, thereby causing “crown fires” that increase tree mortality. Further, fire disturbance encourages regrowth of arundo. Burned areas also favor tamarisk regrowth, generating a positive feedback loop which is ultimately destructive to native habitat and dangerous to human developments (Bell 1997). Tamarisk leaf litter is also highly flammable, and because both plants are more flammable than native riparian vegetation, fires may occur more frequently and contribute to the eventual exclusion of native plant species (Bell 1997; Carpenter 1998; Lovich 2000).

### 2.3.4 *Native Habitats and Wildlife*

Arundo and tamarisk threaten native riparian habitats and the wildlife that depends upon these habitats by excluding native plants from water resources, growing space, and sunlight. Arundo often forms dense monocultures that exclude native vegetation by monopolizing water resources, shading, and altering flood regimes critical to the establishment of native riparian vegetation (Bell 1997; Dudley 2000). The salt-laden leaf litter of tamarisk also precludes such native understory from establishing. Both plants do not offer the same amount of shade as native vegetation (Carpenter 1998). Both arundo and tamarisk reduce habitat quality and food

supply for native wildlife, including insects and bird species (Bell 1997; Dudley 2000; Herrera 2003). Insects and other grazers are not able to use arundo as a food source due to the noxious chemicals it contains and its defensive cellular structure (Bell 1997). This is particularly important for federal and state listed species, such as least Bell’s vireo, southwestern willow flycatcher, and yellow-billed cuckoo, which utilizes insects as a food source. Documented decreases in wildlife usage of riparian areas have occurred due to massive stands of arundo (Dudley 2000).

## 2.4 *Other Invasive Species*

In addition to arundo and tamarisk, perennial pepperweed is a third significant threat to the watershed. Once established, it is very difficult to remove, and the monocultures it creates effectively displace native flora and fauna. Similar to tamarisk, perennial pepperweed also has the ability to concentrate salts near the ground surface (Renz 2000). The following list contains additional noxious and invasive plant species, which may be treated when encountered. The Cal IPC and CDFG also have lists of noxious and invasive plant species. The removal project manager, in coordination with the resource agencies, will make a determination regarding the level of effort that should be exerted in removing each species. For example, mustard may only require treatment if it occurs in stands greater than 0.25 acre at greater than 50-percent cover. Table 1 below lists additional invasive plant species.



**Table 1: Invasive Plant Species**

Scientific Name	Common Name
<i>Ageratina adenophora</i>	eupatory
<i>Ailanthus altissima</i>	tree of heaven
<i>Aptenia</i> spp.	iceplant
<i>Atriplex semibaccata</i>	Australian saltbush
<i>Avena</i> spp.	non-native grasses
<i>Bassia hyssopifolia</i>	five hook bassia
<i>Brassica</i> spp.	mustard species
<i>Bromus</i> spp.	non-native grasses
<i>Cardaria chalepensis</i> or <i>C. draba</i>	hoary cress, white top
<i>Carduus pycnocephalus</i>	Italian thistle
<i>Carpobrotus</i> spp.	iceplant
<i>Centaurea melitensis</i>	totalote
<i>Centaurea solstitialis</i>	yellow starthistle
<i>Cirsium arvense</i>	Canada thistle
<i>Cirsium vulgare</i>	bull thistle
<i>Conium maculatum</i>	poison hemlock
<i>Cortaderia jubata</i> or <i>C. selloana</i>	pampas grass
<i>Cynara cardunculus</i>	artichoke thistle
<i>Cynodon</i> spp.	non-native grasses
<i>Cytisus scoparius</i>	scotch broom
<i>Erodium cicutarium</i>	red stem filaree
<i>Eucalyptus</i> spp.	eucalyptus
<i>Foeniculum vulgare</i>	fennel
<i>Genista monosperma</i>	bridal veil broom
<i>Hedera helix</i>	English ivy
<i>Lepidium latifolium</i>	pepper weed
<i>Linaria dalmatica</i>	dalmation toadflax
<i>Mesembryanthemum</i> spp.	iceplant
<i>Nerium oleander</i>	oleander
<i>Nicotiana glauca</i>	tree tobacco
<i>Phoenix canariensis</i>	canary island palm
<i>Ricinus communis</i>	castor bean
<i>Robinia pseudoacacia</i>	black locust
<i>Salsola</i> spp.	Russian thistle
<i>Schinus</i> spp.	pepper trees
<i>Silybum marianum</i>	milk thistle
<i>Washingtonia</i> spp.	fan palm



### 3.0 DESCRIPTION OF PROJECT AREA REACHES

This section provides specific details on the physical and environmental characteristics for each of the upper Santa Clara River’s six designated reaches and discussion of future removal program issues and recommendations. The same general analysis is also provided for each of the upper Santa Clara River’s ten major tributary systems. In some reaches, removal work may have been conducted prior to the development of the SCARP. The goal of this background information and analysis is to facilitate an understanding among and between future removal project applicants and concerned state and federal resource agencies about the issues surrounding arundo and tamarisk removal proposals. An additional goal is to set the stage for resource agencies such as CDFG, USFWS, and USACE to issue programmatic permits, which will facilitate future removal projects while still protecting critical resources. Reach discussions are generally organized from east to west; with Reach 1 beginning upstream at the eastern project boundary, and Reach 6 ending downstream at the west-

ern project boundary.

The upper Santa Clara River’s ten main tributaries are grouped based on their hydrological connections to one another and their point of intersection with the mainstem. Eight of these tributaries are located on the north side of the watershed and extend into USFS land. Two tributaries are located on the south side of the watershed. Tables 2 and 2a list the reaches and tributaries within the upper Santa Clara River watershed. The location of the project area is shown in Figure 1. Mainstem and tributary surveys performed by AMEC are described in the text, however detailed tributary surveys conducted by Condor Environmental are included as a separate document in the Appendices. Additional information for each reach and its respective tributaries such as summary tables for reach characteristics, channel cover, and sensitive species can be found in Appendix 6.

**Table 2: Reach Descriptions**

Reach	Location (east to west)	Length of Reach (miles)	Arundo Coverage (acres)	Tamarisk Coverage (acres)
Reach 1	Eastern Project Boundary to the Angeles Forest Highway	3.6	0	0
Reach 2	Angeles Forest Highway to Acton	8.0	0	2.5
Reach 3	Acton to Spring Canyon	11.4	111	30
Reach 4	Spring Canyon to Sand Canyon	3.9	70.7	21.3
Reach 5	Sand Canyon to Bouquet Canyon	7.9	98.7	202.5
Reach 6	Bouquet Canyon to the Los Angeles County Line	11.0	464.3	190.3



**Table 2a: Tributary Descriptions**

Reach	Tributary Name	Length of Reach (miles)	Arundo Coverage Greater than 50% (acres)	Tamarisk Coverage Greater than 50% (acres)
Reach 1	No tributaries	n/a	0	0
Reach 2	Jones Canyon Tributaries	9.0	0	0
	Soledad	6.87	0	0
	Aliso Canyon	3.02	0	0
	Escondido Canyon	6.41	0	0
	Santiago Road	n/a	0	0
Reach 3	Aqua Dulce Canyon Tributary	4.7	0	0.15
Reach 4	Oak Spring	5.13	0	0
Reach 5	Sand Canyon Creek	8.5	0	0
	Mint Canyon Creek	13.6	3	0
Reach 6	Bouquet Canyon Creek	25.0	0	0
	South Fork Tributaries	7.5	0	0
	San Francisquito Canyon Creek	21.7	5	0
	Castaic Creek	23.5	3	2
	Hasley Canyon	5.4	0	0
	Chiquito Canyon Tributary	4.9	0	0
	Potrero	3.61	0	0
	Salt	7.24	0	0
	San Martinez Grande	3.22	0	0



### 3.1 *Reach 1: Eastern Project Boundary to Angeles Forest Highway*

#### *Characteristics*

Extending 3.6 miles, Reach 1 comprises the headwaters of the Santa Clara River which are located in Soledad and Kentucky Springs Canyons; and the river flows through Soledad Canyon for many of the following reaches. Kentucky Springs Canyon is fed by several small streams originating in the San Gabriel Mountains. Reach 1 lies entirely within the Angeles National Forest, although there are several private in-holdings. Reach 1 is an ephemeral stream, where surface water is present only after major storm events. The stream channel within this reach is narrow and steep due to surrounding topography. The 500-year floodplain of Reach 1 ranges between 250 and 500 feet in width and has primarily natural streambanks.

The vegetation in Reach 1 is dominated by big sagebrush and chamise. The remainder of the floodplain is dominated by juniper and walnut woodlands. Sensitive species including the coast horned lizard (state candidate for listing) and the short-joint beavertail cactus (state species of concern) have been reported in Reach 1 (CDFG 2004). This reach's high quality habitat may support other sensitive species; however, this area has only been partially surveyed.

#### *Target Species*

No known infestations of arundo, tamarisk, or other invasive plant species have been observed in Reach 1 and therefore no eradication projects are currently anticipated. Although this reach is not threatened or highly suitable for arundo or tamarisk, this reach should be monitored for development of arundo and tamarisk colonies, as presence of these species can lead to infestations downstream.

### 3.2 *Reach 2: Angeles Forest Highway to Acton*

#### *Characteristics*

Reach 2 begins where Angeles Forest Highway crosses the Santa Clara River at its intersection with BP

& L Road and extends eight miles towards the town of Acton. Tributaries draining into the reach include Jones, Acton, and Aliso Canyons. Reach 2 contains substantial acreage of low-level development associated with the town of Acton. Low-density development is present throughout the reach, although it is primarily concentrated around the town of Acton and toward the western end of the reach. This development includes residential housing, ranches, campgrounds, recreation fields, and recreational vehicle parks. The channel within Reach 2 is an open, often shallow, low-gradient wash. The 500-year floodplain is relatively wide near the reach's western boundary, varying between 350 feet in width near its eastern extent and 2,250 feet near Acton.

Vegetation in this reach gradually shifts from dense brush to sparse scrub, with pinyon-juniper woodland in the east transitioning into high desert scrub in the west. Sensitive species in Reach 2 include the coast horned lizard and Mason's neststraw (CNPS List 1B), both known to occur within the 500-year floodplain of the reach (CDFG 2004). As with Reach 1, the lack of reported sensitive species may be due the lack of area surveys.

#### *Target Species*

No arundo infestation has been reported within the 500-year floodplain of Reach 2. However, tamarisk occurs in a few small stands at low densities within one mile of the western boundary of the reach.

### 3.2.1 *Acton, Jones, and Kashmere Canyon Tributaries*

#### *Characteristics*

The Jones Canyon tributaries are located north of the mainstem and connect with the Santa Clara River in Acton. These tributaries include Acton, Jones, and Kashmere Canyons. These canyons consist primarily of private land and scattered rural residences are located in the upper sections of these canyons. These tributaries tend to be arid washes with little or no surface flow of water except under high rain conditions. All three are dominated by desert vegetation and scrub. Sightings of coast horned



lizard have been recorded in these tributaries.

### ***Target Species***

Neither tamarisk nor arundo have been recorded in these tributaries. However, the tributaries are susceptible to infestation from ornamental landscaping by proximate private landowners. Therefore, residents in the area should be educated about arundo and tamarisk and the area should be monitored for possible future infestations.

### **3.2.2 Aliso Canyon Tributary**

#### ***Characteristics***

Aliso Canyon is located south of the mainstem in Reach 2. Aliso Canyon is also an arid wash, except in high rain conditions. Scattered rural residences and areas of agricultural production exist along portions of the canyon. Similar to the Jones Canyon tributaries, Aliso Canyon is characterized by desert vegetation and scrub and coast horned lizards have been sighted.

#### ***Target Species***

Neither tamarisk nor arundo have been recorded in these tributaries. However, they are also susceptible to infestation from ornamental landscaping by proximate private landowners. Therefore, residents in the area should be educated about arundo and tamarisk and the area should be monitored for possible future infestations.

### **3.3 Reach 3: Acton to Spring Canyon**

#### ***Characteristics***

Reach 3 is the longest reach in the project area and extends for 11.4 miles from Acton to Spring Canyon. The only major tributary draining into Reach 3 is Agua Dulce Canyon, entering the mainstem from the north about two miles east of Spring Canyon. Development within the floodplain totals approximately 141 acres, including rural-residential housing, recreational vehicle parks, and campgrounds. Reach 3 traverses deep, narrow Soledad Canyon for nearly its entire length. The river channel is correspondingly narrow, with the 500-year floodplain generally limited to 200 and 500 feet in

width. The stream channel is broad and often dry at its eastern border, transitioning into a steep narrow canyon for virtually its entire 11-mile extent. The majority of Reach 3 is bounded by natural banks that rise sharply from the channel, with minor areas of concrete hard bank protection.

This reach provides large areas of relatively high quality native riparian habitat Cottonwood woodland dominates this reach, occupying 329 acres of the floodplain, with 119 acres of open unvegetated channel breaking up these expanses of woodlands. These woodlands and associated habitats, such as the mixed willow and big sage, provide several uninterrupted one to two mile stretches of high value native habitat, particularly in the central portions of this reach. This area supports known resident populations of the federal and state endangered arroyo toad, unarmored threespine stickleback, and slender-horned spineflower. Potential suitable breeding habitat for the federal and state endangered least Bells' vireo and southwestern willow flycatcher also exist.

#### ***Target Species***

There are only a few minor stands of arundo or tamarisk in the eastern five miles of Reach 3. Dense arundo stands occupy a total of 111 acres along this reach. With dense stands occurring approximately one mile both upstream and downstream of the confluence with Agua Dulce Creek. Tamarisk infestation occurs at low-to-moderate densities with approximately 30 acres of the reach's total area. Tamarisk is located in the same general areas of dense arundo stands, including upstream from Indian Springs Road, one mile upstream and downstream of the Agua Dulce tributary intersection, and near Capra Road.

### **3.3.1 Agua Dulce Canyon**

#### ***Characteristics***

Agua Dulce Canyon is a narrow canyon on the north side of the mainstem with headwaters near Vasquez Rocks County Park. It passes through steep rock walls and intersects with the mainstem in Reach 3 approximately four miles downstream from the headwaters. Near the headwaters, the stream channel is wash-like and has only seasonal surface flow. This section of the



canyon is used for rural residences and small ranches. As the canyon approaches the mainstem, it narrows and becomes steeper, especially downstream near the canyon's intersection with the mainstem. The only development in the base of the canyon is Agua Dulce Road.

The vegetation in Agua Dulce Canyon is dominated by mixed riparian vegetation and some desert species. There is no single dominant plant assemblage within Agua Dulce Canyon. Small cottonwood stands occur throughout the creek, as well as other riparian tree species. Sparse mule fat and other riparian scrub species occur within the creek, as well as scattered desert species such as juniper. Sensitive wildlife species that may be present in the canyon include the arroyo toad, coast horned lizard, and unarmored threespine stickleback.

### *Target Species*

Arundo occurs in scattered, but dense stands along the streambed and on the banks of Agua Dulce Canyon. Due to the narrow nature of this tributary, many of the stands are smaller in size (approximately 5 meters in diameter), except for elbows in the tributary where some larger stands exist. Tamarisk occurs primarily in one stand mid-way to the headwaters off Agua Dulce Road, but additional stands may exist. Surrounding ranches provide sources of arundo and tamarisk.

## **3.4 Reach 4: Spring Canyon to Sand Canyon**

### *Characteristics*

Reach 4 extends 3.9 miles from Spring Canyon to Sand Canyon through the eastern extent of the City of Santa Clarita. The communities of Pine Tree and Canyon Country lie north of the Santa Clara River in this reach, while the communities of Lang and Sulfur Springs extend south from the Santa Clara River. Reach 4 is composed mainly of residential and mining development (91 acres) among sparsely scattered great basin and riparian vegetation. The 500-year floodplain through Reach 4 varies in width from 1,500 feet at its eastern border to 350 feet near Shadow Pines Boulevard and widening to 1,800 feet near Sand Canyon Road. Sand mining in the area near Spring Canyon has lowered the channel approximately 40 feet from its historic elevation.

Reach 4 is dominated by open channel, particularly

in its central sections. Great basin and coastal scrub communities total 131 acres of the floodplain along this reach. At the reach's east end, stands of cottonwood woodland are intermixed with the scrub habitats. Sensitive species reported from Reach 4 are limited to coast horned lizard (state species of concern) from the northern margin of the east end of the reach. The two-striped garter snake (state species of concern) has been observed to the south and may occur when water is present in the floodplain area (CDFG 2004). The endangered slender-horned spineflower may also grow along the stream bank in the upstream portions of Reach 4, but its presence has not been confirmed (AMEC 2004).

### *Target Species*

Arundo infestations range from low-to-high density throughout the 500-year floodplain, occupying approximately 71 acres. There are two extensive arundo stands located at the reach's east end, near the private River's End Campground (located in Reach 3). A one-mile section starts at the vicinity of Lang Station Road. Tamarisk is present on 21 acres of the floodplain in generally medium-to-low densities. With the exception of a small patch at the western end of Reach 4, tamarisk concentration within the 500-year floodplain is limited to the area between Lang Station Road and Poppy Meadows Street.

### **3.4.1 Oak Spring Tributary**

#### *Characteristics*

Oak Spring Canyon feeds into the western extent of Reach 4. The golf course at the mouth of Oak Spring Canyon has contoured the channel throughout the golf course. Sensitive species reported in these tributaries include the two-striped garter snake.

#### *Target Species*

Neither tamarisk nor arundo have been recorded in these tributaries. However, they are also susceptible to infestation from ornamental landscaping by proximate private landowners. Therefore, residents in the area should be educated about arundo and tamarisk and the area should be monitored for possible future infesta-



tions.

### 3.5 *Reach 5: Sand Canyon to Bouquet Canyon*

#### *Characteristics*

Reach 5 extends 7.9 miles from Sand Canyon Road downstream to Bouquet Canyon Road. The majority of this reach falls within the City of Santa Clarita. Major tributaries to Reach 5 include those from Sand Canyon joining the mainstem from the south at the junction between Reaches 4 and 5, and Mint Canyon flowing into the Santa Clara River from the north approximately two miles downstream from this junction. Approximately 360 acres of the 500-year floodplain is developed along Reach 5, which is mostly within the City of Santa Clarita. The 500-year floodplain in Reach 5 varies in width from 500 feet by the Sierra Highway bridge to nearly 2,500 feet in the developed area off Oak Avenue.

Open channel dominates this reach, occupying 404 acres of the floodplain, with great basin plant communities concentrated along the east and west ends of the reach. The channel is heavily braided. Native vegetation communities are dominated by scalebroom and big sagebrush. Although there are scattered groves of cottonwoods and willows along the channel margins in the western portion of this reach, the riparian vegetation consists primarily of mule fat. This reach has limited native vegetation and only sparse data on sensitive species are available. However, the western spadefoot toad (state species of concern), arroyo chub (state species of concern), and the endangered unarmored threespine stickleback, federal threatened California red-legged frog have reported observations in Reach 5. Others that may be present are the coast horned lizard (state species of concern) and western whiptail (state candidate). Similarly, sensitive plant species have not been observed, but the floodplain in Reach 5 has the potential to support the endangered slender-horned spineflower and federally threatened spreading navarretia.

#### *Target Species*

Arundo and tamarisk occupy 302 acres together in low-to-moderate densities throughout this reach. Arundo is established on approximately 203 acres. Large stands of low-density arundo extend downstream for

approximately 3.5 miles from the eastern boundary of Reach 4. Within the mainstem, one source of arundo is one mile west of the conservation camp near the stream channel. The Angeles National Forest cleared one-mile of the channel in 1995 downstream of the conservation camp. A large, high-density stand of arundo is also located downstream from where the Los Angeles aqueduct crosses the river. Additional large areas of low- and medium-density infestations are heavily intermixed with high-quality habitat at the western boundary. Tamarisk occupies approximately 99 acres. Dense stands occur one mile east of Bouquet Canyon Road, and are scattered throughout the eastern portion of the reach. Other invasive plant species identified in Reach 5 included tree tobacco, black locust, and pepper tree.

#### 3.5.1 *Sand Canyon Tributaries*

##### *Characteristics*

The Sand Canyon tributaries are located on the south side of the mainstem and include Sand Canyon and Iron Canyon. Sand Canyon joins the mainstem at the intersection between Reaches 4 and 5. Iron Canyon joins Sand Canyon approximately two miles upstream from the mainstem. Channels of Sand Canyon tributaries tend to be narrow with seasonal surface water flows. Rural residences surround the majority of the Sand Canyon tributaries, many of which are sited in the 500-year floodplain. The headwaters of these tributaries are generally surrounded by protected open space. The Sand Canyon tributaries support scattered mule fat within the channel and live oaks near the stream banks. This stream channel supports only seasonal surface flow. Sensitive species reported in these tributaries include the western spadefoot toad reported in Sand Canyon.

##### *Target Species*

Arundo and tamarisk have not yet been identified in any of these tributaries; however, introductions may occur due to landscaping of rural residences.

#### 3.5.2 *Mint Canyon Tributaries*

##### *Characteristics*

The Mint Canyon tributaries are located on the north



side of the Santa Clara River and join the mainstem about two miles downstream from the Reach 4 boundary. These tributaries include Mint and Rowher Canyons. The 500-year floodplain in Mint Canyon varies between 300 and 1,000 feet wide at its mouth. The streambed is narrow and channelized for 3.5 miles upstream from the mainstem. Surface water is seasonal within Mint Canyon.

Scattered mule fat and great basin scrub communities dominate the stream channel. In some areas, robust cottonwood-willow groves are also present. Southern sycamore-alder riparian forest is also found in a minor tributary near the headwaters of Mint Canyon. Slender-horned spineflower and slender mariposa lily have been reported within Mint Canyon. These occurrences were in the 3.5-mile stretch extending downstream from the intersection of Sand Canyon Road to the mainstem, and species may have since been extirpated by recent development.

### *Target Species*

Tamarisk is present in moderate levels and arundo is present at low to moderate levels within and adjacent to the stream channel throughout Mint Canyon. Much of these infestations are associated with residences using arundo and tamarisk as landscaping plants, which now grow wild in stands. Pepper trees are also present within the stream corridor and are beginning to establish within Mint Canyon.

## **3.6 Reach 6: Bouquet Canyon to Ventura County Line**

### *Characteristics*

Reach 6 begins in Santa Clarita where Bouquet Canyon drains into the mainstem and stretches west 11 miles to the Ventura County line. Six main tributaries drain into Reach 6: Bouquet Canyon, South Fork, San Francisquito Canyon, Castaic Creek, Hasley Canyon, and Chiquito Canyon. Interstate 5 (I-5) divides Reach 6 into two characteristically distinct sections at the western border of Santa Clarita. The land surrounding this reach east of I-5 within Santa Clarita is heavily developed with residential, commercial, and industrial land uses. A public recreational path borders Reach 6 for its entire length between Bouquet Canyon Road and the

South River Village Apartment Complex. The width of the 500-year floodplain on this part of the reach ranges between 700 to 1,000 feet. West of I-5, with the exception of the Six Flags Magic Mountain Theme Park (located adjacent to the Santa Clara River just west of I-5), the Santa Clara River is bordered by agricultural and other undeveloped open land. The majority of the land here is under the ownership of the Lennar-LNR. From I-5 to the Ventura County line, Reach 6 traverses a broad open valley, with a 500-year floodplain of ranging between 1,800 and 3,000 feet in width.

Water flow within Reach 6 is braided and subsidized year-round by effluent from two wastewater treatment plants: the Saugus Wastewater Treatment Plant and the Valencia Water Reclamation Plant. Over 600 acres of Reach 6 is currently open un-vegetated channel. The perennial water flows, cottonwood woodlands, and associated habitats such as mixed willow, mule fat, and big sage provide high quality habitat for several sensitive species. In particular, this reach includes the only known occurrences along the mainstem of the Santa Clara River for breeding of endangered least Bells' vireo. Further, these riparian habitats provide extensive suitable breeding habitat for the endangered southwestern willow flycatcher. This reach also supports known populations of the endangered arroyo toad and unarmored threespine stickleback. Declining sensitive aquatic species such as the western pond turtle (state species of concern) and the two-striped garter snake (state species of concern) are also present.

### *Target Species*

The environmentally sensitive habitats along Reach 6 are also the section of the upper Santa Clara River watershed most heavily infested with arundo. Tamarisk is present to a lesser extent. Large areas of arundo and tamarisk occur at a low density infestation range of about 355 acres. An additional 176 acres of arundo occurs at densities of high density infestation range.

### **3.6.1 Bouquet Canyon Tributaries**

#### *Characteristics*

The Bouquet Canyon tributaries are located on the north side of the mainstem and include Bouquet



Canyon, Dry Canyon, Haskell Canyon, Texas Canyon, Vasquez Canyon, and Plum Canyon. Land use surrounding Bouquet Canyon transitions from a highly urbanized area near the confluence to residential and rural residential upstream, before Bouquet Canyon enters Angeles National Forest. Land currently developed is used for campgrounds or rural residences. The length of the tributary that flows from the intersection of Plum Canyon and Bouquet Canyon through Santa Clarita to the mainstem is channelized. Above Plum Canyon, Bouquet Creek is often confined to a narrow natural channel. Scattered groves of cottonwood, oaks, and willows intermixed with mule fat are located throughout this section of the reach. Upstream, past the USFS boundary, cottonwood woodland transitions to dense live oak woodland. Portions of several of Bouquet Canyon's tributaries, notably the lower portions of Plum, Haskell, Vasquez, and Texas Canyons, contain 500-year floodplains that fall within the project boundary. These canyons vary from broad floodplain supporting scrub habitats with scattered cottonwoods to areas with higher quality riparian habitats. Some areas have been subject to extensive development and the streams are largely channelized.

### *Target Species*

Bouquet Canyon exhibits heavy arundo infestation throughout the lower reaches of the canyon, and lacks public access to the tributary in some of the most heavily infested areas. Once beyond the channelized portion of the tributary, Bouquet Canyon is heavily infested with arundo. Arundo is also present north of the Angeles National Forest boundary. These infestations are smaller and are closely associated with private properties. No tamarisk was observed within Bouquet Canyon. Scattered stands of eucalyptus, pine trees, and pampas grass are located throughout Bouquet Canyon.

### *3.6.2 South Fork Tributaries*

#### *Characteristics*

The South Fork of the Santa Clara River is a system of major tributaries, passing through the City of Santa Clarita. Tributaries include South Fork, Pico Canyon, Newhall Creek, and Placerita Creek. These tributaries are mostly contained within the limits of urban development. With

the exception of Placerita Creek, the streams are channelized throughout much of South Fork system. The waterways therefore tend to be fairly degraded, with little or no vegetation growing within most of the channels. However, the four mile section of the South Fork tributary just prior to where it enters the mainstem is wider and contains more native vegetation, including scattered great basin scrub and mule fat. The channel has seasonal flow, which may be supplemented by urban runoff.

### *Target Species*

Arundo is present in Placerita Creek, near its intersection with South Fork. Due to the channelization of the remaining waterways, there is little potential for invasive species to establish.

### *3.6.3 San Francisquito Canyon*

#### *Characteristics*

San Francisquito Canyon is a large tributary of the Santa Clara River, stretching nearly 22 miles from headwaters on the northeastern boundary of the watershed to the mainstem. It enters the mainstem from the north in Santa Clarita near McBean Parkway. Much of the northern portion of the canyon is located within Angeles National Forest. As with Bouquet Canyon, land use surrounding San Francisquito Creek transitions from highly urban at the confluence to rural residential in the middle reaches and protected open space in the upstream half of the canyon. The 500-year floodplain of the San Francisquito Canyon ranges between 700 and 1,200 feet in the lower portion of the canyon. Most of San Francisquito Canyon has a wide, shallow stream channel with low velocity water flow, although some upstream sections are narrow and undeveloped, particularly near the headwaters in Angeles National Forest. San Francisquito Canyon provides large areas of relatively high value natural habitat, including sage scrub, cottonwood forest, mixed willow forest, sycamore and alder forest, coast live oak woodland.

### *Target Species*

Arundo occurs at moderate to high densities throughout San Francisquito Canyon and presents a



threat to both resources in this tributary and the Santa Clara River's mainstem. Moderate density arundo infestations exist at and downstream of the Los Angeles County Fire Station. Small infestations were observed as high in the watershed as Bee Canyon. No infestations were observed beyond Bee Canyon. No tamarisk was identified within San Francisquito Canyon.

San Francisquito Canyon has had continuing efforts for arundo removal since 1995, which were initiated by the Angeles National Forest Service. The program was expanded in 1999 to include the LADWP property. During 2000 and 2001, the lowest 2.5 miles of San Francisquito were treated for mitigation as a result of a bridge construction and bank stabilization project. Other areas on San Francisquito have been treated by commercial property companies as mitigation for development impacts.

#### 3.6.4 Castaic Creek Tributaries

##### *Characteristics*

The Castaic Creek tributaries are located on the northern side of the mainstem. Castaic Creek tends to be low velocity. Water flow may be subsurface throughout much of the year. The streambed is wide at the mouth of the creek, and is constrained by a barrier fence and agricultural lands on either side. Most of the adjacent land in this area is agricultural with a small amount of recreational open space. Water availability in the downstream section of the Castaic Creek is regulated by dam releases from Castaic Lake. Castaic Lake creates an artificial disjunct in the streambed geomorphology, which is broad with low velocity flow downstream and narrow and deeply incised upstream. Most of the land upstream of Castaic Lake is protected USFS land and is outside of the project area.

##### *Target Species*

Tamarisk and arundo are present in the area of Castaic Creek near where Commerce Center Drive meets Highway 126 and upstream of Castaic Lake on USFS property.

#### 3.6.5 Hasley Canyon Tributary

##### *Characteristics*

Hasley Canyon is a small tributary that drains north from Castaic Creek. In general, the channel tends to have little vegetation, but contains some intermittent coastal scrub and live oaks. The channel has been contoured and directed by residents within much of the canyon. A large construction effort has widened the stream channel near the intersection of Hasley Canyon Road and Commerce Center Drive. Rural residential land surrounds most of Hasley Canyon, although the mouth of the tributary does pass through an unincorporated urbanized area.

##### *Target Species*

No arundo or tamarisk was identified within Hasley Canyon. The majority of other invasive species in the canyon persist as an artifact of private landscaping. Eucalyptus and pepper trees have sprouted outside private yard areas and are colonizing the canyon in areas. Sensitive species, which have been reported in Hasley Canyon, include the San Fernando Valley spineflower, the Los Angeles sunflower, and the Santa Ana sucker.

#### 3.6.6 Chiquito Canyon Tributaries

##### *Characteristics*

The Chiquito Canyon tributaries consist of Chiquito Canyon and San Martinez Grande Canyon. In general, these tributaries are heavily affected by surrounding rural residences, with many landscaping plants encroaching on the stream channel. The stream channels tend to be narrow, and are sometimes paved-over at road crossings and other areas to avoid erosion. In general, there is little water, except for that introduced via runoff and over watering. However, higher amounts of water are present after heavy rain events. Rural residential areas and open space surround the Chiquito Canyon tributaries.

Great basin sagebrush and limited cottonwoods are present within the stream channel although in most areas the stream channel has no vegetation. Disturbed oak savanna, which appears to have been grazed historically, is present along downstream portions of the tributaries. The headwaters are dominated by high-quality coastal sage scrub. The San Fernando Valley spineflower is the only sensitive species known to be present in these



tributaries.

### *Target Species*

There is little to no arundo within the Chiquito Canyon tributaries. Tamarisk is present at moderate densities within the Chiquito Canyon tributaries as individual plants have escaped residential cultivation and have become established along the stream bank. San Martinez Grande Canyon tends to have more tamarisk than Chiquito Canyon. Landscaping plants and non-native grass are the primary invasive species within the Chiquito Canyon tributaries. Liquid amber trees and pepper trees are also present within and along the stream channel.



## **4.0 BIOLOGICAL RESOURCES**

The upper Santa Clara River drains an area that extends from the mountainous areas along the western edge of the Mojave Desert in the east and north of the watershed, west to the inland extent of areas that are typically dominated by coastal habitat associations. The habitats present along the Santa Clara River itself and in the surrounding areas reflect the Santa Clara River's transit of habitats ranging from high desert and montane associations in the inland areas to coastal valley associations near the project area's western boundary. A similar transition from high desert or montane also occurs along many of the Santa Clara River's larger tributaries. Mapping has been completed for the mainstem and tributaries of the upper Santa Clara River watershed (Appendices 6 and 7). A plant and wildlife species list was compiled during these surveys and is included in Appendix 5.

Special status plant and wildlife species are recognized by the California Native Plant Society, CDFG, or USFWS because these species have limited populations. It is important to recognize these species and avoid impacts to them because of various regulatory restrictions as discussed in Chapter 9.

### **4.1 Special Status Plant Species**

A total of 19 special status plant species with the potential to occur within the project area were identified (Table 3). The potential for these species to occur in the study area is based on a review of historical sensitive plant species locations identified in the CNDDDB (CDFG 2002).

### **4.2 Special Status Wildlife Species**

A total of 21 special status wildlife species with the potential to occur within the project area were identified (Table 4). The potential for these species to occur in the study area is also based on a review of historical wildlife species locations identified in the CNDDDB, and a review of pertinent literature. Of these 21 species, eight are federally listed under the Federal Endangered



Table 3: Special Status Plant Species

Scientific Name	Common Name	Status'	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low, and Why)
<i>Allium howellii</i> var. <i>clokeyi</i>	Mt. Pinos onion	List 1B	Pinyon and juniper woodlands and Great Basin scrub; 4,265-6,000 feet above msl.	Potential to occur in Reaches 1 and 2 and all tributaries. Known to occur in Castaic Creek tributaries.	Low: The project area elevation is 4,265 feet at its highest point. This plant does not grow in the riparian flood channel where weed removal will occur.
<i>Arenaria macradenia</i> var. <i>kuschei</i>	Kusche's sandwort	List 1B	Granitic openings in chaparral; 4,000- 5,700 feet above msl.	Potential to occur in Reaches 1, 2, and 3 and all tributaries.	Low: The elevation for this plant is close to the highest elevation for the project (4,265 feet). This plant does not grow in the riparian flood channel where weed removal will occur.
<i>Berberis nevinii</i>	Nevin's barberry	SE, FE, List 1B	Chaparral, cismontane woodland, coastal scrub, riparian scrub/sandy or gravelly soils; 1,000-2,700 feet above msl.	Potential to occur in Reaches 2 through 6 and all tributaries. Known to occur in San Francisquito Canyon.	High: This plant grows in habitats (e.g., riparian scrubs) that could be impacted during weed removal and in habitats where access roads may need to be built.
<i>Calochortus clavatus</i> var. <i>gracilis</i>	Slender mariposa lily	List 1B	Chaparral and coastal sage scrub; 1,100-3,200 feet above msl.	Potential to occur in Reaches 3 through 6 and all tributaries. Known to occur in Mint Canyon Tributaries and in San Francisquito Canyon.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
<i>Calochortus plummerae</i>	Plummer's mariposa lily	List 1B	Chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest, valley and foothill grassland in rocky habitats; 330-5,600 feet above msl.	Potential to occur in all reaches and tributaries. Known to occur in Agua Dulce Canyon and in the South Fork Tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
<i>Castilleja gleasonii</i>	Mt. Gleason Indian paintbrush	SR, List 1B	Lower montane coniferous forests and pinyon and juniper woodlands; 3,800-7,100 feet above msl.	Potential to occur in Reaches 1, 2, and 3 and all tributaries.	Low: The elevation for this plant is close to the highest elevation for the project (4,265 feet). This plant does not grow in the riparian flood channel where weed removal will occur.
<i>Centromadia parryi</i> var. <i>australis</i>	Southern tarplant	List 1B	The margins of marshes and swamps, valley and foothill grasslands, and vernal pools; 0-1,400 feet above msl.	Potential to occur in Reaches 5 and 6 and all tributaries.	High: This plant grows in habitats (e.g., margins of marshes and swamps) that could be impacted during weed removal and where access roads may need to be built.
<i>Chorizanthe parryi</i> var. <i>fernandina</i>	San Fernando Valley spineflower	SC, FC, List 1B	Sandy soils in coastal scrub; 500-4,000 feet above msl.	Potential to occur in Reaches 3 through 6 and all tributaries. Known to occur in Reach 6 and in Castaic Creek and Chiquito Canyon Tributaries	Medium: This plant grows in coastal sage and alluvial scrub habitats.



Scientific Name	Common Name	Status'	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low, and Why)
<i>Dodecathema leptoceras</i>	Slender-horned spineflower	SE, FE, List 1B	Sandy soils in chaparral, cismontane woodland, and coastal scrub (alluvial fans); 650-2,500 feet above msl.	Potential to occur in Reaches 2 through 6 and all tributaries. Known to occur in Reaches 3 and 5 and in Mint Canyon, South Fork, and Halsey Canyon Tributaries.	High: This plant grows in habitats (e.g., alluvial fans) that could be impacted during weed removal and in habitats where access roads may need to be built.
<i>Erodium macrophyllum</i>	Round-leaved filaree	List 2	Clay soils in cismontane woodland, valley and foothill grassland; 50-4,000 feet above msl.	Potential to occur in all reaches and tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
<i>Galium grande</i>	San Gabriel bedstraw	List 1B	Broadleaved upland forest, chaparral, cismontane woodland, lower montane coniferous forest; 1,400-5,000 feet above msl.	Potential to occur in all reaches and tributaries. Known to occur in Castaic Creek Tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
<i>Helianthus nuttallii</i> ssp. <i>parishii</i>	Los Angeles sunflower	List 1A	Coastal salt and freshwater marshes and swamps; 30-1,600 feet above msl.	Potential to occur in Reaches 3 through 6 and all tributaries. Known to occur in Reach 6.	High: This plant grows in habitats (e.g., marshes and swamps) that could be impacted during weed removal.
<i>Lilium parryi</i>	Lemon lily	List 1B	Mesic areas in lower montane coniferous forest, meadows and seeps, riparian scrub, upper montane coniferous forest; 4,300-8,600 feet above msl.	Potential to occur in Reaches 1 and 2 and all tributaries.	Low: The project area elevation is 4,265 feet at its highest point. This plant does not grow in the riparian flood channel where weed removal will occur.
<i>Malacothamnus davidsonii</i>	Davidson's bush mallow	List 1B	Chaparral, cismontane woodland, coastal scrub, riparian woodland; 600-2,800 feet above msl.	Potential to occur in Reaches 2 through 6 and all tributaries.	High: This plant grows in habitats (e.g., riparian woodland) that could be impacted during weed removal and in habitats where access roads may need to be built.
<i>Navarretia fossalis</i>	Spreading navarretia	FT, List 1B	Chenopod scrub, marshes and swamps (assorted shallow freshwater), playas, vernal pools; 100-4,300 feet above msl.	Potential to occur in all reaches. Known historically in Reach 5 and the Plum Canyon Tributary.	High: This plant grows in habitats (e.g., marshes and swamps) that could be impacted during weed removal and in habitats where access roads may need to be built.
<i>Opuntia basilaris</i> var. <i>brachyclada</i>	Short-joint beavertail	List 1B	Chaparral, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodlands; 1,400-5,900 feet above msl.	Potential to occur in all reaches and tributaries. Known to occur in Reach 1 and in Bouquet Canyon and South Fork Tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.



Scientific Name	Common Name	Status <sup>1</sup>	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low, and Why)
<i>Orcuttia californica</i>	California Orcutt grass	List 1B	Vernal pools; 50-2,200 feet above msl.	Potential to occur in Reaches 3 through 6 and all tributaries. Known to occur in Bouquet Canyon and in South Fork Tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
<i>Senecio aphanactis</i>	Rayless ragwort	List 2	Alkaline areas in chaparral, cismontane woodland, coastal scrub; 50-2,600 feet above msl.	Potential to occur in Reaches 2 through 6 and all tributaries. Known to occur in the South Fork Tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
<i>Stylocline masonii</i>	Mason's neststraw	List 1B	Sandy soils in chenopod scrub, pinyon, and juniper woodlands; 330-4,000 feet above msl.	Potential to occur in all reaches and tributaries. Known to occur in Reach 2.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
<sup>1</sup> FC: federal candidate FE: federally listed as endangered FT: federally listed as threatened SC: state candidate SR: state listed as rare ST: state listed as threatened CNPS List 1A: plant species are presumed extinct in California CNPS List 1B: plant species are rare, threatened, or endangered in California and elsewhere CNPS List 2: plants species are rare, threatened, or endangered in California, but more common elsewhere					



Table 4: Special Status Wildlife Species

Scientific Name	Common Name	Status	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low) and Why
<b>Mammals</b>					
<i>Neotoma lepida intermedia</i>	San Diego desert woodrat	SC, SSC	Pinyon-Juniper in association with rocky outcrops, including burrows of ground squirrels and woodrats.	Upstream and middle reaches of project area.	Medium potential to occur since it is not a riparian species. Uplands surrounding riparian zone have greater potential for this species.
<i>Perognathus alticola inexpectatus</i>	Tehachapi pocket mouse	SSC	Prefers open, sandy upland habitats, with friable soils.	Potentially found in adjacent upland habitats in all reaches and tributaries.	Low potential since this species is primarily associated with upland habitats.
<i>Taxidea taxus</i>	American badger	SSC	Prefers open, sandy upland habitats.	Potentially found in adjacent upland habitats in all reaches and tributaries.	Medium potential to occur, but seldom seen due to its fossorial ecology. Not usually associated with riparian habitats, but found in adjacent upland habitats.
<b>Birds</b>					
<i>Accipiter cooperii</i>	Cooper's Hawk	SSC	Found in a variety of habitats, including riparian and uplands, as well as urban areas.	Found in all reaches and tributaries.	High potential to occur, for breeding, roosting, and foraging.
<i>Athene cunicularia</i>	Burrowing owl	SC, SSC	Typically found in open scrub habitats in uplands.	Potentially found in high-quality upland habitats in all reaches and tributaries.	Low potential, since this species does not typically inhabit riparian zones.
<i>Coccyzus americanus occidentalis</i>	Western yellow-billed cuckoo	SE	Prefers dense riparian habitats, including willow-cottonwood.	Potentially found in all reaches, although the species is very rare.	Low potential given the scarcity of this species, but it could be found in any reach with an overstory of riparian hardwoods.
<i>Dendroica petechia brewsteri</i>	Yellow warbler	SSC	Prefers willow riparian and associated habitats.	Potentially found throughout all reaches and tributaries.	Medium potential since this species will occur disjunctly throughout appropriate habitats.
<i>Empidonax traillii eximius</i>	Southwestern willow flycatcher	FE, SE	Riparian scrub, willow and mule fat, including arundo stands.	Known in Reaches 3 and 6.	High potential to occur in downstream reaches, below Soledad Canyon where high quality riparian habitat is prevalent.
<i>Ptilioptila californica californica</i>	Coastal California gnatcatcher	FT, SSC	Coastal sage scrub	Known in Plum and Placerita Canyons.	Low potential, since this species does not typically inhabit riparian zones.



Scientific Name	Common Name	Status	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low) and Why
<i>Gymnogyps californianus</i>	California condor	FE, SE	Montane and cliff habitats, primarily limited to Sespe Wilderness area and adjacent lands.	Potentially found in all reaches, although the species is very rare.	Low potential to occur since no breeding sites are located within the project area, although this species has large home ranges and could potentially forage within the project area.
<i>Icteria virens</i>	Yellow-breasted chat	SSC	Riparian scrub, willow and mule fat, including arundo stands.	Likely to be found in all reaches with willow riparian habitat	High potential to occur in downstream reaches, below Soledad Canyon where high quality riparian habitat is present.
<i>Toxostoma lecontei</i>	Le Conte's thrasher	SSC	Open desert scrub, primarily found in habitats dominated by common saltbush.	Potentially found in Real 1 and 2.	Medium potential to occur in scrub habitats areas.
<i>Vireo bellii pusillus</i>	Least Bell's vireo	FE, SE	Riparian scrub, willow and mule fat, including arundo stands.	Most likely to be encountered in the downstream reaches, but possibly occurs throughout the Santa Clara River.	High potential to occur in downstream reaches, below Soledad Canyon.
<b>Reptiles</b>					
<i>Aspidoscelis tigris stejnegeri</i>	Coastal western whiptail lizard	SC	Chaparral, riparian scrub.	Can be found in open riparian scrub, but chiefly associated with upland habitats.	High potential to occur in appropriate habitats throughout The Santa Clara River.
<i>Phrynosoma coronatum blainvillei</i>	Coast horned lizard	SC, SSC	Chamise chaparral.	This species is unlikely to occur in riparian habitats in the project area, but can be found in uplands.	High potential to occur in appropriate habitats throughout the Santa Clara River.
<i>Thamnophis hammondi</i>	Two-striped garter snake	SC, SSC	Riparian habitat.	May be found throughout project area.	High potential to occur throughout project area. Forages widely, and usually active during the day on highly vegetated stream banks.
<b>Amphibians</b>					
<i>Bufo californicus</i>	Arroyo toad	FE, SE	Sandy alluvial stream courses and adjacent uplands.	Possible throughout project area. Known in Reaches 3 and 6 and Castaic and San Francisquito Creeks.	Medium potential to occur since the species will be locally abundant in the few areas it is found, and thorough surveys of the entire project area are lacking.
<i>Rana muscosa</i>	Mountain yellow-legged frog	FE	Montane streams at higher elevations.	None	Species does not occur in the project area.



Scientific Name	Common Name	Status	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low) and Why
<i>Scaphiopus hammondi</i>	Western spadefoot toad	SC, SSC	Upland and riparian habitat. Breeds in ephemeral pools.	Potential to occur throughout the project area.	High potential to occur, where intact native upland habitat contacts riparian areas.
<i>Rana aurora draytonii</i>	California red-legged frog	FT, SSC	Prefers permanent water with vegetated edges.	Known only from remnant population in San Francisco Creek, but could occur elsewhere.	High potential in San Francisco Creek where current population exists, low potential elsewhere.
<b>Fishes</b>					
<i>Catostomus santaanae</i>	Santa Ana sucker	FT	Swift flowing stretches of Santa Clara River.	Primarily in upstream reaches, but can be found elsewhere during high flows.	High potential to occur when water is present, but low detectability in the absence of trapping/netting surveys.
<i>Gasterosteus aculeatus williamsoni</i>	Unarmored threespine stickleback	FE, SE, DFG: Fully Protected	Typically in slow moving water with vegetated edges.	Possible throughout entire project area.	High potential to occur when water is present, but low detectability in the absence of trapping/netting surveys.
<i>Gila orcutti</i>	Arroyo chub	SC, SSC	Prefers slow water with sand or mud bottom.	Possible throughout project area.	High potential to occur when water is present, but low detectability in the absence of trapping/netting surveys.
<p>FE: federally listed as endangered                      FT: federally listed as threatened                      SC: state candidate                      SE: state listed as endangered                      SSC: state species of special concern                      ST: state listed as threatened                      DFG Fully Protected: The Fish and Game Codes sections dealing with Fully Protected species state that these species "... may not be taken or possessed at any time and no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected" species, although take may be authorized for necessary scientific research. This language arguably makes the "Fully Protected" designation the strongest and most restrictive regarding the "take" of these species. In 2003, the code sections dealing with fully protected species were amended to allow the Department to authorize take resulting from recovery activities for state listed species. More information on Fully Protected species and the take provisions can be found in the Fish and Game Code (birds at §3511, mammals at §4700, reptiles and amphibians at §5050, and fish at §5515). Additional information on Fully Protected fish can be found in the California Code of Regulations, Title 14, Division 1, Subdivision 1, Chapter 2, Article 4, §5.93. The category of Protected Amphibians and Reptiles in Title 14 has been repealed. The Fish and Game Code is available online at: <a href="http://www.leginfo.ca.gov/cgi-bin/calawquery?code=section=fgc">http://www.leginfo.ca.gov/cgi-bin/calawquery?code=section=fgc</a>. Title 14 of the California Code of Regulations is available at <a href="http://ccr.oal.ca.gov">http://ccr.oal.ca.gov</a></p>					



Species Act (FESA).

## 5.0 PROJECT PLANNING

Coordinated removal projects can lead to control of an invasive plant species in the entire watershed. However, before implementing a removal project, it is important to consider the various project elements, which include:

- integrated weed management
- project prioritization
- working with landowners
- public outreach
- surveys and mapping
- methods
- regulatory requirements
- scheduling
- costs
- funding

### 5.1 Integrated Weed Management

Integrated Weed Management (IWM) is a comprehensive strategy for the control of weeds. It considers each of the various factors influencing a weed removal strategy, such as different removal methods, the timing of the project, the location of the project, and potential impacts to the environment. There are also other factors such as overall project goals, specific agency policies, and local politics. The federal Noxious Weed Act further narrows the concept of Integrated Weed Management. It defines IWM as “a system for the planning and implementation of a program, using an interdisciplinary approach, to select a method for containing or controlling undesirable plant species or groups of species using all available methods, including education, prevention, physical or mechanical methods, and general land management practices.”

Integrated Weed Management is vital for the control and potential eradication of invasive plant species. Removal projects often achieve the most success when a variety of strategies are implemented. For example, it may be effective to implement herbivory as a control measure in one section of a removal project area, while other sections undergo eradication measures. Active surveying can assist with controlling outlier populations

of invasive plants that have not established yet. Strategies to prevent the spread of invasive species are also part of IWM. This can be approached from a cultural aspect as educating the public about the threat invasive species pose to the environment may help to avoid the use of these species in residential landscaping.

With IWM practices in place, it is also important to minimize the project impacts. Individual projects will utilize Best Management Practices to reduce impacts to the environment, ensure public health and safety, and increase worker safety. These BMPs are listed in Chapter 14. BMPs can be adapted and modified for each individual project depending upon the removal techniques and sensitive habitat and species present.

The Best Available Technologies are used in addition to the BMPs to achieve successful management strategies. The Best Available Technologies will change over time, as research, technologies, and methods are updated. Geographic Information Systems (GIS) and Global Positioning System units (GPS) assist with surveying and mapping while new methods and equipment can increase removal efficiency. The SCARP is a living document and will be revised as necessary to incorporate the Best Available Technologies.

### 5.2 Prioritization

Individual projects can be conducted anywhere in the upper Santa Clara River watershed. However, since arundo and tamarisk tend to spread downstream, it is best to begin projects at the headwaters of the mainstem of the Santa Clara River and smaller tributary watersheds such as San Francisquito Canyon to ensure effective invasive plant removal. Ideally, the collective effect of the individual projects will eventually be to control invasive plant populations in the watershed.

There are other factors that influence the project site beyond its location in the watershed. These include landowner cooperation, budget, scheduling, regulatory requirements, and many others. Prioritization of projects beyond starting at the highest known establishment should be oriented toward: 1) early detection and control of outlier establishments, 2) control and restoration of limited infestations where sensitive resources are located, and 3) control and restoration of large infesta-



tions.

*Early detection and control of outlier establishments*

This strategy concentrates on areas where arundo or tamarisk have small, limited infestations and do not have any upstream source populations. This strategy may be more time and labor intensive due to potentially difficult logistical issues such as hard to reach locations and/or careful hand-removal techniques of arundo or tamarisk to avoid impacts to wildlife. However, this strategy prevents dense establishment of invasive plant species where there is moderate to good habitat.

*Control and restoration of limited infestations where sensitive resources are located*

This strategy concentrates on areas where arundo or tamarisk have limited infestations and where sensitive resources are located. This strategy may be more time and labor intensive due to careful implementation of hand-removal techniques of arundo or tamarisk to avoid impacts to wildlife. However, this strategy also prevents dense establishment of invasive plant species where there is moderate to good habitat.

*Control and restoration of large infestations*

This strategy concentrates on areas where arundo or tamarisk are dense monocultures in order to completely eradicate their presence and to restore habitat. It may be easier and/or more cost-efficient to use mechanical removal techniques or broadcast foliar spraying in areas with thick infestations. This strategy allows the restoration of large areas, which previously had no habitat value.



## 6.0 SURVEYING AND MAPPING

Project applicants should develop detailed maps for their specific project areas. Maps are integral to effective eradication of establishments of invasive plant colonies. They are important for documenting the current vegetation status, detecting and tracking pioneer colonies of invasive plant clusters, and monitoring the level of success after invasive plant removal.

Effective mapping is a result of organized and consistent data collection. In planning an invasive species removal project, applicants should follow an established protocol for their data collection efforts. Data collection can be accomplished using field forms, aerial maps, photo documentation, and/or GPS units. Utilization of established protocols for data collection also facilitates the sharing of weed information with other agencies that have a stake in controlling and eradicating invasive plant species.

There are numerous mapping techniques with different protocols and different nomenclature (naming) systems. Maps can be prepared manually via the annotation of aerial photographs, or via various GIS software packages in tandem with GPS hand-held units for data capture. Maps may simply reflect the extent of infestations, or may also contain additional attribute information that further characterizes the infestation. Resources for current mapping protocols include the CDFA weed mapping handbook and The Nature Conservancy's Weed Inventory and Mapping System (WIMS), which is currently being adapted by Cal-IPC for California's wildland weeds. CDFG promotes vegetation mapping according to A Manual of California Vegetation (Sawyer

and Keeler-Wolf 1995).

AMEC Earth and Environmental performed mainstem vegetation surveys and a preliminary tributary overview in Winter 2004-2005, which are both discussed within the text of this document. Condor Environmental performed tributary vegetation surveys in Fall 2005. Detailed maps are provided as individual files in the Appendices.

The vegetation mapping surveys undertaken by the VCRC for the Upper Santa Clara River identified 43 vegetation series located within the 500-year floodplain of the mainstem. Vegetation falling outside of the 500-year floodplain was not mapped. Most of the mapped vegetation series were delineated on maps created from aerial photographs following the vegetation series listed in A Manual of California Vegetation (Sawyer and Keeler-Wolf 1995). However, several of the vegetation series incorporated in the SCARP were not derived from the preceding document, but were rather based on the dominant and associated plant species present (e.g., Pepper Tree).

The VCRC has a long-term interest in the removal of invasive species from the Upper Santa Clara River watershed. As such, the VCRC recommends that applicants follow an established protocol of data collection so that consistency of data can be achieved, and for ease of future monitoring efforts. Project applicants are encouraged to use the existing VCRC maps not only for refer-



ence, but also as models for their own map products.

## 7.0 WORKING WITH LANDOWNERS

The majority of the mainstem of the upper Santa Clara River as well as the lower middle reaches of the tributaries are privately owned. A cooperative working relationship with private landowners is critical in order to address the areas of heavy infestations. Several large landowners such as Lennar-LNR and various sand and gravel mining companies own substantial portions of the Santa Clara River. Hundreds of small- and mid-sized parcels are also located throughout the Santa Clara River's middle and upper reaches as well as the lower tributaries. These parcels include private campgrounds, mobile home parks, small ranches, and residential estates. The cooperation of both large and small landowners is essential for successful eradication. Landowners may not be aware of the impacts caused by invasive plants to public safety, property, and the environment. Education and outreach will increase knowledge of these impacts.

Landowners can work with Non-Governmental Organizations (NGOs), Resource Conservation Districts (RCDs), or other groups to perform removal work on their property. Agencies such as RCDs can assist with the regulatory process as well. Project applicants that do not own the property they wish to work on should request a cooperative landowner agreement prior to starting a project.

## 8.0 PUBLIC OUTREACH

Members of the public are often not aware of the negative impacts that invasive species bring to an ecosystem. The public typically assumes that the presence of any variety of greenery in the environment is beneficial and associates scenic value to it. Therefore, increasing public awareness of the impacts from these invasive species and support for their eradication is a critical component of project success. Public outreach activities should focus on a particular audience and have a specific goal, and individual projects should focus on outreach efforts prior to initiating removal. For example, local residents who live adjacent to removal sites should be notified of project activities, removal techniques, and potential impacts such as noise or visual changes before the commencement of the project.

Various organizations and municipalities are already engaged in outreach activities supporting the removal of invasive plants as well as the preventative measures that help reduce the spread of these plants. CAL-IPC is a non-profit organization that works with the California Department of Food and Agriculture's (CDFA) Weed Management Areas (WMA) and other local agencies to educate the public and municipalities on invasive plants and their eradication. Additionally, the Los Angeles Weed Management Area has created a Best Management Practices for Vegetation Removal as well as a children's booklet on invasive plants. There are numerous brochures from the various agencies on how to prevent the spread removal invasive plants. See Chapter 19.0 for resource information.

Where arundo is targeted for removal from private parcels, personal contact with parcel owners must be made in order to gain access to removal sites. Landowners are often concerned about the impacts the removal activities will cause, and care should be taken to acknowledge and address their concerns. While one-on-one meetings may be time consuming, they are a beneficial investment towards a successful removal program. Typical landowner concerns include issues relating to privacy, liability, property damage, impacts to natural resources, erosion, and regulatory problems.

When removal projects are planned for sites that



are adjacent to developed areas, especially residential zones, it is important to notify or otherwise communicate with residents about the removal activities. Tolerance and support of residents for removal projects is enhanced via outreach and education efforts. This can be achieved via an informational postcard mailing, or by distributing brochures or handouts on a door-to-door basis.

The success of outreach efforts can be enhanced by incorporating the following points:

- **Understand Your Audience:** Do not assume individuals are versed in issues pertaining to invasive plant species. Present the information in a manner that is informative and engaging. Photographs and other visual cues are often very helpful in illustrating important points.
- **Keep It Basic:** Focus on primary issues. Overwhelming your audience with information may not necessarily inspire them to join your cause. However, casting illumination on the most important issues will initiate a constructive increase in awareness of the problem.
- **Be Context Aware:** If members of the public initiate casual dialogue about a removal project with you, a casual response will be more appropriate than a technical monologue.
- **Signage:** Post signs where removal work is already underway. Incorporate photos that illustrate “before” and “after” scenarios to reinforce the benefits of the project.

For its own arundo removal efforts, the VCRCDD has initiated several public outreach activities; selected examples are listed below:

- Prepared and distributed brochures containing information about arundo and tamarisk and the problems they cause, as well as the benefits of removal.
- Held public workshops such as those associated with the EIR/EA scoping in January 2005, as well as more recent workshops in Santa Clarita and Acton about the infestation problem in general.
- Created the SCARP Working Group to facilitate community and agency coordination on this issue.
- Contacted local schools to educate students about

invasive plants and Weed Awareness Week.

- Sent out postcards to local residents around the Santa Clarita project site to inform them about the various aspects of the individual project.
- Held two public hearings inviting comments regarding the EIR/EA.
- Participated in the Santa Clara River Rally, a river clean-up event organized by the City of Santa Clarita.

Another important aspect of public outreach is the utilization of local resources. Various organizations and municipalities already support the removal of invasive plant species, and many have implemented preventative measures to reduce the spread of these species. The events they organize help raise public awareness about specific environmental hazards and the measures being taken to remove them. The VCRCDD has participated in many such events in an effort to bring additional attention to the Upper Santa Clara River project. The various agencies and/or events that address invasive species are listed below:

- City of Santa Clarita sponsored events such the Santa Clara River Rally, Arbor Day, and Earth Day
- Los Angeles County sponsored events such as the County Fair and Earth Day
- Los Angeles County Weed Management Area Meeting
- Southern California Wetlands Recovery Project (SCWRP) Task Force Meetings
- Santa Clarita Organization Planning for the Environment (SCOPE)
- Friends of the Santa Clara River
- The Nature Conservancy
- Sierra Club
- California Native Plant Society
- Audubon Society
- Santa Clarita Well Owners Society
- Local Schools



## 9.0 REGULATORY SETTING

A primary goal of the SCARP is to facilitate the permitting of arundo and tamarisk removal projects by state and federal regulatory agencies, consistent with protection of sensitive resources. VCRCDD is coordinating with regulatory agencies to develop a programmatic regulatory framework for future removal projects. As this process may take several years, individual permits may be necessary for removal projects. The following discussion provides an overview of the primary existing regulatory structure covering removal projects. Table 5 provides guidance for individual project applicants for regulatory compliance on their projects.

### 9.1 U.S. Army Corps of Engineers

Under Section 404 of the Clean Water Act (CWA), a permit is required by USACE for any activity that results in discharge of dredged or fill material into “waters of the United States (U.S.)” and associated wetlands. Waters of the U.S. refers to water in drainages that occurs below the plane of the ordinary high water mark. Examples of dredged or fill material for the SCARP projects that would be subject to USACE regulation would include earthmoving associated with temporary water diversions, temporary access roads, and below-ground biomass removal. Different permitting options are available through the USACE. For example, Regional General Permit (RGP) 41 is an existing permit for no or minimal impact invasive plant removal projects for infestations greater than 50 percent cover. Project sites with infestations lower than 50 percent or which have more than minimal impacts require another type of 404 permit such as a nationwide or individual permit.

### 9.2 U.S. Fish and Wildlife Service

Species listed as endangered or threatened by the USFWS are protected under the Federal Endangered Species Act (FESA). If listed species could be affected by removal activities, consultation with the USFWS is required. Consultations result in a set of formalized protection measures that become a part of the project.

### 9.3 California Department of Fish and Game

#### *Streambed Alteration Agreement*

Pursuant to Section 1602.2 of the Fish and Game Code, the CDFG has jurisdiction over activities that affect the “bed, channel, or bank of any river, stream, or lake that has or benefits fish or wildlife”. CDFG jurisdiction includes streamside (riparian) habitat on top of banks as well as the drainage itself.

#### *California Endangered Species Act*

The California Endangered Species Act (CESA) provides protection to endangered and threatened species in California. If a project may affect state-listed species, coordination with CDFG is required. In some cases, an incidental take permit may be required.

### 9.4 Regional Water Quality Control Board

A project that requires a Section 404 permit from the USACE will also require a Water Quality Certification (401 certification) from the RWQCB. A 401 permit certifies that the proposed activity will not violate state or federal water quality standards.

### 9.5 Southern California Air Quality Management District

Projects that propose controlled burning or incineration of biomass require consultation of the Southern California Air Quality Management District.

### 9.6 California Department of Transportation Encroachment Permit

The use of California State highways for other than normal transportation purposes may require written authorization from the Department of Transportation. As the responsible Department for protecting the public’s investment in the State highway system, CalTrans reviews all requests from utility companies, developers, volunteers, nonprofit organizations, etc., desiring to conduct various activities within the right of way.



### 9.7 *Los Angeles Department of Public Works Encroachment Permit*

Project sites that utilize areas owned by or having easements by the Los Angeles Department of Public Works will require an encroachment permit. Road Construction permits are necessary for the construction of driveways, curb drains, sidewalks, curbs and gutters and other types of surface construction. Road Excavation permits are necessary when digging within the road right-of-way, which often includes the portion of land beyond the curb and all the way to the sidewalk. Road Encroachment permits are necessary when you wish to place anything in the road right-of-way temporarily or long term.

### 9.8 *Los Angeles County Grading Permit*

The Los Angeles County Building Code requires a grading permit to perform any grading except for the following work:

An excavation that: 1) is less than 2 feet (61 cm) in depth or; 2) does not create a cut slope greater than 5 feet (1.5 m) in height and steeper than 1 unit vertical in 2 units horizontal (50% slope) and does not exceed 50 cubic yards (38.3 m<sup>3</sup>).

A fill not intended to support structures and which does not obstruct a drainage course if such fill (a) is placed on natural grade that has a slope not steeper than five horizontal to one vertical and is less than 1 foot (30.5 cm) deep, or (b) is less than 3 feet (91.4 cm) in depth at its deepest point, measured vertically upward from natural grade to the surface of the fill, and does not exceed 50 cubic yards (38.2 m<sup>3</sup>), or (c) does not exceed 20 cubic yards (15.3 m<sup>3</sup>) on any one lot.

### 9.9 *California Environment Quality Act*

The California Environmental Quality Act (CEQA) is intended to provide information to public agencies, decision-makers, and the public regarding the environmental impacts from implementation of a proposed project. CEQA compliance is required for all local and state public agencies, municipalities, and private entities that undertake an activity, which requires a permit, or discretionary approval from a government agency, or that may cause either a direct physical change in the en-

vironment or a reasonably foreseeable indirect change in the environment.

The environmental review process was established to enable public agencies to evaluate a project in terms of its environmental consequences, to examine and implement methods of eliminating or reducing any potentially adverse impacts, and to consider alternatives to the project. While CEQA requires major consideration be given to avoid environmental impacts, the lead agency and other responsible public agencies must balance adverse environmental effects against other public objectives, including social and economic goals, in determining whether and in what manner a project should be approved.

Projects using the methods in this long-term plan may utilize the SCARP programmatic EIR once the programmatic permit structure has been developed. Other projects may require a CEQA exemption, negative declaration, mitigated negative declaration, or environmental impact report.

### 9.10 *National Environmental Protection Act*

The National Environmental Protection Act (NEPA) requires federal agencies to consider potential environmental consequence of proposed actions in their decision-making process. The law's intent is to protect, restore, or enhance the environment through well-informed federal decisions. Projects which require a permit or discretionary approval from a federal agency will also require NEPA compliance.

The regulatory process may involve a significant investment of time. Table 5 is provided as a planning aid and offers an example illustration of the amount of time applicants can expect to use for this phase of their projects.



**Table 5: Guide to Regulatory Compliance**

Timeline	Task
1-2 months	Use SCARP to develop project and choose removal or control method.
1-6 months depending on scope and scale of project, engineered design, and other project elements.	Develop project description, including analysis of impacts, avoidance, and minimization measures.
1- 2 months	Complete and submit application materials for: 404 permit (USACE); 401 certification (RWQCB); 1602 Streambed Alteration Agreement (CDFG)
1-3 months depending on agency availability	Agencies require additional information or modification to application or project description. Coordinate with agencies to modify application or project description as necessary.
1-2 months	Agencies accept revised application or project description.
After receipt of complete application	USACE begins consultation with USFWS
3 months to over a year depending on type of consultation	USFWS issues Letter of Concurrence or Biological Opinion.
Usually within 3 months of completed applications and completed consultation with USFWS	Agencies issue permits.
Upon receipt of all permits	Implement project



## 10.0 REMOVAL METHODOLOGY

A wide range of techniques is currently used in the control and removal of arundo and tamarisk. These include hand removal, mechanical removal, herbicide application, tarping, controlled burning, and biological control, as well as various combinations of these techniques. Based upon a review of available literature and contact with different agencies and specialists, it has been determined no single method has been proven most effective for every situation. Different agencies and organizations involved in control of arundo and tamarisk tend to favor differing approaches to control and removal based on their experience, resources, and local environmental and policy circumstances. This is also reflected in the literature, where different researchers have noted variable findings for the effectiveness of different techniques.

For example, the Santa Margarita and San Luis Rey Watersheds Weed Management Area (SMSLRWMA) rely primarily on a fall-period foliar spray application, followed by spring biomass removal for arundo removal. The SMSLRWMA reports this method as having the highest success rate for their arundo infestation problem (Giessow 2005). In contrast, in its initial focused projects, the VCRCDD has used various methods, including foliar spray application or the cut and daub technique accompanied by biomass removal, with chipping and reuse of the arundo mulch outside the stream channel. Other groups, such as Circuit Rider Productions, prefer tarping as a non-herbicidal approach, and have found it highly effective on smaller stands of arundo.

Ultimately, the selection of the appropriate removal method for each project will depend upon:

- the time of year
- severity of infestation
- the presence of native plants and wildlife
- the degree of intermixing of invasive species with sensitive native habitats
- the presence of sensitive native species
- access
- proximity to surface water
- budget
- permitting standards

Regardless of the method chosen, all projects will require follow-up treatments and monitoring, and have the potential to impact sensitive species in certain habitat areas. Due to the range of variables that influence the control and removal of these invasive species, and the differences among opinion on which techniques are the most effective and environmentally appropriate for a given circumstance, the SCARP presents a menu of options for different removal techniques. Each technique is described in terms of typical procedures involved and the general circumstances where it is usually employed including a discussion of the general pros and cons of each approach, which is summarized in Table 6.

The general analysis of the pros and cons of available control options is further refined in terms of their potential utility for application to various reaches of the Santa Clara River and its associated tributaries. For planning purposes, the Santa Clara River has been subdivided into six reaches (Chapter 3) based on similar traits such as channel morphology, water availability, vegetation types, and surrounding uses and access. Each major tributary is treated individually with the major tributaries broken into upper, middle, and lower reaches where appropriate based on differing physical characteristics.

The Santa Clara River's reaches and its tributaries vary considerably not only in terms of physical and ecological characteristics, but also in degree of infestation, intermixing of invasive species with native habitats, environmental sensitivity, and access. These factors in turn guide, but not entirely limit, the choice of removal options preferable for a certain reach. For example, the environmental sensitivity of a certain reach may warrant use of more labor intensive but environmentally sensitive techniques (e.g., cut and daub) and limit the widespread use of more intrusive techniques (e.g., mechanical clearing), particularly during the bird breeding season. However, sub-sections of this reach may be less sensitive and warrant consideration of mechanical clearing or other more invasive approaches. For this reason, the methods section is generally inclusive in terms of available techniques. However, regardless of the technique selected, all potential options are accompanied by an extensive list of BMPs in Chapter 14.





**Table 6: Summary of Removal Method Options**

Method	Appropriate Use	Timing	Tools	Instructions	Advantages	Disadvantages
Hand Removal (Above-Ground only)	Small infestations where there is concern regarding herbicide use.	Removal can be performed anytime, but most effective time to cut arundo and tamarisk is during the growing season (spring through fall). Rain and high water can limit wet season access.	Loppers, machete, chainsaw, bladed weed whipper, or similar equipment.	Stems, canes, and trunks are cut as close to the ground as possible. Cut biomass is generally removed from the project site and chipped, burned, or disposed of at a landfill to prevent reestablishment of cuttings. Roots and rhizomes are left in the ground.	Specific, minimizes damage to native plants/ animals. Minimizes soil disturbance.	Labor and time intensive. Very low mortality rates require repeated re-treatment (>5 years) to be effective which increases the project cost and frequency of disturbance to sensitive areas. Extensive debris removal.
Hand Removal (Above and Below-Ground)	Young plants and small stands, or when there is concern about herbicide use.	Removal can be performed anytime. Rain and high water can limit wet season access.	Pick-axe, mattock, shovel, loppers, machete, chainsaw, picks, or similar equipment.	Above-ground trunks, stems, or canes are first cut near the base. After clearing the material, roots and rhizomes are dug up using hand tools.	Specific, minimizes damage to native plants/animals. Effective if rhizomes and root masses are thoroughly cleared from site.	Labor and time intensive. Requires careful cleaning of roots/ rhizomes and debris removal. Soil disturbance and erosion potential.
Mechanical Removal (Above-Ground only)	Areas with easy access for heavy equipment and on stands not inter-mixed with native plants.	Removal can be performed anytime, but most effective time to cut arundo and tamarisk is during the growing season (spring through fall). Rain and high water can limit wet season access.	Tractor-mounted mower, towed disc, plow, flail mower, or similar equipment.	The stalks, stems, and canes are cut using the mower, disc or plow as close to the ground as possible. Cut biomass is removed from the project site immediately following cutting to prevent reestablishment of the cut material. Roots and rhizomes will remain in the ground.	Effective biomass removal for extensive stands.	Very low mortality rate requires repeated re-treatments. Extensive manual debris removal necessary when biomass is large enough to resprout. Requires site access by equipment.
Mechanical Removal (Above and Below-Ground)	Areas with easy access for heavy equipment and on stands not inter-mixed with native plants.	Removal can be performed anytime. Rain and high water can limit wet season access.	Backhoe, excavators or other heavy machinery.	A backhoe or tractor is to be used to simultaneously remove the plants and their root system. If roots/rhizomes remain, the equipment can be used to excavate these larger segments. Hand crews using shovels can dig out smaller fragments.	Effective if rhizomes and root masses are thoroughly cleared from site. Effective for removing very large establishments in open and accessible terrain.	Extensive debris removal. Major soil disturbance and erosion potential. Possible impacts to native wildlife and plant species. Requires site access by equipment.
Tarping	Small stands (<0.25 acres) not intermixed with native plants.	Tarps applied in late spring/ early summer and remain for up to 5 months, usually from June to November.	Chainsaws, machetes, loppers, or similar equipment to cut plants. Opaque thick tarps or pond liners, stakes or weights to hold tarps down.	Stalks and branches should be cut within inches of the ground. Chipped biomass should be placed over cut stalks. The opaque tarp or pond liner is laid over the cut material and secured with stakes or weights. The tarp remains on the target area for a period of five months and is then removed. Dead biomass is removed from the project area and roots and rhizomes are left in the ground.	High success rate when properly applied. Available for active channel areas. Minimizes soil disturbance. Effective on small stands.	Application of method is limited by size of stand. May damage soil microorganisms. Not appropriate for areas that may flood (i.e. channel).
Foliar Spray or Basal Bark Treatment	Any size stand not intermixed with native plants or where herbicide applicators can avoid native plants.	Apply herbicide anytime, but most efficient in early fall through winter when plant energy is transferred to roots. Herbicide should be applied on dry days and during low winds.	Herbicide, applicators such as backpack sprayer, ATV-mounted boom sprayer, spray rig, helicopter, or similar equipment.	Crews apply herbicide using sprayers or wicking on leaves and stems of arundo and foliage or basal bark of tamarisk. Follow herbicide label instructions. Personnel must be trained in the use and handling of herbicides. Timing of application is dependent upon type of herbicide used.	Short duration of labor. Low concentrations of herbicide. Effective on any size of stand. Minimizes soil disturbance.	Risk of drift to non-target plants and wildlife or adjacent sensitive receptors. Herbicide application should not be used in areas where there is great concern regarding herbicide use. Weather conditions must be suitable for herbicide application.

Method	Appropriate Use	Timing	Tools	Instructions	Advantages	Disadvantages
Cut and Paint/Daub	Any size stand. Allows— allows controlled application of herbicide on stands heavily intermixed with native plant species.	Apply herbicide anytime, but most efficient in early fall through winter when plant energy is transferred to roots. Herbicide should be applied on dry days and during low winds.	Chainsaws, loppers, or similar equipment can be used for cutting. Herbicide. Paintbrushes, sponge daubers, or similar equipment for herbicide application.	Trunks, stems, and canes of arundo and/or tamarisk are cut within one foot of the ground and removed. Herbicides is applied to the cut stem surface using brushes or daubers. Timing of application is dependent upon herbicide used. Follow herbicide label instructions. Personnel must be trained in the use and handling of herbicides.	Very high mortality rate. Efficient use of herbicide. Highly selective with little risk of drift of herbicide onto non-target plants or sensitive wildlife species. Little soil disturbance.	Very labor intensive. High concentrations (90-100%) of herbicide. Extensive debris removal is often required. Higher initial labor and herbicide costs than other methods, although less retreatment is required. Weather conditions must be suitable for herbicide application.
Cut, Resprout, and Spray or Paint/Daub	Any size stand not intermixed with native plants or where herbicide applicators can avoid native plants.	Cut one to two months prior to spraying. Apply herbicide when resprouts are 2-4 feet tall, but most efficient in early fall through winter when plant energy is transferred to roots. Herbicide should be applied on dry days and during low winds.	Loppers, chainsaws, flail mower, or similar equipment for cutting. Herbicide. Paintbrushes, sponge daubers,, applicators such as backpack sprayers, ATV-mounted boom sprayers, spray rigs, helicopter, or similar equipment for herbicide application.	Trunks, stems, and canes of arundo and/or tamarisk are cut within one foot of the ground and removed. Herbicide is applied. Apply herbicide after a sufficient period has elapsed (approximately one to two months) to allow for re-sprouting. Follow herbicide label instructions. Personnel must be trained in the use and handling of herbicides.	Low soil disturbance associated with this method if hand tools are used. Less risk of herbicide drift than when spraying full-grown canes.	Waiting for resprouts after cutting can be impractical when working in remote areas. Large equipment (such as flail mowers) can substantially disrupt the soil and damage native, non-target species and habitat. Weather conditions must be suitable for herbicide application.
Cut and Spray	Any size stand not intermixed with native plants or where herbicide applicators can avoid native plants.	Apply herbicide anytime, but most efficient in early fall through winter when plant energy is transferred to roots. Herbicide should be applied on dry days and during low winds.	Loppers, chainsaws, flail mower, or similar equipment for cutting. Herbicide. Backpack sprayers, applicators such as backpack sprayer, ATV-mounted boom sprayers, spray rigs, or similar equipment for herbicide application. .	Crews will cut plant to four or five feet and then apply herbicide using hand held sprayers on leaves and stems of arundo and foliage or basal bark of tamarisk. Personnel must be trained in the use and handling of herbicides.	Moderate mortality rate. Minimizes soil disturbance. Minimizes risk of drift onto non-target species.	Biomass removal is labor intensive. Stalks intended for spraying may be trampled. Weather conditions must be suitable for herbicide application.
Controlled Burning	Large stands of pure arundo and tamarisk or for girdling of individual tamarisk trees.	Removal can be performed anytime. Anytime. Burning is most effective during growing season.	Flamethrowers weed burners, or similar equipment. Fuel.	Crews to either broadcast burn large stands or employ flamethrowers or weed-burners to spot treat small clusters, or heat-girdle stems at the base of individual plants. For larger controlled burns, fire crews would likely be required to monitor fires to prevent unintentional spread. . Fires applied during the rain season may help prevent spread of wildfires.	Highly effective in removing biomass.	Requires permits to perform burns and repeated burning to control biomass. Low mortality rates make it ineffective as sole or primary tool. Large potential for regrowth. Potential for associated collateral impacts to native habitat and wildlife. Risk of fire spread to non-intended targets. Arundo and tamarisk readily recover from fire which allows them to out-compete native riparian vegetation in post-fire circumstances.



Method	Appropriate Use	Timing	Tools	Instructions	Advantages	Disadvantages
Controlled Burning with Herbicide Treatment	Large stands of pure tamarisk.	Removal can be performed anytime. Anytime. Burning is most effective during growing season. Herbicide application most effective in the fall through winter.	Flame throwers or weed burners, or similar equipment. Fuel. Herbicide, sponge daubers, paintbrushes, and backpack sprayers.	Crews Controlled burning involves using crews to either broadcast burn large stands or employ flamethrowers or weed-burners to spot treat small clusters, or heat-girdle stems at the base of individual plants. For larger controlled burns, fire crews would likely be required to monitor fires to prevent unintentional spread. Fires applied during the rain season may help prevent spread of wildfires. Herbicide is then may be applied to cut canes or stumps, or applied to resprouts after a sufficient period has elapsed (approximately one to two months). Personnel must be trained in the use and handling of herbicides.	Highly effective in removing biomass.	Requires permits to perform burns. Potential for associated collateral impacts to native habitat and wildlife. Risk of fire spread to non-intended targets. Weather conditions must be suitable for herbicide application.
Grazing	Large stands of pure arundo or tamarisk where herbicide use is a concern.	Anytime. Most effective during growing season.	Grazing animals such as goats, temporary fencing.	Although grazing can be used to reduce or eliminate tamarisk sprouts and reduce arundo growth, this technique requires focusing the grazers on areas with high densities of the target vegetation. This may require fencing, herding, or other techniques to ensure that the method is effective and that grazers do not target native vegetation.	If grazing animals are readily available, then may be effective temporary control of new growth. Provides animal forage.	Labor and time intensive. Very low mortality rates require repeated re-treatment (>5 years) to be effective which increases the project cost and frequency of disturbance to sensitive areas. May be difficult to focus grazing on target species. Concentrated areas of animal waste may cause negative impacts to treatment areas.
Biological Control	Control of large infestations.	Dependent upon pathogen or species released.	Dependent upon pathogen or species released.	Biological control would involve the controlled release of a pathogen, or insect species from these plants' native range to feed upon, create disease in, or otherwise impair the growth, spread, and/or reproduction of arundo and tamarisk. All such biological controls are monitored and regulated by the USDA and it would be necessary to coordinate with that agency.	When implemented, biological control is expected to be effective in controlling the spread of infestations, but may not be extremely effective in the eradication of the target species populations.	No biological control agent is approved for use in the upper Santa Clara River for either arundo or tamarisk as of this writing.



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## 11.0 HERBICIDES

The range of herbicides available for use on arundo and tamarisk infestations is limited due to the label restrictions of application to wildlands. However, application of herbicides can be one of the most effective tools for control and eradication of these invasive plants. Most herbicides work by disrupting amino acid production in plants. As humans and wildlife do not share these same metabolic pathways, herbicide function is not directly relevant to health risk assessment. Herbicides are effective when used alone to control infestations, but are often used in conjunction with other techniques such as cutting or mowing. The use of herbicides can substantially increase mortality rates of persistent invasive plants, reducing the need for invasive hand or mechanical excavation of roots and rhizomes and associated soil disturbances. However, the utility of herbicide application in control of arundo and tamarisk can be affected by its relatively high initial cost, restrictions on use in proximity to water, the degree of intermixing of invasive plants with natives, and the presence of sensitive species. These factors can all restrict the type of herbicide allowed, the location and timing of use, and the method of application.

The success of herbicide application primarily depends upon selecting the appropriate herbicide for the task and closely adhering to label directions. Many herbicides are prohibited for use around open water and all may exhibit seasonal variations in effectiveness. The most effective method of application can vary between brands and types of herbicides. Most herbicides require the use of a surfactant, which may be included in the product or added prior to application to increase effectiveness. Colorants are also often added to herbicide solutions to enable spray crews to see where they have sprayed after initial evaporation of the solution. The USEPA and the California Department of Pesticide Regulation (CDPR) must register the herbicides prior to their use in California. Further, the large-scale application of herbicides must be overseen by a licensed professional. Appendices 9 and 10 contain detailed descriptions of herbicides, issues surrounding application, and appropriate techniques for application.

The three herbicides most commonly used in the

eradication of arundo and tamarisk in riparian areas of Southern California are glyphosate, triclopyr, and imazapyr. While these herbicides are available under a variety of brand names, the focus of our discussion pertains specifically to these respective active ingredients. Formulations of glyphosate and triclopyr for use near aquatic habitats are available, and a formulation of imazapyr is pending for use near water. Different mixtures of these herbicides are effective under different circumstances as discussed in more detail in Appendix 9.

### 11.1 Glyphosate

Glyphosate can be used to treat arundo and tamarisk is the active ingredient in the retail products such as Aquamaster<sup>®</sup>, Rodeo<sup>®</sup>, Glypro<sup>®</sup>, and Roundup<sup>®</sup>. The USEPA has approved Rodeo<sup>®</sup> and Aquamaster<sup>®</sup> for use in aquatic environments, making glyphosate one of the primary herbicides currently available for use when surface water is present. Roundup<sup>®</sup>, conversely, is only approved for use in areas where water is not present.

Glyphosate is most effective when used on perennial plants, such as arundo and tamarisk, when applied in the late summer and fall when the plant is entering dormancy, as this permits transmission of the herbicide to the plant's root system (Sonoma Ecology Center 1999).

### 11.2 Imazapyr

Imazapyr can also be used to treat arundo and tamarisk and is the active ingredient in Stalker<sup>®</sup> and the new aquatic habitat formulation, Habitat<sup>®</sup>. Imazapyr is a non-selective herbicide used for the control of a broad range of weeds including terrestrial annual and perennial grasses and broadleaved herbs, wood species, and riparian and emergent aquatic species (Tu, et al. 2001). a low potential for leaching into groundwater. It has low toxicity to invertebrates and is non-toxic to fish, mammals, and birds (USFS 1995). Unlike glyphosate, it can damage adjacent non-target plants, with the exception of conifers, by transfer between root networks.

### 11.3 Triclopyr

Triclopyr can be used to treat tamarisk and is a selective systemic herbicide. It has little or no impact on



grasses (e.g. arundo). Triclopyr is the active ingredient in Garlon® and Pathfinder® formulations, and is known as Access® in other states. Garlon® 4 and Pathfinder® II are approved for terrestrial habitats. Garlon® 3A is approved for use in closed aquatic habitats such as wetlands and lakes. It is not allowed for use on streams and rivers. It is recommended for use within 300 feet of water by the USFWS.

#### 11.4 Adjuvants

Herbicides generally need to be applied with an adjuvant. There are several types of adjuvants including surfactants, non-foaming agents, and colorants. A surfactant is any compound that is added to an herbicide formulation or tank mix to facilitate the emulsifying, dispersing, spreading, wetting, or other properties of a liquid by modifying its surface characteristics (Vencill 2002). Surfactants, also known as stickers/spreaders, are similar to detergents in their action, reducing water surface tension to allow wetting and penetration of the plant tissues. The surfactant helps to achieve optimum herbicide adsorption into and adherence from the herbicide onto the plant. Surfactants may also improve an herbicide's efficacy so that the concentration or total amount of herbicide required to achieve a given effect is reduced, sometimes as much as five- or ten-fold (Tu et al. 2001). In this way, adding an appropriate surfactant can decrease the amount of herbicide applied and lower total costs for weed control (Tu et al. 2001). All herbicide labels recommend surfactants and other additives to improve herbicide effectiveness. In some cases, the herbicide will already have the surfactant included, but in other cases, it will be necessary to buy one. Herbicide applicators should check the label prior to adding surfactant. USEPA regulated adjuvants should be approved by the regulatory agencies. Non-ionic surfactants, such as Agridex®, are recommended by the USFWS.

#### 12.0 ACCESS AND STAGING AREAS

Staging areas are often utilized during larger removal projects. Staging areas are used for the storage of and servicing of equipment, the chipping and temporary storage of biomass, and the subsequent loading of chipped material onto trucks for removal from the project area. Staging areas are typically 0.25 to 0.5 acres in size.

Staging area selection is based on available space, ease of access from surrounding roads, ease of access to the eradication site, and the least potential to conflict with adjacent land uses. Permission for use of each staging area may need to be coordinated with the appropriate landowner. Staging areas are typically enclosed with orange construction fencing, or by a six-foot-tall chain link fence to prevent unauthorized access and to ensure public safety.

Staging areas should be located outside of the 25-year floodplain on the upper terrace, levee, or bank of the river or tributary where removal is occurring. In staging areas where chipping is not compatible with surrounding land uses (i.e., near residences, schools, and parks), chipping should occur at the nearest staging area that is appropriate for chipping. Each staging area may be used to accommodate equipment storage and maintenance, portable sanitation facilities, emergency decontamination kits, and handheld equipment when not in use. Unsecured herbicides should be removed from the staging areas each night. All handheld equipment, including chainsaws and backpack sprayers, should be removed from the staging area at the end of each work day and not left at the project site. If large equipment, including ladders, tractors, chippers, and booms, are to be left at the work site overnight, they should be stored in the staging area. Large equipment should also be kept in the staging area when not in use. All maintenance and refueling activities should be performed within the staging areas to minimize risk of leakage/spills.



### **13.0 DISPOSAL OPTIONS**

Arundo and tamarisk biomass may be disposed of in a variety of ways.

#### **13.1 Drying**

Treated biomass is stacked at staging areas and completely dried, so it is no longer viable and able to resprout. The dried biomass can be left at the site, burned, chipped, or taken to a landfill for permanent disposal. Biomass may be left in piles in upland areas outside the 25-year floodplain to enhance wildlife habitat for small mammals only if cut prior to seed production. If left on site, biomass should be monitored for re-growth. Drying may not be appropriate for rhizomes due to their ability to resprout when exposed to moisture, even after long periods of drying,

#### **13.2 Chipping**

A chipper is used at the staging area, or on the banks of the river or tributary, or within the river channel itself (often directly into the back of trucks) to shred the arundo canes or smaller tamarisk branches. The chipper should be placed at an appropriate distance from potentially sensitive groups and all noise reduction accessories should be employed. The biomass may either be stacked and dried before being fed into the chipper, or may be fed into the chipper while still green. It is recommended that a large chipper be used as arundo can break the blades of smaller chippers. Chipped arundo biomass is suitable for beneficial reuse as mulch if chips are less than four inches, as longer segments often still remain viable. Chipped tamarisk biomass may be contaminated with seed or salt (from foliage). It is recommended that tamarisk mulch be allowed to dry for two weeks to ensure seeds are no longer viable. Chipped biomass of arundo or tamarisk may also be disposed of off-site in a landfill for permanent disposal.

#### **13.3 Incineration**

Disposal of biomass occurs by burning cut material (that has not been chemically treated) at the staging area after the biomass has dried. Incineration requires obtaining a permit from the Los Angeles County Fire

Department and the Los Angeles Air Quality Management District and would only be appropriate outside of fire season. Incineration should only be used under low wind conditions. Necessary fire control equipment (e.g., extinguishers, water hoses, etc.) should be on hand to prevent any unintended spread of the fire.

#### **13.4 Landfill Disposal**

The cut biomass is transported off-site to a landfill for permanent disposal. Chiquita Canyon Landfill is the closest landfill to the project area available for use. Landfills typically charge per load or by ton, which can add to the overall project cost.

#### **13.5 Beneficial Re-use**

##### **13.5.1 Commercial and Cottage Industries**

Removed arundo stalks may occasionally be sold for commercial purposes. Manufacturers of reeds for woodwind instruments, as well as those producing pressed board and paper products often have an interest in acquiring cut arundo canes. Arundo biomass may also be used to handcraft flutes, walking canes, and other such items as part of a cottage industry. However, as the overall goal of any removal project is to eradicate arundo, the sale of cut arundo for profit, and the development of commercial distribution channels is not encouraged. Project applicants who are approached by commercial entities who either wish to acquire the cut biomass, or who offer cutting/harvesting services, should only undertake such arrangements after entering into contract negotiations with the commercial entity. Appendix 12 lists guidelines that should be included in such a contract.

##### **13.5.2 Cogeneration**

Dried arundo and tamarisk biomass may be used as an environmentally friendly fuel in cogeneration power plants. However, and as mentioned above, the establishment of arundo for commercial applications is not encouraged as the overall goal is to eradicate arundo.



## 14.0 BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES

Although the primary goal of arundo and tamarisk eradication programs is to improve habitat quality, some eradication techniques have the potential to negatively impact native habitat surrounding, and within, the project footprint. BMPs are intended to reduce the ecological cost of eradication projects and minimize deleterious impacts, while allowing the most appropriate eradication techniques to be used. Regulatory permits require implementation of BMPs. Most BMPs are implemented at the time work is conducted in the field, however some can be implemented prior to commencement of work.

The BMP project checklist provided below (Table 7) is designed to facilitate the application of BMPs for all possible projects. The list is based on three elements that will need to be considered for each project before it is implemented:

- (1) how invasive species are to be removed from the project site;
- (2) how the biomass of dead invasive plants will be disposed of and removed from the project site after treatment; and
- (3) what types of sensitive species are either present or have the potential to be present on the site.

Note that all general BMPs shall be applied to all projects, no matter how small, in order to ensure that removal of invasive species does not adversely affect the remaining habitat quality. To use the checklist, answer the questions in gray bars, and see the text sections of the SCARP referred to next to the answer.

### 14.1 General BMPs

The following general BMPs are applicable to all removal scenarios and must be implemented for all related projects.

#### 14.1.1 Limits to Site Disturbance

- All projects will coordinate with the regulatory agencies to obtain appropriate permits.
- Work area will be limited to smallest area possible.

- Vehicle use will be limited to the maximum extent possible. If vehicles are to be used, rubber-tired vehicles are preferred over tracked equipment.
- Soil disturbance will be limited to the maximum extent possible.
- Native vegetation and tree damage or removal will be limited to the maximum extent possible.
- No project activities will occur in flowing or ponded water.
  - If water must be crossed, an appropriate spanning method such as a temporary bridge consisting of planks or a steel grate/plate is to be used.
  - If work must occur in areas of flowing or ponded water, approved techniques for water diversion are to be used prior to beginning project activities.
- Staging areas will be located outside the active channel on the upper terrace, levee, or bank of the river or tributary.
- Staging areas will be located in compacted and de graded areas, preferably near access points when site conditions allow.
- Movement of personnel and equipment will be limited to designated work zones, staging areas, and access roads.
- Access points will be located at pre-existing ramps/roads, in areas infested with non-native or invasive plant species, or in areas that are already degraded. Areas with compacted soil will be used preferentially over areas with loose soils. Soil from access points infested with noxious species will be compacted, and biomass from such access points will be mulched to avoid distribution of seeds.

#### 14.1.2 Site and Personnel Management

- All OSHA (Occupational Safety and Health Administration) regulations will be followed by project personnel.
- Chemical toilets for personnel shall be kept in staging areas during removal activities.
- Project activities will be limited to normal business hours.
- Extraneous noise will be limited to the maximum



- extent possible (e.g., radios for entertainment).
- Equipment and machinery use will comply with all applicable local noise ordinances and policies.
- Smoking will not be allowed on site.
- Pets of project personnel will not be allowed on site.
- Prior to removal activities, treatment areas will be marked, and signs will be clearly posted along access points to the project site.
- Signs will be posted on affected trails for a sufficient time to warn trail users of heavy-duty equipment crossings. The signs will be posted on either side of the active access and shall be maintained for the entire period of project-related trail use.

- Signs and flaggers shall be used in areas where equipment use would access high speed roads (e.g. blind corners).
- All neighbors within 100 feet of proposed areas will receive notice of proposed projects one month before start of work.

**14.1.3 Personnel Education**

- All project personnel will be briefed on environmental concerns regarding the project, including the use of herbicides, appropriate work practices (including spill prevention and response measures), and other measures needed to minimize project impacts. Personnel will be informed of the

**Table 7: BMP Checklist**

*	All general BMPs (Section 14.1 and all sub sections) must be adhered to at all times.	
1	How will invasive species be removed from the project site?	
	Biomass Removal	14.2.1
	Herbicides	14.2.2
	Foliar Application	14.2.3
	Cut and Paint	14.2.4
	Cut and Spray Resprouts	14.2.5
	Tarping	14.2.6
	Controlled Burning	14.2.7
	Biological Control	14.2.8
	Grazing and Herbivory	14.2.9
2	What method of biomass disposal will be used?	
	Drying	14.3.1
	Chipping	14.3.2
	Incineration	14.3.3
	Landfill Disposal	14.3.4
3	If sensitive species are present on site, what type? (For a description of sensitive species see Section 4.0, Biological Resources.)	
	Birds	14.4.1
	Amphibians/Reptiles	14.4.2
	Fish	14.4.3
	Plants	14.4.4



locations of foot and vehicle access paths, areas that are sensitive, and areas that are closed to access. The construction contractor shall monitor all construction-related activities to ensure that all of the environmental protection measures are followed throughout initial project activities and subsequent activities.

- All project personnel will participate in an educational program to identify the target plant species (arundo or tamarisk), incidental noxious plant species on the site, and native plant species on the site prior to proposed activities. This training will include how the target and incidental plant species are distributed in order to prevent spread of viable biomass.
- If special status plant or wildlife species (or species of concern) occur on site, a qualified biologist will conduct an educational program on how to avoid impacts to these species for all project personnel prior to proposed activities. This training will cover a description of all listed species (or species of concern), which occur within the project boundary and their habitats. This training shall also include a description of the applicable regulations such as the ESA and the State Fish and Game regulations, the need to adhere to these regulations, penalties associated with violations, and measures being implemented to conserve the species within the project area.

#### ***14.1.4 Air and Water Quality And Site Contaminant Prevention and Control***

- All vehicles will observe a maximum speed limit of 15 miles per hour or lower at the project site and staging areas to avoid generation of dust.
- Appropriate dust suppression methods will be used during on-site removal activities. Recommended methods include application of water, use of wind break enclosures, covers on soil piles and dump truck loads, use of silt fences, and suspension of earth-movement activities during high wind conditions.
- Emissions from construction equipment will be controlled by adherence to the recommended maintenance schedules for each individual equip-

ment type. Repairs to malfunctioning equipment will be made as soon as possible.

- All trash items will be enclosed in sealed containers and regularly removed from the site.
- Disposal of project waste materials such as trash, used equipment, oil, grease, and chemicals will be done in accordance with federal, state, and local regulations.
- Erosion control measures (e.g., silt fencing, mulch, matting, soil binder, seeding) will be implemented as appropriate to inhibit sediment transport into the waterways.
- If work is to occur during the rainy season, no work will occur unless there is a three-day clear weather forecast. No work will occur during rain events.
- No unchipped biomass greater than four inches in length will be left overnight within the stream channel.
- Stockpiled biomass, loose soil, or other debris will not be left overnight within the stream channel or on its banks. If stockpiled biomass must be left overnight, it will be moved to staging areas.
- All equipment and clothing will be inspected and cleaned at the end of each work day to prevent the further spread of invasive species.
- Herbicide storage during application, and the fueling and lubrication of mechanical equipment will be confined to staging areas.
- All vehicles and equipment shall be moved to a staging area or removed from the site overnight.
- Immediate control, containment, and cleanup of fluids and herbicides due to spills or equipment failure (broken hoses, punctured tanks, etc.) will be implemented. All contaminated materials will be disposed of promptly and properly to prevent contamination of the site. To reduce the potential for spills, the refueling of portable equipment shall occur within a contained area. Where that is not possible, barriers shall be placed around the site where the fuel nozzle enters the fuel tank. The barriers shall be such that spills shall be contained and easily cleaned up. Refueling activities shall ensure that the potential for spillage from overfilling, nozzle removal, or other action is minimized to the extent feasible.



#### 14.1.5 *Biological Resources (If Listed Species or Species of Concern Have Potential to Occur)*

- If listed species or species of concern have potential to occur in the area, the project manager shall coordinate with the appropriate resource agencies and a qualified biologist to conduct surveys and implement measures to avoid impacts.
- If listed species or species of concern are known to occur in the area, a qualified biologist will be retained to recommend measures to protect these species such as the project scheduling, delineation of the work area, staging area, and access points.
- If listed species are present, a qualified biologist will monitor project activities as directed by regulatory agencies.
- Impacts to nesting birds per Migratory Bird Treaty Act (MBTA) will be avoided by:
  - the cessation of work during bird breeding season (March 15 – September 15);
  - the performance of surveys by a qualified biologist to determine presence/absence of nesting birds prior to undertaking work;
  - the establishment of appropriate exclusionary buffers around nests, if present.

### 14.2 *Technique-Specific BMPs*

#### 14.2.1 *Biomass Removal*

- Target species' canes/trunks will be cut to less than twelve inches in height and straight across to prevent sharp points from injuring project personnel or the public.

#### 14.2.2 *Herbicides*

- A DPR licensed Pest Control Advisor (PCA) will prepare a written recommendation for the use of all materials/herbicides on agricultural areas (as defined by CDPR); the recommendation will be submitted to the Los Angeles County Agricultural Commissioner's Office.
- All material/herbicide usage on agricultural areas (as defined by CDPR) will occur only as directed by the written recommendation from a licensed PCA.

- Only herbicides registered for use in California by the EPA and the DPR will be used.
- Only herbicides approved for aquatic use may be used within the banks of rivers and tributaries. Roundup® may not be used within the active channel of rivers and tributaries.
- All adjuvants will be registered by the EPA and approved for use by the resource agencies.
- Herbicide application will be conducted only by personnel with an operator identification number from the Agricultural Commissioner's Office or supervised by a DPR certified or licensed Qualified Applicator (QAC or QAL).
- Herbicide usage will be limited to the minimum amount required to be effective.
- Herbicides shall be applied according to the manufacturer's label specifications.
- Herbicides will be colored with a biodegradable dye to facilitate visual control of application.
- Avoidance measures such as pulling back or temporarily tarping desired vegetation will be used to the extent feasible to prevent unintended herbicide impacts.
- Herbicides will be secured or removed from staging areas at night.

#### 14.2.3 *Foliar Application (Full Stands, Cut Stands, Resprouts)*

- Herbicide will not be applied when conditions are windless or greater than ten miles per hour (mph).
- Herbicide will not be applied if air temperature exceeds volatilization limits of herbicide, unless adjacent native species are protected (e.g., tarped).
- Tarps shall be used to cover desired vegetation (to the extent feasible) to prevent unintended herbicide impacts.
- Booms or ladders will not be employed for foliar spraying within 200 feet of residences, parks, schools or similar sensitive receptors. Foliar spray applications shall be limited to the cut and spray technique within this setback.

#### 14.2.4 *Cut-and-Paint*

- See BMPs for biomass removal and herbicides.



#### 14.2.5 *Cut and Spray Resprouts*

- See BMPs for biomass removal and herbicides.

#### 14.2.6 *Tarping*

- Target species' canes/trunks will be cut to less than twelve inches in height and straight across to prevent sharp points from injuring project personnel or the public.
- Mechanical equipment will not be driven over tarped areas.
- Tarps shall be manually transported into seasonally and perennially wet areas.
- Tarping material will be removed and disposed of properly after completion of the project.

#### 14.2.7 *Controlled Burning*

- This method will be used in compliance with all local laws and regulations and will be conducted in conjunction with the local fire department and AQMD.
- Adjacent land uses and land ownership will be considered prior to implementing controlled burns.
- All controlled burns will be conducted during the rainy season.
- All controlled burns will be supervised by qualified fire personnel.
- All controlled burns will be conducted during low-wind conditions.
- Adjacent landowners will be notified prior to implementing controlled burns.

#### 14.2.8 *Biological Control*

- Biological control vectors will not be released without USDA approval.

#### 14.2.9 *Grazing and Herbivory*

- The use of grazing animals shall be restricted to areas outside of flowing water with a minimum setback of 50 feet for grazing from any flowing water.
- Grazing will be controlled by erection of temporary fencing to restrict grazing animal to the target area.

### 14.3 *STORAGE AND DISPOSAL METHODS*

#### 14.3.1 *Drying*

- Drying of biomass will occur outside of the active channel at designated staging areas.

#### 14.3.2 *Chipping*

- All chipped biomass will be disposed of off site in a landfill or will be used as mulch.
- All measures shall be taken to reduce the noise of chipper and to prevent noise disturbance to potentially sensitive receptors.
- Necessary measures shall be taken to reduce and control dust generated by chipping.
- Chipping shall occur on staging areas only with prior approval of the appropriate landowner and/or agency.

#### 14.3.3 *Incineration*

- All federal, state, and local laws and provisions regarding incineration of biomass shall be followed, including those of the local fire department and AQMD.
- All incineration will take place at appropriate designated locations.

#### 14.3.4 *Landfill Disposal*

- Cut biomass is transported off-site to a landfill for permanent disposal. Chiquita Canyon Land fill is the closest landfill to the project area available for use. Landfills typically charge per load or by ton, which can add to the overall project cost.

### 14.4 *Threatened and Endangered Species-Specific BMPs*

#### 14.4.1 *Birds (Western Yellow-Billed Cuckoo, Southwestern Willow Flycatcher, California Condor, Least Bell's Vireo, Coastal California Gnatcatcher)*

- Project activities (e.g., application of herbicide, mechanical trimming, and/or removal, etc.) shall be conducted between 15 September and 15 March to avoid impacts to listed bird species such as least Bell's vireo and southwestern willow



flycatcher during the breeding season, or shall provide a 500 foot radius buffer around each nest, if either species is present.

- Noise levels will not exceed 60 dBA (A-weighted decibel scale) within 500 feet of nests.

#### **14.4.2 Amphibians (*Arroyo Toad, California Red-legged Frog*)**

- No work will be conducted within areas of known or potential arroyo toad habitat during the breeding season (February to August).
- Vehicles and equipment shall be removed from the habitat before sunset in sensitive amphibian areas.
- Stockpiles of biomass will not be kept in habitat areas, but will be moved to upland areas outside the 25-year floodplain immediately to minimize amphibian and reptile usage.

#### **14.4.3 Fish (*Unarmored Threespine Stickleback, Santa Ana Sucker*)**

- No work will occur in flowing or ponded water.
- Grading and excavation will be set back a minimum of 50 feet from the edge of the active channel. Grazing areas will be fenced to prevent animals from entering water. The boundaries of excavated projects will be demarcated by temporary construction fencing or flagged stakes.

#### **14.4.4 Plants (*e.g., Nevin's Barberry, Slender-Horned Spineflower, Spreading Navarretia*)**

- All listed plant locations will be fenced to avoid disturbance and accidental damage/mortality.
- Herbicides will not be used near known or probable locations of sensitive plant species.

Areas identified as potential special status plant habitat will be surveyed by a qualified botanist prior to commencing work.



### 15.0 MAINTENANCE AND MONITORING

Arundo and tamarisk are aggressive invasive plants with an extraordinary ability to spread, reproduce, and thrive under a wide range of conditions. As such, any removal program for substantial infestations requires a long-term commitment of resources, repeated treatments, and ongoing monitoring in order to be successful (Table 8). This adds to the overall cost of removal efforts, but without such repeated treatments and monitoring, successful removal projects can quickly experience reinvasion, with the potential for a treated area to return to a pre-removal condition, sometimes within a few years.

The issue is exacerbated within the upper Santa Clara River watershed because extensive infestation increases the chance of re-infestation from offsite sources. Therefore, all removal methods will require at least three years of continuous monitoring and follow-up treatments. Even approaches with high initial mortality rates such as cut and daub/paint will require this extent of monitoring, and likely follow-up treatments in spots. For methods with lower mortality rates, monitoring times and the number of required re-treatments may increase to five years. Monitoring site visits are recommended quarterly for the first year and biannually for years two to five.

**Table 8: Comparison of Re-Treatment Requirements of Removal Methods**

Method	Average 1 <sup>st</sup> Year Mortality Rate	Level of Re-Treatment Effort Required	Average Number of Re-Treatments Required
Hand Above-Ground Removal	<50%	Same as initial treatment.	>5
Hand and Mechanical Above-Ground Removal	5-50%	Varies depending on success of initial treatment. Potentially the same as initial treatment.	>5
Mechanical Above-Ground Removal	<50%	Same as initial treatment.	>5
Mechanical Above- and Below-Ground Removal	5-50%	Varies depending on success of initial treatment. Potentially the same as initial treatment.	>5
Tarping	50-95%	Few resprouts – little effort.	At least 3
Foliar Spray	50-95%	Few resprouts – little effort.	3-5
Cut and Spray or Paint/ Daub	50-90%	Few resprouts – little effort.	3-5
Cut, Resprout, and Spray	~50%	Some resprouts – close to the same amount of effort as initial treatment.	3-5

The level of intensity, duration, and frequency of required re-treatment depends on many factors such as the skill of the crews involved, initial budget, etc. As such, this table is provided for general reference only.  
 Source: Sonoma Ecology Center 1999.



## 16.0 HABITAT RESTORATION AND REVEGETATION

There are two types of revegetation: passive and active. Passive revegetation means there will be natural recruitment from native species while active revegetation means introducing native species by planting seeds, cuttings, or container stock.

*Passive revegetation* means replanting by natural processes. Surrounding native plant habitats provide seed sources for propagation. Once the competition of arundo or tamarisk is removed, native species will continue to propagate and grow there. This method requires the least effort and expertise to restore native riparian vegetation. It also doesn't require repeated disturbance for maintenance and ensures the revegetation of local genetic stock. However, passive revegetation may take several years or more to become established. If invasive plants are established upstream of the project area or in surrounding areas, the site is at risk of being repopulated by invasive plants.

Passive revegetation is most appropriate when:

- There are native plant and seed sources, either on-site or upstream.
- The site does not contain extensive disturbed, unvegetated, exposed ground that would attract non-native pest plants.
- The soils are stable and at low risk of erosion.
- The site tends to flood each year, allowing nearby native plant material to settle and become established.

If these conditions exist, passive revegetation may be a more appropriate use of time and resources than active revegetation.

*Active revegetation* means collecting and planting seeds, cuttings, or container stock. Active revegetation is recommended for sites are located on upper banks where natural recruitment is unlikely to occur or on areas which have erosion problems. Project sites should be monitored during removal activities for natural recruitment of native species. Supplemental water or irrigation may be required. Active revegetation is often planned after removal activities have been completed to avoid impacts to newly planted vegetation. Active revegetation may take from three to five years.

Active revegetation is most appropriate when:

- The site is located downstream from, or near invasive plant species. In such cases, prompt revegetation with natives may be necessary to prevent reinvasion of the treated site.
- The soil or stream bank is unstable and at high risk of erosion.
- A landowner strongly desires a privacy screen.
- There are special status species utilizing the project area.
- Natural recruitment is not providing species diversity.

There are several different revegetation techniques. Depending upon the project site conditions and desired habitat diversity, a combination of revegetation techniques may be used. Active revegetation alone may not provide sufficient soil or bank stabilization. Soil retention materials and stabilizing structures may be needed to adequately prevent erosion and bank failure. In such cases, materials such as erosion control fabrics and engineered structures should be considered before engaging in invasive plant removal. For structural changes, consult with a professional engineer or landscape architect, or a government agency such as Resource Conservation Districts.

Depending upon the level of habitat restoration desired and various individual project factors, the project costs will vary. A successful revegetation project will provide habitat, include a diverse set of plant types and species, reduce erosion, and require minimal annual management (CDFG 2003). If revegetation of a project site is intended, it is advisable to plan ahead to obtain local native plant material, grow container stock if necessary or prepare seeds for planting, and create a schedule for planting and maintenance. Planting cuttings or container stock usually works well for species that do not germinate well from seed or need intensive seed preparation. Seeding can be applied to species that germinate well from seed. It is important to consider the species diversity and local genetics when planning the plant palette. Native plant material such as seeds and cuttings should be obtained from the project site or as close as possible. Site preparation may include reducing the weed seed bank in the soil by herbicide application or disking prior to seed set. If there is a large



weed seed bank, this process may be performed several times. Planting or seeding is usually performed in the fall season to take advantage of rains for germination and encourage root growth. If rains are late, revegetation may occur in the winter or early spring. If planting or seeding is performed at another time of year, supplemental water or irrigation should be considered (Sonoma Ecology Center 1999).

Revegetation techniques include:

- Hand broadcasting of native grass, forb, and/or shrub seed mixes
- Hydroseeding of native grass, forb, and/or shrub seed mixes, may also contain binders for erosion control
- Drill, imprint, or pit seeding
- Direct planting of tree or shrub seeds
- Planting of tree and/or shrub cuttings
- Planting of tree, shrub, forb, and/or grass container plants

Depending upon the level of habitat restoration desired and various individual project factors, the project costs will vary. A successful revegetation project will provide habitat, include a diverse set of plant types and species, reduce erosion, and require minimal annual management (CDFG 2003). If revegetation of a project site is intended, it is advisable to plan ahead to obtain local native plant material, grow container stock if necessary or prepare seeds for planting, and create a schedule for planting and maintenance. Planting cuttings or container stock usually works well for species that do not germinate well from seed or need intensive seed preparation. Seeding can be applied to species that germinate well from seed. It is important to consider the species diversity and local genetics when planning the plant palette. Native plant material such as seeds and cuttings should be obtained from the project site or as close as possible. Site preparation may include reducing the weed seed bank in the soil by herbicide application or disking prior to seed set. If there is a large weed seed bank, this process may be performed several times. Planting or seeding is usually performed in the fall season to take advantage of rains for germination and encouragement of root growth. If rains are late, revegetation may occur in the winter or early spring. If planting or seeding

is performed at another time of year, supplemental water or irrigation should be considered (Sonoma Ecology Center 1999).

## **16.1 Planting Methods**

### **16.1.1 Broadcast Seeding**

Broadcast seeding can be performed by hand, with hand-held or rolling broadcast seeders, or larger broadcasters towed by all-terrain vehicles or tractors. The soil bed should be prepared prior to seeding. If there is compaction, the soil should be disked or tilled. Also, the soil should be raked before and after seeding to incorporate the seeds into the soil. If available, large equipment such as a harrow and a ring roller can assist with working the seeds into the soil and enhance soil compaction after seeding. The seeding rate for broadcast seeding is usually 25 to 30 pounds per acre.

#### **Drill or Imprint Seeding**

Dry seeding can also be performed with large equipment such as drills, imprinters, or pitters. A tractor-drawn drill makes small furrows, deposits seeds in the furrows, and covers the seed with soil. Drills come in different sizes and types with attachments to improve seeding different species. Imprinters have a hydraulic wheel system with different seed boxes and a roller with teeth. These allow for diverse seed mixes and fertilizer or mycorrhizal inoculum to be applied at the same time. Both of these seeding applications can be faster and more uniform than broadcast seeding. The seeding rate for drilling or imprinting is usually 12 to 18 pounds per acre.

### **16.1.2 Hydroseeding**

Hydroseeding uses hydraulic equipment to spread a wet mixture of seeds, fertilizer, mycorrhizae, erosion control binder, and green day dye. This method can seed a large area quickly. The hydroseed mixture can be applied from a turret on top of a truck while driving or with a hose. Hydroseeding is most effective during the fall or early spring when rains will encourage germination. However, if supplemental water is available, it can be applied at other times of the year. It is important for the components of the hydroseed mixture to be correctly combined in appropriate proportions and the soil



bed is prepared prior to application. The California Native Grass Association recommends a two step process: 1) applying seed, a small amount of virgin wood fiber mulch, mycorrhizal inoculum, compost, and an organic time-released fertilizer first and; 2) applying a second layer of wood fiber and compost to cover. If erosion control is necessary on steep slopes, apply a third layer of rice or native straw with a tackifier.

### 16.1.3 *Transplanting Emergent Plants*

Rushes, sedges, and tules are often called “emergent” plants since they usually emerge from water. These plants may grow from seeds or spread by rhizomes, which makes them good candidates for transplanting. Plants with intact rhizomes should be harvested in the winter or early spring. Several small clumps from a variety of larger clumps should be taken to ensure the parent population will survive and to include genetic diversity in the new planting area. Collected plant material should be stored in moist soil and transplanted within a reasonable time. Collected specimens should be planted in a large enough hole to accommodate the entire rhizome, soil should be packed around the rhizome, and thoroughly watered. Above ground portions of plant should be trimmed to stimulate growth.

### 16.1.4 *Planting Cuttings*

Willows, cottonwoods, Mexican elderberry, and many other riparian species can be planted from cuttings. These plants have the ability to grow roots from stems. Cuttings should be made when plants are dormant during winter months. Cuttings should be sliced so that the

inner side of the branch is at an angle to indicate the end that will be planted in the ground. The cuttings may be a variety of sizes with different diameters and lengths depending upon the plant species and the location of the planting. Cuttings should have several viable buds along the stem in order to ensure new growth. Cuttings may be stored in water until ready to use, grown in water until roots appear, or planted as container stock. Cuttings should be planted in soil with angled, cut side down (buds should be pointing up) with three-quarters of the cutting in the ground and one-quarter exposed. If holes are augured, fertilizer or mycorrhizal inoculum may be added to the hole or mixed with the backfill soil before planting. Cuttings can also be driven into the ground with a mallet if soil is soft. Damage to the top of cuttings may be, sliced off.

### 16.1.5 *Planting Container Plants*

Container plants may be ordered in a wide variety of species from a native plant nursery. Ideally, container stock will be grown from locally collected plant material. Container plants will require supplemental water – from either winter rains or irrigation. Holes should be dug twice as wide and twice as deep as the container plant. In addition, fertilizer or mycorrhizal inoculum may be added to the hole or mixed with the backfill soil before planting. The hole should be firmly backfilled to depth of the rootball, and then the container plant placed inside.



## 17.0 DEVELOPING A BUDGET AND SCHEDULE

### 17.1 Cost of Removal

Removal costs vary greatly and are influenced by many factors including the extent and degree of infestation, labor rates, the ease of site access, the removal method employed, the frequency, duration, and level of effort required for follow-up treatments, biomass transport distances, and disposal techniques. Typical costs associated with various arundo and tamarisk removal methods are not well documented and can vary greatly from project to project. Removal of minor or isolated stands of arundo or tamarisk can often be accomplished relatively inexpensively (less than \$2,000 per acre). However, current available methods which are suitable for successful removal of major infestations are all relatively expensive, ranging in price from approximately \$2,500 to \$9,500 per acre, depending on many variables. Techniques with the highest initial mortality rates and the lowest resultant follow-up monitoring and re-treatment costs tend to be the most expensive in terms of up-front costs, but the least expensive over longer periods. A project checklist is provided in Table 9.

Because such a wide range of factors affect removal project cost, it is not possible to provide precise estimates. Similar removal methods employed under generally similar circumstances can even exhibit variations in cost if just one key factor, such as difficulty of access or material transport, increases substantially due to factors such as distance or variable landfill tipping fees.

### 17.2 Cost Effectiveness

The SCARP proposes several methods for removal. Each method has advantages and disadvantages in different respects. Public agencies need to balance needs across the entire geographic area under their jurisdiction, as issues of social justice and environmental justice are important considerations in public and private policy and planning. (LAWMA 2005).

Although there may be certain concerns over the use of herbicides in the environment, this method may be more cost-effective in terms of funds and time. However, local communities or organizations may choose non-chemical methods of control, which may not be as cost-efficient. These groups have options to obtain ad-

ditional funding for alternative methods of control such as volunteer programs and grants.

Development of a project schedule is an integral component to any removal project. Table 9 is provided as a planning aid and offers examples of the steps applicants can expect to incorporate in their projects.

## 18.0 FUNDING

There are several ways to fund invasive plant removal projects. Local agencies and non-profit organizations may apply for funding through grants, restoration loans, cost-share programs, in-lieu fees, mitigation banking, or through alternative sources. Individual landowners should contact their local agencies or NGOs for grant or cost-share opportunities.

### 18.1 Grants

Grants are provided by governmental agencies or NGOs. There is usually a lengthy process for the application of grants. The process may take up to two years before funding is obtained. Each source will have different applications and contract requirements. There may be a two-part application, which consists of a pre-proposal or conceptual proposal and a final proposal if the pre-proposal is accepted. Grants often need to have matching funds provided by donated cash, labor, or equipment.

Some agencies and organizations that provide grants are listed below:

- State Water Resources Control Board
- National Fish and Wildlife Foundation
- State Resources Agency
- California Department of Parks
- Recreation Land and Water Conservation Fund
- Habitat Conservation Fund
- Natural Resource Conservation Service

Websites, which provide information regarding available grants, are listed below:

- <http://www.epa.gov/watershedfunding>
- [www.calwatershedfunds.org](http://www.calwatershedfunds.org)
- <http://www.invasivespecies.gov/toolkit/grants-info.shtml>



**Table 9: Project Checklist**

<b>PREPARATION</b>	
	Choose site - from headwaters down
	Obtain Landowner Cooperative Agreement
	Perform site assessment - level of infestation, potential for wildlife, staging areas, access
	Prepare project description - site plan, maps, choose removal/disposal methods, BMPs
	Survey project boundary
	Determine level of CEQA and which permits are necessary
	Complete vegetation/habitat surveys
	Complete wildlife surveys
	Complete sensitive species surveys
	Prepare CEQA - Initial Study, Negative Declaration, Mitigated Negative Declaration, Environmental Impact Report
	Contact resource agencies and prepare permits, including fees - CDFG, USACE, RWQCB, USFWS, AQMD, LADPW
	Prepare SWPPP
	Prepare specifications - safety, access to water, ingress/egress, removal methods, transport, disposal
	Prepare maintenance and monitoring plan
	Prepare bid package
	Contact youth groups such as CCC or City Corps for labor
	Notify and educate any surrounding residents via postcards, brochures, or handouts.
<b>CONSTRUCTION</b>	
	Mobilization - move in equipment, portable restrooms, signage, security fencing
	Clear & grub - staging areas, access roads, debris removal
	Construct access roads - equipment, dust/weed issues, watering truck for dust control
	Dewatering, if necessary
	Remove invasive species - labor, equipment, & herbicides
	Biological monitoring
	Transportation - to staging area (equipment & labor)
	Disposal - landfill, chipping/landfill, chipping - onsite/offsite mulch, incineration (equipment, landfill fees, transportation costs)
	Clean up, deconstruct access roads
	Demobilization - move out equipment, portable restrooms, signage, security fencing
<b>MAINTENANCE &amp; MONITORING (3- 5 years)</b>	
	Remove invasive species - labor, equipment, & herbicides
	Biological monitoring
	Transportation - to staging area (equipment & labor)
	Disposal - landfill, chipping/landfill, chipping - onsite/offsite mulch, incineration (equipment, landfill fees, transportation costs)
	Annual reports to resource agencies
	Management



- <http://www.wcb.ca.gov>
- [http://www.cdfa.ca.gov/phpps/ipc/weedmgmtareas/Funding/funding\\_hp.htm](http://www.cdfa.ca.gov/phpps/ipc/weedmgmtareas/Funding/funding_hp.htm)

Further information regarding available public and private grants can be obtained from the Foundation Center Libraries (<http://fdncenter.org>). Locations of these libraries include:

Ventura County Community Foundation  
Funding and Information Resource Center  
1355 Del Norte Road  
Camarillo, CA 93010  
(805) 988-0196

California Community Foundation  
Funding Information Center  
606 S. Olive St. Suite 2400  
Los Angeles, CA 90014-1526  
(213) 413-4042

Los Angeles Public Library  
West Valley Regional Branch Library  
19036 Vanowen Street  
Reseda, CA 91335  
(818) 345-4393

Santa Monica Public Library  
1343 Sixth Street  
Santa Monica, CA 90401-1603  
(213) 458-8859

## 18.2 Resource Loans

The State Water Resource Control Board has low interest loans for restoration and conservation projects. The Federal Water Pollution Control Act (Clean Water Act or CWA), as amended in 1987, provides for establishment of a State Revolving Fund (SRF) loan program. The program is funded by federal grants and State bond funds. The purpose of the SRF loan program is to implement the CWA and various State laws by providing financial assistance for the construction of facilities or implementation of measures necessary to address water quality problems and to prevent pollution of the waters of the State. The SRF Loan Program provides low-interest loan funding for construction of publicly-owned wastewater treatment facilities, local sewers, sewer interceptors, water reclamation facilities, as well as,

expanded use projects such as implementation of non-point source (NPS) projects or programs, development and implementation of estuary Comprehensive Conservation and Management Plans, and storm water treatment. There is more information available on the website: <http://www.swrcb.ca.gov/funding/srf.html>.

## 18.3 Cost-Share Programs

The NRCS has two cost-share programs to assist private landowners perform restoration and conservation projects.

### 18.3.1 Environmental Quality Incentives Program – EQIP

The Environmental Quality Incentives Program (EQIP) provides a voluntary conservation program for farmers and ranchers that promote agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan.

EQIP may cost-share up to 75 percent of the costs of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without the incentive. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. Farmers and ranchers may elect to use a certified third-party provider for technical assistance. An individual or entity



may not receive, directly or indirectly, cost-share or incentive payments that, taken together, exceed \$450,000 for all EQIP contracts entered during the term of the Farm Bill.

### **18.3.2 Wildlife Habitat Incentives Program - WHIP**

This program is available for all landowners with less than \$2 million income. The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP, USDA's Natural Resources Conservation Service provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from five to 10 years from the date the agreement is signed.

WHIP has proven to be a highly effective and widely accepted program across the country. By targeting wildlife habitat projects on all lands and aquatic areas, WHIP provides assistance to conservation minded landowners who are unable to meet the specific eligibility requirements of other USDA conservation programs.

### **18.4 In-Lieu Fee Program**

The in-lieu-fee program is a program run by the USACE to offset impacts to Waters of the United States, which are permitted under Section 404 of the CWA. In-lieu-fee mitigation occurs in circumstances where a permittee provides funds to an in-lieu-fee sponsor instead of either completing project-specific mitigation or purchasing credits from a mitigation bank approved under the Banking Guidance. Funds collected from the permittees under in-lieu-fee arrangements are used for replacing wetland and riparian functions and values and are not used to finance non-mitigation programs and priorities such as education projects or research. Currently no in-lieu-fee program agreements exist within the SCARP project area. To further research the in-lieu-fee program option or to develop an in-lieu-fee program, contact the USACE Los Angeles District office.

### **18.5 Mitigation Bank**

Invasive weed removal can serve as compensatory mitigation for certain projects affecting aquatic resources and can be incorporated into the BMPs of many projects. The USACE, RWQCB, and CDFG can require permittees whose activities involve temporary or construction-related disturbance of aquatic areas to ensure that the disturbed areas are not invaded by arundo, tamarisk, or other weeds. This can help reduce proliferation of infestation, as often happens in recently disturbed areas. When on-site mitigation is not appropriate, the Corps can direct permittees to mitigate the impacts of their activities by removing invasive weeds in strategic areas of the watershed; thereby contributing to the overall control program. Wetland mitigation banks strive to establish large, contiguous wetland areas, which can be used to mitigate for a number of independent impacts. This allows eligible permittees to purchase compensatory mitigation credits from another entity that has already produced and banked them, thereby eliminating the need to produce compensatory mitigation areas on-site (ELI and IWR 1994). Mitigation banks advance effective regional habitat conservation by encouraging the bundling of mitigation "credits" at sites recognized to be high priorities for habitat protection and restoration in watersheds and ecosystems and provide a mechanism that assigns a monetary value to habitat, which in turn allows a landowner to obtain a financial return for conserving land rather than developing it. The USACE has been an active participant in the establishment a mitigation bank in the Santa Ana River, which is focused on invasive weed removal. The goal of the Santa Ana River Mitigation Bank (SARMB) is to reestablish native riparian ecological diversity and other riparian functions through the removal of invasive weeds. Currently, a mitigation bank has not been established for the Santa Clara River, although the SARMB may serve as a template for the development of one in the future.



## 19.0 RESOURCES

The following list of resources provides further information and guidance to project applicants.

### 19.1 Local Agency and NGO Contacts

Large amounts of material already exist on the problems posed by arundo and tamarisk including the benefits of removal, and general approaches and techniques to successful removal. When combined with the detailed information contained in the SCARP document, ample information is available both to the public and to future project applicants. The primary points of contact for the public would be:

Ventura County Resource Conservation District  
 P.O. Box 147 (Mailing address)  
 3380 Somis Road (Street Address)  
 Somis, Ca 93066  
 (805) 386-4685

Antelope Valley Resource Conservation District  
 44811 N. Date Ave., Suite G  
 Lancaster, CA 93534  
 (661) 945-2604

Other agencies and organizations that can provide assistance are provided in Table 10.

**Table 10: Agencies and Organizations Assistance**

Agency or Group Name	Assistance Available	How to Contact
Los Angeles County Agricultural Commissioner	Regulates herbicide use. Provides information to obtain certification or licenses. Also provides Operator Identification Number and safety training for application of non-restricted materials.	(626)575-5471 12300 Lower Azusa Road Arcadia, CA 91006-5872 <a href="http://acwm.co.la.ca.us/">http://acwm.co.la.ca.us/</a>
Southern California Air Quality Management District	May require permit for controlled burning or incineration of biomass. Advises days when burning can occur.	(909)396-2000 21865 Copley Dr Diamond Bar, CA 91765 <a href="http://www.aqmd.gov/">http://www.aqmd.gov/</a>
County or Local Water Districts	May require a permit to access properties.	(661)259-3610
California Conservation Corps (CCC) (Camarillo/Los Angeles/Norwalk)	Eradication of invasive plants and restoration of native plants	(805)484-4345 1878 South Lewis Rd. Unit 60 Camarillo, CA 93010 <a href="http://www.ccc.ca.gov/">http://www.ccc.ca.gov/</a>
Los Angeles Conservation Corps	Eradication of invasive plants and restoration of native plants	(213)747-1872 P.O. Box 15868 Los Angeles, CA 90015 <a href="http://www.lacorps.org/">http://www.lacorps.org/</a>
Concerned Resource Environmental Workers (CREW)	Eradication of invasive plants and restoration of native plants	(805)646-5085 P.O. Box 1532 Ojai, CA 93024 (No Website)
California Department of Fish and Game (San Diego)	Issues Streambed Alteration Agreements and consults for impacts to state listed species.	(916)445-0411 1416 Ninth Street Sacramento, California 95814 <a href="http://www.dfg.ca.gov/">http://www.dfg.ca.gov/</a>
California Invasive Plant Council	Provides information on non-native invasive plants in California.	(510)843-3902 1442-A Walnut St., #462 Berkeley, CA 94709 <a href="http://www.cal-ipc.org/">http://www.cal-ipc.org/</a>



Agency or Group Name	Assistance Available	How to Contact
Los Angeles County or local Fire Department	Provides information for fire safety. May issue a burn permit.	(818)890-5783 12605 Osbourne St Pacoima, CA 91311 <a href="http://www.lacofd.org/">http://www.lacofd.org/</a>
Natural Resource Conservation Service (Lancaster)	Provides information for erosion control, non-native plant removal, habitat restoration, and funding	(661)945-2604 44811 N. Date Avenue, Suite G, Lancaster, CA 93534 <a href="http://www.ca.nrcs.usda.gov">http://www.ca.nrcs.usda.gov</a>
Antelope Valley and Ventura County Resource Conservation District	Provides information for non-native plant removal, habitat restoration, permitting, and funding	(805)386-4685 P.O. Box 147 Somis, CA 93066 <a href="http://www.vcrd.org">http://www.vcrd.org</a>
Los Angeles County Public Works	Issues encroachment permits	(626)458-4300 900 South Fremont Avenue Alhambra, CA 91803 <a href="http://ladpw.org/wmd/">http://ladpw.org/wmd/</a>
Team Arundo del Norte (Sonoma Ecology Center)	Provides information on eradication techniques, biology, grant information, regional eradication coordination	(707)996-0712 P.O. Box 1486 Eldridge CA 95431 <a href="http://www.sonomaecologycenter.org/">http://www.sonomaecologycenter.org/</a>
Arundo Task Force	Provides information on eradication techniques, biology, and grant information.	(805)386-4685 P.O. Box 147 Somis CA 93066 <a href="http://www.arundotaskforce.org">http://www.arundotaskforce.org</a>
US Army Corps of Engineers (Los Angeles Region)	Issues Section 404 permit (for earthmoving or fill in stream)	213) 452-3908 P.O. Box 532711 Los Angeles CA 90053-2325 <a href="http://www.spl.usace.army.mil/">http://www.spl.usace.army.mil/</a>
US Fish and Wildlife Service (San Diego)	Provides consultations for potential impacts to federal listed species and may have potential funding through Partners for Wildlife or Santa Clara River Trustee Council	1-800-344-WILD 2493 Portala Road, Suite B Ventura, CA 93003 <a href="http://www.fws.gov/">http://www.fws.gov/</a>
Regional Water Quality Control Board (Los Angeles)	Provides information on water quality issues and issues 401 Water Quality Certification (for earthmoving or fill in stream)	(213) 576-1364 P.O. Box 2815 Sacramento, CA 95812-2815 <a href="http://www.calepa.ca.gov/">http://www.calepa.ca.gov/</a>
US Bureau of Land Management	Potential funding through War on Weeds	(202) 452-5125 1849 C Street, Room 406-LS Washington, DC 20240 <a href="http://www.blm.gov/nhp/index.htm">http://www.blm.gov/nhp/index.htm</a>
City of Santa Clarita, Environmental Services Division	Provides information on City activities	(661)222-7222 23920 Valencia Boulevard, Ste. 300 Santa Clarita, California 91355 <a href="http://www.santa-clarita.com/">http://www.santa-clarita.com/</a>
Los Angeles Weed Management Area	Provides information on weed management	(626)575-5471 12300 Lower Azusa Road Arcadia, CA 91006-5872 <a href="http://acwm.co.la.ca.us/">http://acwm.co.la.ca.us/</a>



Agency or Group Name	Assistance Available	How to Contact
The Nature Conservancy	Provides information on eradication methods	(805)642-0345 3639 Harbor Boulevard, Suite 201 Ventura, CA 93001 <a href="http://www.tnccalifornia.org">http://www.tnccalifornia.org</a>
California Native Plant Society (Ventura)	Provides information on California native plants	(916) 447-2677 2707 K Street, Suite 1 Sacramento, CA 95816-5113 <a href="http://www.cnps.org/">http://www.cnps.org/</a>
Society for Ecological Restoration (SER Cal)	Provides information on California native habitat restoration	2701 20th Street Bakersfield, CA 93301-3334 Tel. (661) 634-9228 <a href="http://www.sercal.org/">http://www.sercal.org/</a>
Chiquita Canyon Landfill	Closest landfill to the project area	3 miles west of Interstate 5 on State Route 126 in Santa Clarita Valley. <a href="http://www.chiquitacanyon.com">http://www.chiquitacanyon.com</a>

## 19.2 Books

### *The Nature Conservancy Handbook:*

Weed Control Methods Handbook: Tools &  
Techniques for Use in Natural Areas

### *Team Arundo del Norte Handbooks:*

Arundo: A Landowner Handbook  
Controlling Arundo in Your Watershed: A Guide  
For Organizations

### *Cal IPC Handbook:*

The Weedworker's Handbook: A Guide to  
Techniques for Removing Bay Area Invasive Plants

## 19.3 Web Resources

### ARUNDO

NPS PCA	<a href="http://www.nps.gov/plants/alien/fact/ardo1.htm">http://www.nps.gov/plants/alien/fact/ardo1.htm</a>
SAWPA	<a href="http://www.sawpa.org/arundo/">http://www.sawpa.org/arundo/</a>
SMSLRWMA - Arundo Biology	<a href="http://www.nps.gov/plants/alien/fact/ardo1.htm">http://www.nps.gov/plants/alien/fact/ardo1.htm</a>
Team Arundo del Norte	<a href="http://teamarundo.org/">http://teamarundo.org/</a>
TAdN Arundo Reference Library	<a href="http://teamarundo.org/research_reference/index.html#biblio">http://teamarundo.org/research_reference/index.html#biblio</a>
TNC - Arundo Stewardship Abstract	<a href="http://tncweeds.ucdavis.edu/esadocs/documnts/arundon.html">http://tncweeds.ucdavis.edu/esadocs/documnts/arundon.html</a>
TNC - Arundo Images	<a href="http://tncweeds.ucdavis.edu/esadocs/arundona.html">http://tncweeds.ucdavis.edu/esadocs/arundona.html</a>
USDA	<a href="http://plants.usda.gov/cgi_bin/plant_profile.cgi?symbol=ARDO4">http://plants.usda.gov/cgi_bin/plant_profile.cgi?symbol=ARDO4</a>
USACE - Arundo Removal	<a href="http://www.wes.army.mil/el/pmis/plants/html/arundo_d.html">http://www.wes.army.mil/el/pmis/plants/html/arundo_d.html</a>



## TAMARISK

<i>CAIN NBII - Tamarisk</i>	<a href="http://cain.nbii.gov/crisis/crisiscat/viewResource?resource=http://cain.nbii.gov/%2Fcrisis%2Finvasive_terms%23Tamarix">http://cain.nbii.gov/crisis/crisiscat/viewResource?resource=http://cain.nbii.gov/%2Fcrisis%2Finvasive_terms%23Tamarix</a>
<i>Earlham College</i>	<a href="http://www.earlham.edu/~biol/desert/invasive.htm">http://www.earlham.edu/~biol/desert/invasive.htm</a>
<i>Invasive Species.gov - Saltcedar profile</i>	<a href="http://www.invasivespecies.gov/profiles/saltcedar.shtml">http://www.invasivespecies.gov/profiles/saltcedar.shtml</a>
<i>Proceedings Saltcedar Workshop June 12, 1996</i>	<a href="http://www.invasivespecies.gov/education/workshopJun96/index.html">http://www.invasivespecies.gov/education/workshopJun96/index.html</a>
<i>NPS</i>	<a href="http://www.nps.gov/plants/alien/fact/tama1.htm">http://www.nps.gov/plants/alien/fact/tama1.htm</a>
<i>TNC – Tamarisk Stewardship Abstract</i>	<a href="http://tncweeds.ucdavis.edu/esadocs/tamaramo.html">http://tncweeds.ucdavis.edu/esadocs/tamaramo.html</a>
<i>USFS</i>	<a href="http://www.fs.fed.us/database/feis/plants/tree/tamspp/all.html">http://www.fs.fed.us/database/feis/plants/tree/tamspp/all.html</a>
<i>WA NWCB</i>	<a href="http://www.nwcb.wa.gov/weed_info/saltcedar.html">http://www.nwcb.wa.gov/weed_info/saltcedar.html</a>
<i>USACE</i>	<a href="http://www.wes.army.mil/el/pmis/plants/html/tamarix_.html">http://www.wes.army.mil/el/pmis/plants/html/tamarix_.html</a>

## INVASIVE PLANT ORGANIZATIONS

<i>Cal IPC</i>	<a href="http://www.cal-ipc.org/">http://www.cal-ipc.org/</a>
<i>California Weed Management Areas</i>	<a href="http://www.cdfa.ca.gov/phpps/ipc/weedmgtaareas/">http://www.cdfa.ca.gov/phpps/ipc/weedmgtaareas/</a>
<i>L.A. County Weed Management Area</i>	<a href="http://acwm.co.la.ca.us/scripts/wma_2.htm">http://acwm.co.la.ca.us/scripts/wma_2.htm</a>
<i>Santa Barbara County Weed Management Area</i>	<a href="http://www.countyofsb.org/agcomm/wma/">http://www.countyofsb.org/agcomm/wma/</a>
<i>Santa Margarita &amp; San Luis Rey Weed Mgmt</i>	<a href="http://smslrwma.org/">http://smslrwma.org/</a>
<i>Invasive Species Information Node (ISIN) of the NBII</i>	<a href="http://invasivespecies.nbii.gov/">http://invasivespecies.nbii.gov/</a>
<i>Noxious Weed Information Project</i>	<a href="http://www.cdfa.ca.gov/phpps/ipc/noxweedinfo/noxweedinfo_hp.htm">http://www.cdfa.ca.gov/phpps/ipc/noxweedinfo/noxweedinfo_hp.htm</a>
<i>Center for Invasive Plant Management</i>	<a href="http://www.weedcenter.org/">http://www.weedcenter.org/</a>
<i>NPS - Monitoring Invasives</i>	<a href="http://science.nature.nps.gov/im/monitor/invasives.htm">http://science.nature.nps.gov/im/monitor/invasives.htm</a>
<i>USACE Aquatic Plant Control</i>	<a href="http://www.wes.army.mil/el/aqua/">http://www.wes.army.mil/el/aqua/</a>
<i>SFWI NIS Guidebook</i>	<a href="http://www.sfei.org/nis/NISguidebook.pdf">http://www.sfei.org/nis/NISguidebook.pdf</a>
<i>TNC Weed Removal Handbook</i>	<a href="http://tncweeds.ucdavis.edu/handbook.html">http://tncweeds.ucdavis.edu/handbook.html</a>
<i>Global Invasive Species Specialists Groups</i>	<a href="http://www.issg.org/">http://www.issg.org/</a>



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1.0 SCARP WORKING GROUP MEMORANDUM OF UNDERSTANDING

MEMORANDUM OF UNDERSTANDING

BETWEEN THE VENTURA COUNTY RESOURCE CONSERVATION DISTRICT (VCRC), AND THE ANTELOPE VALLEY RESOURCE CONSERVATION DISTRICT (AVRCD)

WHEREAS, the VCRC has been awarded a grant by the State Water Resources Control Board and possibly in the future, the US Army Corps of Engineers, to work on vegetative mapping, a programmatic EIR and exotic plant removal in the Los Angeles County portion of the Santa Clara River; and

WHEREAS, the Ventura County Arundo Task Force (VCATF), under the direction of the VCRC, has developed a cooperative relationship with the permitting agencies, municipalities, environmental groups and other stakeholders within the Santa Clara River Watershed interested in removing *Arundo donax* and other non-native plants; and

WHEREAS, the Santa Clara River has its headwaters in Los Angeles County and drains through Ventura County on its way to the Pacific Ocean; and

WHEREAS, the VCATF will be doing work within the Ventura County portion of the Santa Clara River to remove exotic plants, especially *Arundo donax* and Tamarisk; and

WHEREAS, the most effective method of exotic plant removal is from the top of the watershed down, and

WHEREAS, the VCRC is willing to spearhead the removal work within the entire watershed in cooperation with the AVRCD who is capable and willing to be the supplier of vegetative material for revegetation of the exotic plant removal project areas at fair market value; and

WHEREAS, in the interest of continuity of efforts, it is desirable that the two RCDs cooperate to enable VCRC to perform exotic plant removal, and its associated tasks, within the boundaries of the AVRCD.

NOW THEREFORE BE IT RESOLVED, ORDERED, AND DECLARED by the VENTURA COUNTY RESOURCE CONSERVATION DISTRICT and the ANTELOPE VALLEY RESOURCE CONSERVATION DISTRICT that they hereby approve a Memorandum of Understanding enabling the VCRC to carry out exotic plant removal projects within the AVRCD boundaries.

In Witness Whereof, the parties have executed this instrument on the 12 day of December, 2003.

Ventura County  
Resource Conservation District  
Lee C. Waddle III, President

Antelope Valley  
Resource Conservation District  
Kare Ellingbo, President

By Lee C. Waddle III 9/18/03

By Kare Ellingbo



Ventura County Resource Conservation District

P.O. Box 147 – 3380 Somis Road – Somis, California 93066  
Phone (805) 386-4685 – Fax: (805) 386-4890

**MEMORANDUM OF UNDERSTANDING  
FOR THE  
SANTA CLARA ARUNDO REMOVAL PLAN (SCARP)**

**SECTION 1- PURPOSE**

This Memorandum of Understanding (MOU) establishes a framework to proactively address the intent of the Santa Clara Arundo Removal Plan (SCARP) during its development and implementation. The Ventura County Resource Conservation District (VCRCD), as lead agency for the Ventura County Arundo Task Force, in conjunction with its partners, will take the lead to coordinate activities and communication of the Working Group formed during this process. The MOU will foster interagency cooperation with the VCRCD, federal and local agencies, watershed-based groups, and private landowners in programs that contribute to the removal of invasive plant species and restoration of habitat.

**SECTION 2- OVERVIEW**

The SCARP will be utilized to perform integrated weed management on a regional planning level. The SCARP will include programmatic California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) planning and related documentation for the implementation, maintenance, and monitoring of *Arundo donax* and *Tamarix* spp. removal projects within the riparian corridors (500-year floodplain) of the upper Santa Clara River Watershed. In general, the VCRCD and its partners will work together to develop a comprehensive document, which will include vegetation mapping and wildlife surveys, potential project site identification, potential removal techniques, long-term implementation procedures, evaluating potential environmental impacts of *Arundo* and *Tamarix* removal, identifying mitigation measures, identifying potential future funding, and conducting public outreach.

**SECTION 3 AGREEMENT**

It is mutually agreed upon and understood by and among the parties to this MOU that:

- A. The VCRCD shall utilize Costa-Machado Water Act of 2000 [Proposition 13] Grant\* funds to develop the Santa Clara Arundo Removal Plan [SCARP] to control invasive non-native plant infestations within the Santa Clara River Watershed using the elements of integrated weed management.. The VCRCD shall consider input from all parties to this MOU to develop and implement the SCARP.
- B. The SCARP Working Group will initially meet at least four times per year to provide input for the development of the SCARP.
- C. This MOU may be revised as necessary, by mutual consent of the parties, by issuance of a written amendment signed and dated by all parties.
- D. This MOU in no way restricts any party from participation in similar agreements and/or activities with other public or private entities.



MEMORANDUM OF UNDERSTANDING  
SCARP WORKING GROUP

- E. Interested landowners, land managers (private, city, county, state and federal), special districts, and the public in the Santa Clara River Watershed may become part of the SCARP Working Group by execution of the signature page entitled "Agreement to Join the Memorandum of Understanding Establishing the Santa Clara Arundo Removal Plan Technical Advisory Committee" attached as Exhibit A. The executed signature page shall be returned to the VCRCD for distribution to all parties to this MOU.
- G. This MOU shall be effective upon execution by a minimum of two (2) parties. Any party may terminate their participation in this MOU at any time by providing written notice to the VCRCD.
- H. This MOU is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between the parties to this instrument will be handled in accordance with the laws, regulations, and procedures applicable to each governmental agency, private landowner, or other participant, including those for government procurement and printing. Such endeavors will be outlined in separate agreements that shall be made in writing by representatives of the parties and shall be independently authorized by appropriate statutory authority.
- I. Each party shall maintain its own insurance coverage, through commercial insurance, self-insurance or a combination thereof, against any claim, expense, cost, damage or liability arising out of the performance of its responsibilities pursuant to this MOU.
- J. Each party shall perform its responsibilities and activities described herein as an independent party and not as an officer, agent, servant, or employee of any of the other parties hereto. Each party shall be solely responsible for the acts and omissions of its officers, agents, employees, contractors, and subcontractors, if any. Nothing herein shall be considered as creating a partnership or joint venture between the parties.

\*Funding for this project has been provided in full or in part through an Agreement with the State Water Resources Control Board (SWRCB) pursuant to the Costa-Machado Water Act of 2000 (Proposition 13) and any amendments thereto for the implementation of California's Nonpoint Source Pollution Control Program. The contents of this document do not necessarily reflect the views and policies of the SWRCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.



MEMORANDUM OF UNDERSTANDING  
SCARP WORKING GROUP

EXHIBIT A

Effective Date

In witness whereof, the parties hereto have executed this MOU as of the dates written below.

Ventura County Resource Conservation District (VCRCD)  
Signature: Lee C. Waddle III Date: 8/10/04  
Printed Name and Title: LEE WADDLE III

Name/Address of Party to Receive Notices:  
Patricia Oliver  
Ventura County Resource Conservation District  
PO Box 147  
Somis, CA 93066

Organization: Los Angeles County Ag Comm W&M  
Signature: Robert G. Atkins Date: 7-22-04  
Printed Name and Title: Robert G. Atkins, Interim Agricultural Commissioner/Weighs & Meas  
Name/Address of Party to Receive Notices:  
Jim HARTMAN  
12300 Lower AZUSA ROAD  
ARCADIA, CA 91006



MEMORANDUM OF UNDERSTANDING  
SCARP WORKING GROUP

EXHIBIT A

Effective Date

In witness whereof, the parties hereto have executed this MOU as of the dates written below.

Ventura County Resource Conservation District (VCRCD)  
Signature: Lee C. Waddle III Date: 8/10/04  
Printed Name and Title: LEE C WADDLE III

Name/Address of Party to Receive Notices:  
Patricia Oliver  
Ventura County Resource Conservation District  
PO Box 147  
Somis, CA 93066

Organization: FRIENDS OF THE SANTA CLARA RIVER  
Signature: Ron Bottorff Date: 7-25-04

Printed Name and Title: \_\_\_\_\_  
Name/Address of Party to Receive Notices:  
RON BOTTORFF  
660 RANDY DRIVE  
NEWBURY PARK CA 91320



MEMORANDUM OF UNDERSTANDING  
SCARP WORKING GROUP

EXHIBIT A

Effective Date

In witness whereof, the parties hereto have executed this MOU as of the dates written below.

Ventura County Resource Conservation District (VCRCD)  
Signature: *Lee C. Waddle III* Date: 8/10/04  
Printed Name and Title: LEE WADDLE III

Name/Address of Party to Receive Notices:  
Patricia Oliver  
Ventura County Resource Conservation District  
PO Box 147  
Somis, CA 93066

Organization: U.S. Fish & Wildlife Service, Ventura Fish & Wildlife Office  
Signature: *Diane K. Noda* Date: 7/23/04

Printed Name and Title: Diane K. Noda, Field Supervisor  
Name/Address of Party to Receive Notices:  
Denise Steurer  
2493 Portola Road, Suite B  
Ventura, CA 93003



MEMORANDUM OF UNDERSTANDING  
SCARP WORKING GROUP

EXHIBIT A

Effective Date

In witness whereof, the parties hereto have executed this MOU as of the dates written below.

Ventura County Resource Conservation District (VCRCO)

Signature: [Signature] Date: 10/12/04  
Printed Name and Title: \_\_\_\_\_

*Name/Address of Party to Receive Notices:*

Patricia Oliver  
Ventura County Resource Conservation District  
PO Box 147  
Somis, CA 93066

Organization: USDA Forest Service, Angeles NF  
Signature: [Signature] Date: 10/15/04

Printed Name and Title: Jody Noiron Forest Supervisor

*Name/Address of Party to Receive Notices:*

William Brown  
Janet Nickerson  
\_\_\_\_\_  
\_\_\_\_\_

04-MU-11050100-000



MEMORANDUM OF UNDERSTANDING  
SCARP WORKING GROUP

EXHIBIT A

Effective Date

In witness whereof, the parties hereto have executed this MOU as of the dates written below.

Ventura County Resource Conservation District (VCRCD)

Signature: Jan C. Waddell III Date: 11/17/04  
Printed Name and Title: \_\_\_\_\_

Name/Address of Party to Receive Notices:

Patricia Oliver  
Ventura County Resource Conservation District  
PO Box 147  
Somis, CA 93066

Organization: University of California Cooperative Extension  
Signature: Sabrina Drill Date: 10/26/04

Printed Name and Title: Sabrina Drill, Natural Resources Advisor

Name/Address of Party to Receive Notices:

Sabrina Drill  
UCCE  
4800 Cesar Chavez Bl.  
Los Angeles, CA 90022



MEMORANDUM OF UNDERSTANDING  
SCARP WORKING GROUP



Ventura County Resource Conservation District  
P.O. Box 147 - 3380 Somis Road - Somis, California 93066 Phone (805) 386-4685 - Fax: (805) 386-4890

MEMORANDUM OF UNDERSTANDING SCARP WORKING GROUP

**EXHIBIT A**

Effective Date

In witness whereof, the parties hereto have executed this MOU as of the dates written below:

Ventura County Resource Conservation District (VCRCD)

Signature: Lee C. Waddle III

Date: 11/25/04

Printed Name and Title: LEE C. WADDLE III, PRESIDENT

*Name/Address of Party to Receive Notices:*

Patricia Oliver  
Ventura County Resource Conservation District  
PO Box 147  
Somis, CA 93066

Organization: City of Santa Clarita, CA

Signature: Kenneth R. Pulskamp

Date: 11/25/04

Printed Name and Title: Kenneth R. Pulskamp, City Manager

*Name/Address of Party to Receive Notices:*

Travis Lange, Environmental Services Division Manager  
City of Santa Clarita  
23920 Valencia Blvd. #300  
Santa Clarita CA 91355

MEMORANDUM OF UNDERSTANDING  
SCARP WORKING GROUP

EXHIBIT A

Effective Date

In witness whereof, the parties hereto have executed this MOU as of the dates written below.

Ventura County Resource Conservation District (VCRCD)

Signature: [Signature] Date: 2/5/05  
Printed Name and Title: LEE C. WADDLE III, PRESIDENT

*Name/Address of Party to Receive Notices:*

Patricia Oliver  
Ventura County Resource Conservation District  
PO Box 147  
Somis, CA 93066

Organization: Los Angeles County Flood Control District (LACFCD)

Signature: [Signature] Date: Jan. 5, 2005

Printed Name and Title: BLIANE T. SABARI, DEPUTY DIRECTOR

*Name/Address of Party to Receive Notices:*

Martin Moreno  
County of Los Angeles Department of Public Works  
900 South Fremont Avenue  
Alhambra, CA 91803

APPROVED AS TO FORM:

RAYMOND G. FORTNER, JR.  
County Counsel

BY [Signature]  
Deputy



## 2.0 PHYSICAL SETTING

The Santa Clara River system originates at Pacifico Mountain within the San Gabriel Mountains, and flows westward for approximately 84 miles to the Pacific Ocean. It drains a total area of approximately 1,634 square miles. Approximately 90 percent of the watershed consists of rugged mountains up to 8,800 feet above mean sea level (msl) in elevation; the remainder consists of valley floor and coastal plain (Ventura County Watershed Protection District [VCWPD] and Los Angeles County Department of Public Works [LADPW] 1996). Urban development is generally limited to less than 12 percent of the watershed, concentrated in the cities of Santa Clarita, Santa Paula, and Fillmore in the inland valleys and the City of Oxnard in the coastal plain. The mean annual precipitation for the Santa Clara River watershed ranges from 16 inches in the valley areas to about 36 inches in the mountains. Most precipitation occurs from December through March. Snow is common in the mountains in the winter, but is usually short-lived. The majority of annual precipitation is a result of winter storms that originate over the Pacific and move eastward over the watershed.

The Santa Clara River and its tributaries are naturally ephemeral streams along most of their length. Streamflow from natural precipitation is negligible along the majority of its reaches most of the year, except during and immediately following rainfall events. Streamflow increases rapidly in response to rainfall, and then drops abruptly due to percolation losses in the alluvial channels. Extreme runoff events are generally produced by heavy rainfall over a relatively short period of time. Melting snow in the upper watershed has very little influence on streamflow. However, as discussed further in this section, some segments of the Santa Clara River experience large amounts of perennial flow due to artificial releases from lakes and wastewater treatment plants.

The character and morphology of the Santa Clara River vary widely along its course as a function of elevation, topography, and substrate. It originates as a typical mountain stream with a relatively narrow channel incised into hard bedrock that formed the local mountains. It has a straight to meandering channel pattern. The characteristic channel bed forms are represented by sequences of bars, riffles, and pools. As the Santa Clara River exits the confinement of the mountains, it widens and has a typical braided stream

geomorphology characterized by a frequently shifting network of channels, intervening bars, and a broad floodplain area. The Santa Clara River maintains this braided stream pattern almost throughout its 45-mile length in the project area, with a floodplain typically averaging between 600 to 1,000 feet in width. In a few locations, channels for the floodplain narrow to between 200 and 600 feet, including Soledad Canyon west of Acton, bridge choke points in Santa Clarita, and channels where the Santa Clara River is artificially narrowed for flood control bank protection. However, the Santa Clara River's mainstem and the lower and middle reaches of many of its tributaries are characterized by these broad floodplains. The Santa Clara River's floodplain widens even further in places, averaging 2,000 or more feet in width near Acton toward the project area's eastern boundary and up to 3,000 feet toward the project area's western boundary, west of Interstate 5 (I-5).

The Santa Clara River's broad floodplain and channel bed are characterized by braided stream deposits composed of coarse sediment ranging in size from coarse sand to boulder. Depending on the width of the channel and the influence of tributaries, bed materials along a particular reach can range from fine sediments to cobble and boulders. However, in a typical reach, the riverbed is dominated by sand and gravel. In a few instances, such as Aliso Canyon near the headwaters, limited portions of Soledad Canyon in the middle reaches, and the upstream portions of several tributaries, the Santa Clara River or its tributaries flow over or near bedrock.

The primarily wide nature of the channel and the coarse sand and gravel character of the stream bed result in typically shallow and wide streamwater flows. When combined with the deep alluvium underlying much of the Santa Clara River's length and the lower end of its tributaries, these channel characteristics tend to minimize surface flow for most of the year.

### 2.1 River Reaches

Although the Santa Clara River channel and floodplain are generally broad through its course within the project area, channel geomorphology, and the associated in-stream vegetation can vary substantially between different reaches of the Santa Clara River. Vegetation ranges from sparse high desert scrub associations in many sections to dense cottonwood woodlands in others. These vegetation associations tend to support different mixes and densities of rare or sensitive plant and wildlife



species. The density of arundo and tamarisk infestations also vary, depending upon both water availability and the degree of disturbance from in-channel or adjacent land uses. In order to reflect these variations in the Santa Clara River's environment, the mainstem of the Santa Clara River was divided into six reaches. This division facilitates the discussion of arundo and tamarisk removal techniques and important resources of the upper Santa Clara River particular to each reach. Reaches were numbered beginning at the headwaters on the eastern project boundary, downstream to the western project boundary (Figure 2-1).

Major tributaries to the Santa Clara River are also included in the SCARP since extensive stands of arundo and tamarisk exist in some tributaries and invasive plant material can be washed into the mainstem from the tributaries to start new infestations. Tributaries were grouped based on their hydrological connections to each other and the point of intersection with the mainstem. Ten main tributary systems were included, eight of which drain the more extensive northern portions of the watershed and two smaller systems which drain more confined areas in the southwest portion of the watershed. Several of the longer streams, which drain on the north side of the watershed, including the Bouquet, San Francisquito, and Castaic Creeks, extend well into areas under federal management within Angeles National Forest.

Several of these tributaries also support sensitive plant and wildlife species. In general, the condition of most tributaries reflects that of the mainstem and is governed by elevation and natural gradients existing from headwaters (high elevation) to the junction with the Santa Clara River (lower elevation). Most tributaries display the broad floodplain typical of the mainstem in their lower and middle reaches, narrowing more toward the headwaters.

## 2.2 Land Use

Much of the upper watershed, particularly the upper reaches of the Santa Clara River and its tributaries, consists of rugged mountainous topography and natural land within the boundaries of Angeles National Forest. Although limited along the mainstem, the USFS-owned land occupies approximately 223,000 acres (55 percent of watershed) and covers much of the middle and upper reaches of Mint, Bouquet, San Francisquito, and Castaic Creeks. USFS lands also cover much of the watershed's steep southern flanks. These lands typically

support relatively undisturbed native habitats including chaparral, coastal sage scrub, and oak woodlands on the slopes and scattered high-quality riparian habitats within the stream channels.

The upper and middle reaches of the Santa Clara River and the lower ends of the tributaries are primarily under private ownership, with development such as lower density rural residential "ranchettes" and several rural communities such as Acton and Soledad located within and adjacent to Santa Clara River and tributary floodplains. Hundreds of acres of existing development, including campgrounds, trailer parks, and ranchettes, exist within Santa Clara River and tributary floodplains. Even with this development, the middle reaches of the Santa Clara River and the lower ends of the tributaries often support extensive cottonwood/willow riparian forests and riparian scrub. As discussed in Chapter 4, these habitats often support sensitive species.

As the lower reaches of the Santa Clara River enter the generally broad Santa Clarita Valley, land uses change from largely rural to increasingly urban, especially within the boundaries of the growing City of Santa Clarita. The Santa Clara River and the lowest reaches of the tributaries are often confined by a range of bank protection measures with either urban or agricultural development up to or within the floodplain. Even with this encroachment, the downstream portions of the Santa Clara River and its tributaries still support extensive stands of riparian woodland, particularly extensive stands of cottonwoods. Arundo and tamarisk infestation is also heaviest in this area, reflective of the degree of disturbance and nutrient-laden water availability from urban sewage treatment plants.

Based on the Los Angeles County Assessor's Office generalized land use data (Table 2-2), roughly 86 percent (349,824 acres) of the upper Santa Clara River sub-watershed is largely undeveloped, with much of this land consisting of rugged mountainous areas in Angeles National Forest. However, very little of this publicly owned land is along the Santa Clara River's mainstem or lower reaches of the tributaries where arundo and tamarisk infestations are concentrated. Relatively large portions of this undeveloped land are also owned by larger private enterprises such as the Newhall Land and Cattle Company (Newhall) which owns thousands of acres of undeveloped land in the lower watershed, much of it adjacent to and within the Santa Clara River.

The next most frequent land uses in the upper Santa Clara River sub-watershed are residential and



Figure 2-1: Regional Location Upper Santa Clara River Watershed Arundo and Tamarisk Removal Plan

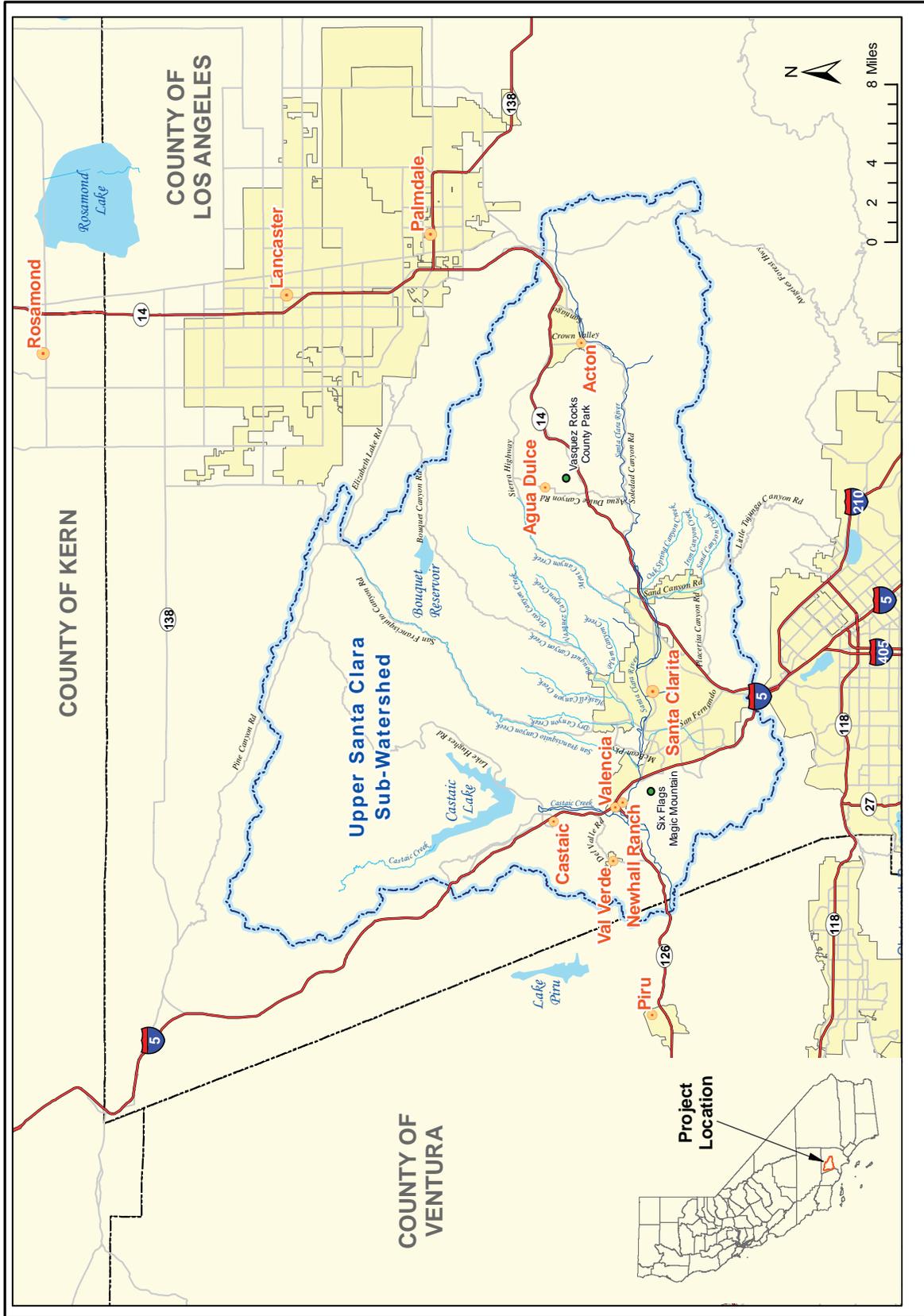


FIGURE  
**2-1**

Regional Location  
 Upper Santa Clara Watershed Arundo and Tamarisk Removal Plan



commercial uses (Figure 2-2). Both of these uses are present in the floodplain of the Santa Clara River along its entire length, with higher density residential and commercial-industrial uses typically confined to the City of Santa Clarita toward the watershed’s lower west end. However, as noted above, lower density estate or ranchette style development occurs throughout the floodplain of the Santa Clara River and the lower tributaries. Higher density mobile home and trailer parks also occur at a number of floodplain locations. Industrial uses are also present in the floodplain, particularly sand and gravel mines along Reach 4. Cultivated agriculture (1,800 acres) is also an important floodplain land use, especially on Newhall Land and Cattle Company property and along the lower Santa Clara River west of I-5. Fragmented ownership of the floodplain and the presence of sensitive residential uses will be an important factor to consider in any invasive species removal program.

### 2.3 Drainage

Approximately 40 percent of the watershed (drained by the upper Santa Clara River) is located in Los Angeles County, and 60 percent (drained by the lower Santa Clara River) is in Ventura County. However, due in part to elevations and associated rainfall patterns, the upper watershed contributes disproportionately less to total stream flow than the lower, with only 20 percent of flow at Highway 101 in Oxnard associated with drainage from Los Angeles County, and almost 70 percent derived from Sespe Creek and its associated high mountain watershed. The largest tributaries to the upper watershed are Bouquet, San Francisquito, and Castaic Creeks, with Castaic often contributing year-

round flows due to releases from the dam.

The Santa Clara River is characterized by highly variable stream flows (discharge), with many years exhibiting relatively low flows interrupted by occasional high flow events. These flow characteristics of the Santa Clara River play a key role in defining the river’s sediment transport and vegetation establishment.

Streamflow from natural precipitation is negligible most of the year, except during and immediately following rainfall events. Streamflow increases rapidly in response to effective rainfall occasionally causing flashfloods, then drops abruptly due to percolation losses in the alluvial channels. General winter storms occur from December through March. They originate over the Pacific Ocean due to interaction between polar Pacific and tropical Pacific air masses, moving eastward across California. These storms may last several days. Summer storms are very infrequent, and are usually associated with late summer cyclones, producing very little precipitation.

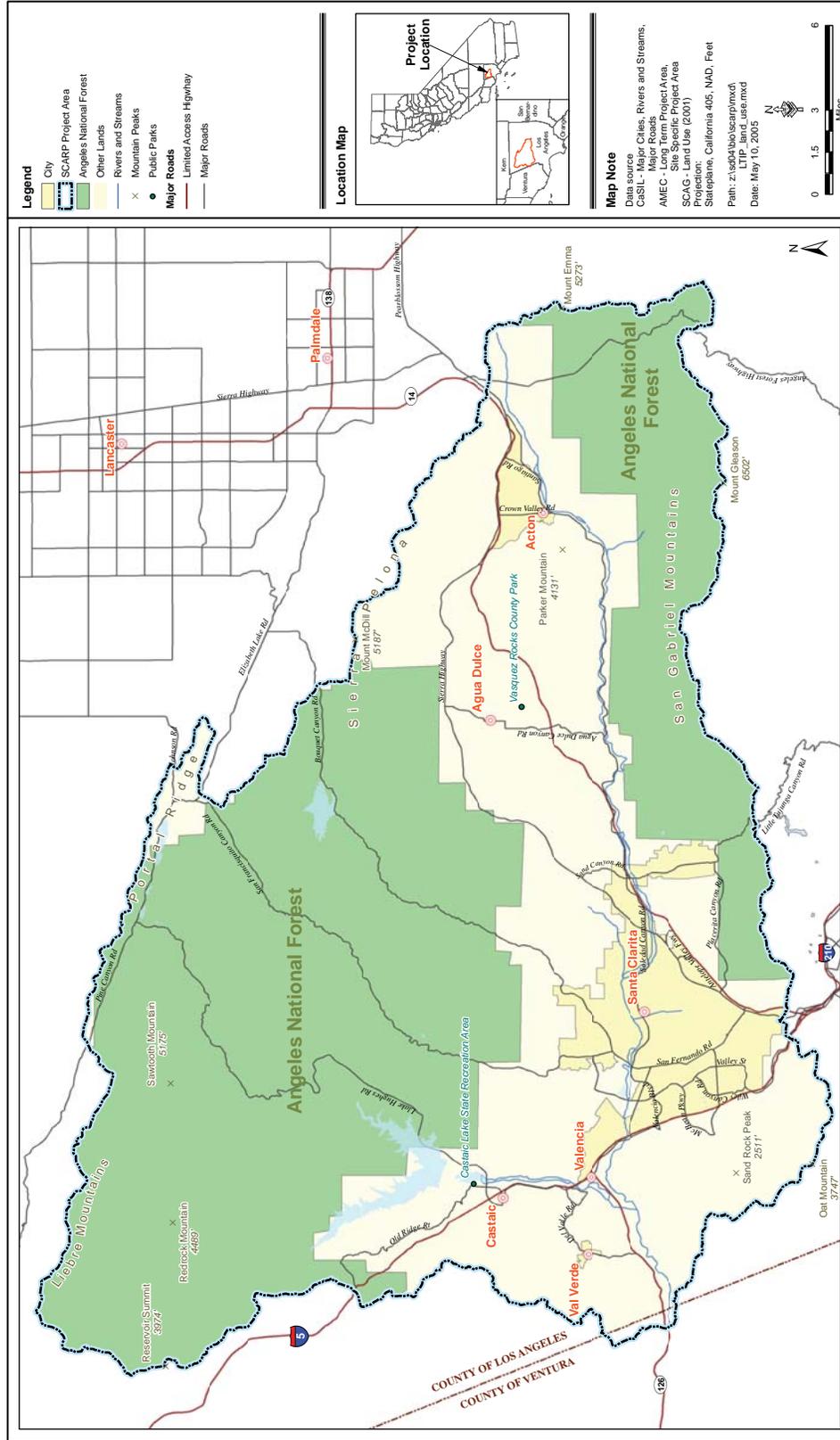
Other portions of the Santa Clara River have perennial surface flows. Controlled water conservation releases, wastewater effluent discharges, agricultural runoff, “rising” groundwater, and other flows contribute to the year-round flow in some reaches. In particular, Reach 6 through the City of Santa Clarita to the Los Angeles County line experiences perennial flows associated with releases of 14 million gallons per day from the Valencia and Saugus Water Reclamation Facilities. Flows below the confluence of the Santa Clara River and Piru Creek are also influenced by water conservation releases of captured winter floodwaters at Lake Piru (United Water Conservation District [UWCD] and Castaic Lake Water Agency [CLWA] 1996). Due to these contributions, the

Land Use Categories	Acres	Percentage (%) of Total
Other	46	0.01
Transportation	1,792	0.44
Recreational Open /Park Space	2,727	0.67
Agriculture	3,335	0.82
Open Water	3,825	0.94
Industrial/Commercial/Office	19,709	4.82
Residential	23,631	5.78
Parks/Open Space	353,999	86.54
<b>Total</b>	<b>409,064</b>	<b>100.02</b>

\*Table created 3-23-05



Figure 2-2: Upper Santa Clara River Watershed - General Land Uses



Upper Santa Clara River Watershed - General Land Uses  
 Arundo and Tamarisk Removal Program Project Area



annual mean flow at the Los Angeles-Ventura County line gauging station has increased from 25,700 af in 1972 (mean for 20 years) to 35,360 af in 1988 (mean for 36 years) (UWCD and CLWA 1996).

Principal tributaries of the Santa Clara River are Agua Dulce Canyon (487 acres), Sand Canyon (813 acres), Mint Canyon (931 acres), Bouquet Canyon (885 acres), Santa Clara South Fork (2,098 acres), San Francisquito Creek (1,464 acres), and Castaic Creek (1,968 acres). Aliso Canyon, Jones Canyon, Kashmere Canyon, and Acton Canyon also contribute to the arid headwaters in the east. Hasley Canyon, Chiquito Canyon, and San Martinez Grande are small tributaries on the western end of the watershed. Four major reservoirs, Lake Piru and Pyramid Lake on Piru Creek, Castaic Lake on Castaic Creek, and the Bouquet Reservoir on Bouquet Creek control flow from about 37 percent of the watershed (VCWPD and LADPW 1996).

## 2.4 *Water Quality*

The quality water in the Santa Clara River and hydraulically connected aquifers are monitored and evaluated by the California Department of Water Resources (DWR) and UWCD in accordance with the state water quality standards. DWR provides periodic assessments of surface water and groundwater quality conditions on a watershed basis under its water quality evaluation program and advises the RWQCB in preparation of water quality control plans to ensure protection of the state's water supply. The UWCD provides local monitoring of water quality conditions within the district boundary, including the lower Santa Clara River watershed and associated groundwater basin.

Other water quality management efforts that have been completed, or are in progress, include development of a chloride total maximum daily load (TMDL) for the upper reaches of the Santa Clara River, a nutrient TMDL, and on-going National Pollutant Discharge Elimination System (NPDES) permit-related monitoring.

In general, the waters in the Santa Clara River and its tributaries have been modified by the drawdown of aquifers from decades of pumping, the release of treated effluent, and imported water. Further, discharges from wastewater treatment plants, and non-point source emissions from agriculture and fisheries in the watershed have changed the flow and concentration of nutrients and other contaminants in the watershed (U.S. Geological Survey [USGS] 1998). In summary, three reaches in the Santa Clara River have been identified as impaired due to ammonia, which can be detrimental to fish. Two reaches as well as three tributaries also exhibit nitrate levels that exceed the RWQCB's 1994 Basin Plan Water Quality Objectives. Further, one reach was identified as being impaired for low dissolved oxygen levels and organic enrichment (RWQCB 1994).

Two trends observed in the water quality data collected in the upper Santa Clara River by UWCD and CLWA are: (1) total dissolved solids (TDS) and sulfates increase downstream and (2) there has been a general decrease in concentrations of TDS and sulfates at the stations over their periods of record. Concentrations of TDS and sulfates at the most downstream monitoring station (near the county line) have historically been about ten times higher than that at the most upstream monitoring station (UCWD and CLWA 1996).



### 3.0 SOIL ASSOCIATIONS

Soil types in and along the bed of the Santa Clara River are primarily riverwash or Sandy Alluvial Land. Riverwash consists of the sandy material in the riverbed. Narrow strips of gravelly sand occupy much of the Santa Clara River area. During flood events, deposits of alluvium sediment and debris are shifted (both laid down and removed) as a result of stream bank erosion and flowing water. The hazard of riverwash soil blown by winds is slight to moderate. Areas with riverwash soils are typically used for wildlife habitat. Sandy Alluvial Land exists primarily on floodplains along the Santa Clara River and its larger tributaries. It consists of unconsolidated alluvium that generally is stratified and ranges from sand to loamy sand in texture. Flooding is frequent, and during each flood resorting of the soil material occurs. Soil blowing is a moderate hazard. Sandy Alluvial Land is typically used for grazing and wildlife habitat (USDA 1970). The soil physiographic regions (broad-scale subdivisions based on terrain texture) of the project area surrounding the Santa Clara River (alluvial fans and terraces and uplands) are described below. Soil associations are grouped on the basis of physiography.

#### 3.1 Soils of the Alluvial Fans and Terraces

This physiographic region occurs in the western and southwestern parts of the Antelope Valley, near Acton, Saugus, and Newhall, and south and east of Pear Blossom Highway. Elevations in this physiographic region range from 2,600 to 3,900 feet above msl in the western part of Antelope Valley and near Acton. They range from about 1,175 to 1,400 feet above msl near Saugus and Newhall. Two of the soil associations in the Antelope Valley area are in this region, which includes small areas of the land types riverwash, Sandy Alluvial Land, and Terrace Escarpments. Both soil associations, the Hanford-Ramona-Greenfield association and the Yolo-Metz-Cortina association, are found in the project area (USDA 1970).

##### 3.1.1 Yolo-Metz-Cortina Association

Soils in this association are found primarily near Castaic, Saugus, and Newhall on alluvial fans and flood plains. They are well drained to excessively drained, are very deep, have a loam to loamy sand surface layer, and are formed in alluvium from sedimentary rock.

Slopes range from 0 to 9 percent and elevations range from 1,175 to 1,400 feet above msl. This association is used for many kinds of dryland irrigated crops and for dryland pasture. It is also used for range, wildlife habitat, and homesites (USDA 1970).

##### Yolo Soils

Yolo soils are well drained soils that have formed in sedimentary alluvium. These soils are on alluvial fans. Slopes are 0 to 9 percent. Elevations range from 1,175 to 1,200 feet above msl. Typically the surface layer is grayish-brown loam about 18 inches thick. Below is grayish-brown loam, also about 18 inches thick, underlain by light yellowish-brown loam near silt loam about 36 inches thick. Permeability is moderate in this soil. Available water holding capacity is 8.5 to 10.5 inches. Fertility is high. Runoff is very slow, and the hazard of erosion is none to slight. When on a slope of 2 to 9 percent, runoff is slow to moderate and the hazard of erosion is slight to medium. Roots can penetrate to a depth of 60 inches or more. These soils are used mainly for irrigated crops, for range and for homesites (USDA 1970).

##### Metz Soils

Metz soils are somewhat excessively drained soils that have formed in mixed alluvium and are neutral throughout. These soils are on alluvial fans and flood plains. Slopes are 0 to 9 percent. Elevations range from 1,175 to 1,250 feet above msl. A typical profile of the surface layer is brown loamy sand about 7 inches thick. Below is brown and light brownish-gray loamy sand and sand that contains some fine gravel and extends to a depth of 60 inches or more. In some areas the surface layer is loam. Their surface later is brown loamy sand or loam. Permeability in this soil is rapid. Available water holding capacity is 4 to 5 inches. Fertility is low. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight to moderate. Roots can penetrate to a depth of 60 inches or more. These soils are used for irrigated crop, dryland farming, and wildlife habitat (USDA 1970).

##### Cortina Soils

Cortina soils are excessively drained soils that have formed in alluvium that is predominantly sedimentary. The soils are on alluvial fans. Slopes are 0 to 9 percent. Elevation ranges from 1,200 feet to 1,400 feet above



msl. In a typical profile, the surface layer is pale-brown cobbly sandy loam about 6 inches thick. Below, to a depth of 60 inches or more, is pale-brown and light yellowish-brown very gravelly and cobbly sandy loam. In some areas the surface layer is not cobbly. Permeability in this soil is rapid. Available water holding capacity is 2 to 4 inches. Runoff is slow, and hazard of erosion is slight. Cortina sandy loam on a 2 to 9 percent slope has a moderate hazard of erosion. Fertility is low. Roots can penetrate to a depth of 60 inches or more. These soils are used for dryland pastures and small grains, for range, and for irrigated crops (USDA 1970).

### 3.1.2 *Hanford-Ramona-Greenfield Associations*

This soil association is found primarily in areas near Fairmont, Acton, Juniper Hills, and Leona Valley on alluvial fans and terraces. The soils are very deep, are well drained, and are formed in alluvium from granitic rock. Slopes range from 0 to 30 percent. Elevations range from 2,600 to 3,900 feet above msl. The soils of this association are used for dryland and irrigated crops. They are also used for limited grazing and wildlife habitat (USDA 1970).

#### *Hanford Soils*

Hanford soils are well drained or somewhat excessively well drained soils that have formed in granitic alluvium. These soils are on alluvial fans. Slopes are 2 to 15 percent. Elevations range from 2,600 feet to 3,500 feet above msl. The surface layer in a typical profile is pale-brown coarse sandy loam about 8 inches thick. Below is light yellowish-brown coarse sandy loam and gravelly loamy coarse sand that extends to a depth of 70 inches or more. In some places, the surface layer is loamy sand, sandy loam, gravelly sandy loam, or loam. Permeability of this soil is moderate to moderately rapid. Available water holding capacity ranges from 5 inches to 10 inches. Fertility is low to moderate. Runoff is slow and the hazard of erosion is mostly slight; and in Hanford sandy loam, the hazard of erosion is slight to moderate. These soils are used for irrigated crops, for dryland small grains, for range, and for wildlife. Roots can penetrate to a depth of 60 inches or more. These soils are used for irrigated crops, for dryland small grains, for range, and for wildlife (USDA 1970).

#### *Ramona Soils*

Ramona soils are well drained soils that have formed in the granitic alluvium. These soils are on terraces that are undulating in many places. Slopes range from 0 to 30 percent. Elevations range from 2,750 to 3,900 feet above msl. The surface layer in a typical profile is brown coarse sandy loam and sandy loam about 20 inches thick. The subsoil is brown loam, sandy clay loam, and heavy loam about 44 inches thick. The next layer is brown loam that generally is stratified and in many places is variable in texture. Permeability is moderately slow in this soil. Available water holding capacity is 8 to 10 inches. Fertility is moderate, runoff is slow to medium, and the hazard of erosion is slight to moderate. In Ramona sandy loam at a 9 to 30 percent slope, runoff is medium to rapid and the hazard of erosion is moderate to high. Roots can penetrate Ramona soils to a depth of 60 inches. These soils are used for irrigated crops and for dryland small grains, orchards, and range. The areas also provide habitat for wildlife (USDA 1970).

#### *Greenfield*

Greenfield soils consist of well drained soils that have formed in granitic alluvium. These soils are on alluvial fans and terraces. Slopes are 0 to 15 percent. Elevations range from 2,600 to 3,500 feet above msl. In a typical profile, the surface layer is pale-brown and brown sand loam about 20 inches thick. The subsoil is brown sandy loam and heavy sandy loam about 40 inches thick. Below is brown coarse sandy loam. Permeability is moderately rapid in this soil. Available water holding capacity is 7.5 to 9.0 inches. Fertility is moderate. Roots can penetrate to a depth of 60 inches or more. Runoff is slow to medium, and the hazard of erosion is slight to moderate. As the slope of Greenfield sandy loam increases to 9 to 15 percent, runoff increases to medium to rapid and the hazard of erosion increases to moderate to high. Greenfield soils are used for pasture, range, and irrigated and dryland crops (USDA 1970).

### 3.2 *Soils of the Uplands*

This physiographic region consists of upland foothills, mountains, ridges, fault scarps, and associated valley floors which are found along the northern and southern edges of the San Andreas Rift Zone, the southern flank of the Tehachapi Mountains, and the foothills of the San Gabriel, Sierra Pelona, and Liebre



Mountain Ranges. Elevations in this region range from about 1,250 to more than 6,500 feet above msl. Eight soil associations are in the foothills, mountains, and terraces. Three of them are found in the project area: the Vista-Amargosa association, the Ojai-Agua Dulce association, and the Saugus-Castaic-Balcom association (USDA 1970). These soil types are generally subject to moderate to high levels of erosion and contribute to the deep alluvium and sand and gravel deposits along the Santa Clara River.

A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

### 3.2.1 Vista-Amargosa Association

Areas of this soil association are on foothills and mountains and are found peppered throughout the project area. The soils are moderately deep to shallow over granite and are well drained to excessively well drained. Slopes range from 9 to 55 percent. Elevations range from 2,200 to 3,900 feet above msl. The soils of this association are used for dryland grain and wildlife habitat (USDA 1970).

#### Vista Soils

Vista soils are well drained, deep soils that formed in material weathered from granitic rock. These soils are on foothills in the uplands. Slopes range from 9 to 50 percent. Elevations range from 2,200 to 3,900 feet above msl. Typically the surface layer is brown coarse sand loam about 16 inches thick. The subsoil is brown sandy loam about 12 inches thick and contains 2 to 3 percent more clay than the surface layer. Below is yellowish-brown coarse sandy loam about 4 inches thick. Hard granitic rock is at a depth of about 32 inches. Permeability of this soil is moderately rapid. Available holding capacity is 2.5 to 3.5 inches. Fertility is low. Runoff is medium to rapid, and the hazard of erosion is moderate to high. In most places, roots can penetrate to a depth of about 28 to 38 inches. These soils are used for dryland small grains, range, and wildlife habitat (USDA 1970).

#### Amargosa Soils

The Amargosa series are excessively drained, shallow soils that formed in the material weathered from granitic rock. Slopes range from 9 to 55 percent. Elevations range from 2,600 to 3,500 feet above msl. The surface layer in a typical profile is brown and yellowish-brown coarse sandy loam about 13 inches thick. Hard granitic rock is at a depth of about 18 inches. Hard outcrops of rock cover 2 to 10 percent of the surface. Permeability is moderately rapid in this soil. Available water holding capacity is 1.0 to 1.5 inches. Fertility is very low, runoff is medium to rapid, and the hazard of erosion is moderate to high. In most places, roots can penetrate to a depth of about 14 to 20 inches. These soils are mostly used for recreation and wildlife habitat (USDA 1970).

### 3.2.2 Ojai-Agua Dulce Association

The soils of this association are near Newhall, Saugus, and Solemint. The Ojai soils are on terraces, and the Agua Dulce soils are on foothills. These soils are very deep to moderately deep and are well drained. They formed in semi-consolidated to unconsolidated sediment from sedimentary rock. Slopes range from 2 to 50 percent. Elevations range from 1,300 to 2,700 feet above msl (USDA 1970). Ojai soils make up about 65 percent of this association, and Agua Dulce soils make up about 30 percent.

#### Ojai

Ojai soils are well drained. They are formed in weakly consolidated sedimentary alluvium that contains somewhat weathered pebbles and cobblestones of mixed origin. These soils are typically found on terraces and foothills. Slopes range from 2 to 50 percent. Elevations range from 1,300 to 2,200 feet above msl. In a typical profile, the surface layer is grayish-brown and brown loam about 25 inches thick. The subsoil is reddish-brown and brown clay loam about 28 inches thick. It is underlain by reddish-yellow sandy loam that has lenses of gravelly sandy loam and is stratified. The soil has a moderately slow permeability. Available water holding capacity is 9 to 11 inches. Fertility is low. Runoff is slow to medium, and the hazard of erosion is slight to moderate. In areas with a greater than 15 percent slope, runoff is medium to rapid, and the hazard of erosion is moderate to high. Roots can penetrate to a depth of 60 inches. These soils are used for dryland and irrigated crops. They are also used for range, homesites, and wildlife habitat (USDA 1970).



### *Agua Dulce*

The Agua Dulce soils are well drained soils that formed in uplifted non-marine sedimentary alluvium. These soils typically occur on foothills in the uplands. Slopes range from 30 to 50 percent. Elevations range from 2,200 to 2,700 feet above msl. In a typical profile, the surface layer is grayish-brown stony loam and loam about 6 inches thick. The subsoil is a brown, very cobbly and gravelly clay loam about 14 inches thick. Just below is light yellowish-brown very gravelly loamy coarse sand. Weakly consolidated conglomerate is found at a depth of about 40 inches. Permeability is moderately slow in this soil. Available water holding capacity is 3.0 to 4.0 inches. Fertility is moderate, runoff is rapid, and the erosion is high. Roots can penetrate to a depth between 36 and 60 inches. Thin lenses of sandstone conglomerate generally limit the depth to which plant roots can penetrate. These soils are used for range and wildlife habitat (USDA 1970).

#### **3.2.3 Saugus-Castaic-Balcom Association**

Some areas of this soils association are adjacent to Ventura County, and others are north and south of the Santa Clara River and its tributaries near Saugus. These soils are found on foothills and mountains. They are deep to moderately deep and are well drained. They are formed in material from weakly consolidated sediment and shale. Slopes range from 2 to 65 percent. Elevations range from 1,250 to 2,250 feet above msl. The more gently sloping areas of this association are used for dryland grain, but the steeper areas are used for range, wildlife, and recreation. In addition, Saugus soils are used for homesites (USDA 1970).

### *Saugus Soils*

Saugus soils are well drained and occur on uplands. They are formed on weakly consolidated sediment that contained pebbles and cobblestones in some places. Slopes range from 15 to 50 percent. Elevations range from 1,300 to 2,250 feet above msl. In a typical profile, the surface layer is grayish-brown loam about 15 inches thick. Below is grayish-brown loam underlain by weakly consolidated sediment at a depth of 42 inches. Permeability is moderate in this soil. Available water holding capacity is 5.0 to 7.5 inches. Fertility is low, runoff is medium to rapid, and the hazard of erosion is moderate to high. These soils are used for range, homesites, and wildlife habitat (USDA 1970).

### *Castaic Soils*

Castaic soils consist of well drained soils that formed in material from soft shale and sandstone. These soils occur on uplands. Slopes range from 2 to 65 percent. Elevations range from 1,250 to 1,500 feet above msl. In a typical profile, the surface layer is pale-brown silty clay loam about 9 inches thick. Below is yellowish-brown silty clay loam underlain by soft shale and sandstone at a depth of about 26 inches. Permeability is moderately slow in these soils. Available water holding capacity is 5 to 7 inches. Fertility is moderate. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Plant roots can penetrate to a depth of 26 to 36 inches, but in places they reach a depth of 44 inches. In Castaic silty clay loam with a 2 to 9 percent slope, fertility is low, runoff is slow to medium, and the erosion hazard is slight to moderate. These soils are used for dryland small grains and pasture, for range, and as wildlife habitat (USDA 1970).

### *Balcom Soils*

Balcom soils are well drained soils that are formed from calcareous soft shale and sandstone. These soils occur on uplands. Slopes range from 9 to 65 percent. Elevations range from 1,250 to 1,500 feet above msl. The surface layer in a typical profile is pale-brown, silty clay loam about 10 inches thick. Below is a pale-brown, moderately alkaline silty clay loam underlain by soft sandstone and shale at a depth of 26 to 40 inches. These soils have moderately slow permeability. Available water holding capacity is 5 to 7 inches, and fertility is moderate. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Plant roots generally penetrate to a depth of 28 to 36 inches. In some places, however, roots can penetrate only to a depth of 26 inches, and in other places they can reach a depth of 40 inches. Balcom soils are used for dryland small grains, pasture, and range. They are also used as wildlife habitat and for recreational purposes (USDA 1970).



## 4.0 BIOLOGICAL RESOURCES

The upper Santa Clara River drains an area that extends from mountainous areas in the east and north of the watershed along the western edge of the Mojave Desert, west to the inland extent of areas typically dominated by coastal habitat associations. The habitats present along the Santa Clara River itself and in the surrounding areas reflect the Santa Clara River's transition of habitats ranging from high desert and montane associations in the inland areas to coastal valley associations near the project area's western boundary. A similar transition from high desert or montane also occurs along many of the Santa Clara River's larger tributaries.

The focus of this section is upon those habitats and wildlife species, which occur within the 500-year floodplain of the Santa Clara River and its tributaries. To date, this effort has been concentrated to-date on the mapping of vegetation along the mainstem of the Santa Clara River, and on a literature search and limited reconnaissance-level field work surveying for sensitive plant and animal species. As discussed further below, sensitive plant and wildlife species information, in particular, primarily relies on existing data sources. Substantial data exist for the western reaches of the Santa Clara River, which have been subject to extensive development-related surveys. However, much of the middle and upper reaches of the Santa Clara River and the majority of the tributaries have been only lightly surveyed, if at all. The lack of specific references to the presence of sensitive species in these areas should not be interpreted as species absence, rather a lack of existing data. Where possible, based on available data and input from wildlife biologists and botanists, the potential for occurrence of sensitive species has been noted based on habitat suitability.

### 4.1 Vegetation<sup>1</sup>

Vegetation along the mainstem of the Santa Clara River was mapped during 15 days of fieldwork that took place over roughly a three-month period. Mapping was initiated in October 2004. This initial mapping effort was interrupted by extensive flooding in December 2004. Mapping subsequently resumed in late January

2005, and was again interrupted by heavy flooding in February 2005. Final mapping was completed in late March 2005, with confirmation and rechecking of polygons completed in early April 2005.

The mapping of the vegetation along the mainstem of the Santa Clara River should be considered a snapshot in time. Riparian habitats are dynamic systems, changing cover and composition in response to natural flooding events. The winter of 2004 to 2005 was one of the wettest on record, with rainfall and associated flooding equaling a 100-year flood along some portions of the Santa Clara River and some tributaries. Heavy scouring of the Santa Clara River channel and tributaries occurred, in some instances removing long-established vegetation and mature native woodlands. This change was particularly evident for arundo, with vast quantities of canes and rhizomes washed from long-established stands and transported downstream. Scouring was particularly severe at confluences and along the river bends. No detailed tracking of these changes has occurred. Report reviewers and future users should consider that many areas currently mapped as open channel have the potential to revegetate over time. Even more important, areas shown as clear of arundo may become infested or experience an increase in the density levels over time.

The mainstem vegetation mapping surveys identified 43 vegetation series located within the 500-year floodplain on the mainstem of the Santa Clara River. Vegetation falling outside of the 500-year floodplain was not mapped and is only peripherally discussed below. Most of the vegetation series mapped along the Santa Clara River were delineated on maps created from aerial photographs following the vegetation series listed in *A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995). Several of the vegetation series were not included in *A Manual of California Vegetation* and were created based on the dominant and associated plant species present (e.g., Pepper Tree).

Arundo and tamarisk are usually considered associate species in the riparian and transitional vegetation series discussed below. Infestation levels within each vegetation series are highly variable and depend on a variety of factors including the vegetation series, location, water availability, and level of past disturbance. Arundo and

<sup>1</sup> The spelling of scientific and common names for plant species is based on *The Jepson Manual*. The vegetation mapping is based upon *A Manual of California Vegetation*. The spelling of common plant names for these sources sometimes disagree. For example, narrow-leaved willow in *The Jepson Manual* becomes narrowleaf willow in *A Manual of California Vegetation*.



tamarisk infestation locations and densities are discussed further in Appendix 6 and are shown on vegetation maps in Appendix 7 where densities exceed 50 percent or greater of cover within any given association. However, low-to-medium density infestations, which are not shown on the figures, occupy well over 500 acres or almost 10 percent of the Santa Clara River's floodplain and can substantially displace native understory, even where the predominant overstory cover still comprises native trees or shrubs.

#### 4.1.1 *Dominant Series*

The 500-year floodplain of the Santa Clara River and its tributaries cover approximately 16,400 acres. Approximately 5,449 acres are in the mainstem of the Santa Clara River and the vegetative associations within these areas have been mapped to date. As discussed above, the Santa Clara River's vegetation generally transitions from montane or high desert scrub habitats in the east to more coastal valley and well-watered associations toward the west. However, local variations exist, based on changes in hydrology and channel morphology. These changes are exemplified by the sudden transition from high desert scrub to dense cottonwood forest as the Santa Clara River's 2,000-foot-wide floodplain at Acton enters the relatively narrow 200 to 600-foot-wide confines of Soledad Canyon.

Detailed mapping of the relative cover of different vegetative associations and uses within the Santa Clara River revealed seven predominant uses or covers, which occupy 70 percent of the Santa Clara River's floodplain (Table 4-1). The dominant cover series within the 500-year floodplain is open channel, which occupies more than 1,300 acres. It is unclear whether the dominance of open channel is associated with recent flooding or if it is a more stable long-term feature. The second-most dominant cover within the floodplain is 907 acres of development, the majority of which consists of private campgrounds, trailer parks, and sand and gravel operations located in Reaches 2, 3 and 4. Development in the floodplain also includes more permanent estate homes, mobile home parks, light industrial uses, and very low density ranchettes (e.g., 5 to 10 acre parcels) in all reaches. The third most dominant cover is 787 acres of cottonwood woodland, an important native riparian community. Cumulatively, all native riparian vegetative associations (e.g., cottonwoods, willows, mule fat) occupy approximately 1,180 acres or 22 percent of the total floodplain area that has been mapped to date.

#### 4.1.2 *General Habitats*

As noted above, the 5,449 mapped acres within the Santa Clara River's 500-year floodplain support 43 identified different vegetation associations or uses. Brief descriptions of each vegetation series, an accompanying mapping code along with the acreage of that vegetation series and the general location by Santa Clara River reach are included in Table 4-2 below (see Appendix 7 for complete vegetation maps). For ease of reference these associations have been grouped into six major categories that are briefly described below.

##### *Open Channel*

As noted above, open channel is the most common cover in the study area, comprising 1,309 acres (24 percent) of mainstem floodplain acreage. This association includes open active river and stream channels, sand and gravel bars, cobbles, and boulders. The extent and boundaries of this association likely varies substantially in response to major storm events and may currently occupy an unusually large extent of the river channel. Open channel areas tend to revegetate in riparian and other scrub communities during low and moderate rainfall years and expand during and after high-flow events. When water is flowing, open channel provides habitat for all aquatic species, particularly the endangered unarmored threespine stickleback, and the threatened arroyo chub. Depending on substrate composition, these areas can also provide important habitat to the endangered arroyo toad.

##### *Riparian Communities*

Riparian communities include woodlands such as the cottonwood, mixed, red, narrow leaf, and arroyo willow associations and riparian scrub such as mule fat. Also included are very limited localized associations such as white alder and cattail. The Santa Clara River's 1,180 acres of riparian communities constitute approximately 22 percent of the total mainstem floodplain acreage and are the most sensitive major habitat types in terms of overall wildlife productivity, rarity, and their critical importance in the support of rare, threatened, and endangered species. Such communities flourish within the Santa Clara River and tributary floodplains in areas of low gradient depositions. As noted in Chapter 1, California has lost 90 percent of its riparian woodlands, increasing the importance of the limited remaining acreage. Species of particular concern, which are



<b>Table 4-1: Dominant Cover and Vegetation Associations<sup>1</sup></b>			
<b>Cover Association</b>	<b>Acreage</b>	<b>(percent cover<sup>2</sup>)</b>	<b>Primary Location</b>
Open Channel	1,309 acres	(24%)	Throughout, concentrated on Reaches 4, 5 and 6
Development	907 acres	(17%)	Throughout, concentrated in Reaches 2, 3 and 4
Cottonwood Woodland	787 acres	(14%)	Reaches 3 and 6
Big Sagebrush	447 acres	(8%)	Reaches 1 and 2
Agriculture	395 acres	(7%)	Reach 6
California Juniper-Big Sagebrush-Rabbit brush	338 acres	(6%)	Reaches 1 and 2 near Acton
Mixed Willow	224 acres	(4%)	Reach 6

<sup>1</sup>Vegetation associations are for mainstem only. Tributaries are currently being mapped  
<sup>2</sup> Percentages are based on mapped areas (~5,449 acres) not total floodplain area (~16,400 acres)

dependent upon this habitat, include the federal and state endangered least Bells’ vireo, the southwestern willow flycatcher, the western pond turtle, and the two-striped garter snake. While important stands of riparian vegetation exist in every reach and most tributaries, the most significant riparian areas are located within Reaches 3 and 6. Within these reaches, stands of cottonwood woodland ranging from 10 to 30 acres intermix with willow and mule fat associations and open channel to provide very high quality habitat. Although all tributaries contain some riparian associations, major concentrations are limited to Bouquet, San Francisquito, and Castaic Creeks.

**Great Basin/High Desert Communities**

These associations include scrub and woodlands such as big sagebrush, the California juniper-big sagebrush-rabbit brush, big sagebrush-scale broom, scale broom-fourwing saltbush, and rabbitbrush. These desert-oriented associations occupy approximately 1,186 acres (22 percent) of the total mainstem floodplain acreage. These vegetative associations occur throughout the mainstem, but are concentrated in Reaches 1 and 2, where they form the dominant vegetative cover. These associations also occur in drier sections of the tributaries, particularly Jones, Agua Dulce, and Mint Canyons. These vegetative associations provide important habitat for a range of common native wildlife and the sensitive slender-horned spineflower and the coast horned lizard.

**Coastal Scrub/Woodland Associations**

These associations include 13 scrub and woodland associations including California sage brush, California buckwheat, California buckwheat-white sage, mixed sage, and scattered areas of Coast Live, Valley, and Engelmann Oak Woodlands. The 117 acres of Coastal Scrub/Woodland associations are a relatively minor component of project area vegetation and occupy only two percent of the project area acreage; although these associations occur in every reach and tributary, they are most frequent in Reach 4. The shrub associations are rare within the floodplain study area as they tend to be concentrated on slopes, occasionally extending down into alluvium. The woodland associations occur on slopes and terraces and extend into the alluvium in places. These scattered associations can support a number of rare species such as the federal and state endangered Nevin’s barberry and slender-horned spineflower and sensitive wildlife (species of special concern and/or state candidates) such as the Le Conte’s thrasher, coastal whiptail lizard, and the coast horned lizard.

**Non-Native and Invasive Species**

These associations include the primary target species of arundo and tamarisk, as well as incidental invasive species such as California pepper trees, tree of heaven, and perennial pepperweed, which are troublesome but not as aggressive in this watershed as either arundo or



tamarisk. Non-native grassland is also included in this category. Non-native vegetation associations occupy approximately 300 acres of the Santa Clara River's mainstem. With the exception of Reach 1, these associations can be found throughout the mainstem of the river and tributaries, but are concentrated between Reaches 3 and 6 of the Santa Clara River and in the middle to lower reaches of the tributaries.

### *Agriculture*

While much of the private open land adjacent to and often within the river is used for grazing, this association includes only land cultivated for irrigated pasture or row crops. This association is typically located on benches within or adjacent to stream channels and occupies 395 acres or approximately seven percent of the study area. It is particularly prevalent within the floodplain areas in Reach 6 west of I-5.

### *4.2 Special Status Plant Species*

A total of 19 sensitive plant species were identified with the potential to occur within the project area. Sensitive plant species are rare, threatened, or endangered with state or federal status. California also has state candidates for listing, state species of special concern, and DFG fully protected species. The California Native Plant Society (CNPS) also has categorized species as List 1A or 1B. CNPS List 1A species are presumed to be extinct in California and elsewhere. CNPS List 1B species are rare, threatened, or endangered in California and elsewhere (CDFG 2001). CNPS List 3 or 4 species are not discussed here. These species were identified as potentially occurring in the study area based on a review of historical sensitive plant species locations identified in the CNDDDB (CDFG 2002). CNPS List 1A species are presumed extinct in California and elsewhere. The following six plants from Table 3 in the Long Term Plan are discussed in further detail below because they were determined to have a high potential to be impacted during the invasives removal project. The other 13 plants will not be discussed in detail since the likelihood of these plants being impacted during project activities is low; however, surveys for all sensitive plants should occur prior to any project-related activity where vegetation and/or soil would be disturbed.

#### *4.2.1 Nevin's Barberry (Berberis nevinii)* **Federal: Endangered** **State: Endangered** **CNPS: List 1B**

The current distribution of Nevin's barberry is limited to Southern California where it occurs in San Diego, Riverside, Los Angeles, and San Bernardino Counties. It is estimated that fewer than 1,000 Nevin's barberry plants remain over its entire range (CDFG 2001; CNPS 2001; Reiser 2001). Within the study area, suitable habitat for Nevin's barberry may exist in Reaches 2 to 6 of the upper Santa Clara River and in all tributaries. However, the only known location for Nevin's barberry within the study area is at two sites within the middle reaches of San Francisquito Creek. Approximately 200 plants were observed in 1988 south of Powerhouse #2 in 1988 on both slopes and in a wash near the Los Angeles County fire station. This population may be threatened by dumping and channel shaping. One specimen was observed one-half mile north the Powerhouse in 1985, but was threatened by road construction. A population at the confluence of San Francisquito with the mainstem has been likely extirpated by development.

Nevin's barberry is known to occur only in sandy or gravelly soils located in chaparral, cismontane woodland, coastal scrub, and riparian scrub plant communities (CNPS 2001). Nevin's barberry produces racemes of yellow flowers which bloom from March through April and seed production for Nevin's barberry is sporadic and fertility has been observed to be low (USFWS 1998; Boyd 1987). In cultivation studies, the reproductive success rate is observed to be low (Mistretta 1989). Nevin's barberry is able to stump sprout following a wildfire (USFWS 1998).

Nevin's barberry is state and federally listed as endangered, and is a CNPS List 1B species. This species is endemic to California and many historical populations have been extirpated (CDFG 2000; CNPS 2001). Primary current threats include development and road maintenance (CDFG 2000; CNPS 2001; Reiser 2001). Critical habitat does not appear to have been designated for this species.



**4.2.2 Slender-Horned Spineflower**  
**(*Dodecahema leptoceras*)**  
**Federal Status: Endangered**  
**State Status: Endangered**  
**CNPS: List 1B**

The slender-horned spineflower is endemic to California with known distribution limited to Los Angeles, Riverside and San Bernardino Counties. Less than 1,000 individuals are estimated to exist throughout its global range (CDFG 2001). Within the study area, potential habitat occurs in Reaches 2 to 6 and on all tributaries. However, historically known populations are restricted to Reaches 3 (last sighting 1993) and 5 (possibly extirpated) and the Mint (last sighting 1937, not located in 1979 survey) and South Fork Tributaries (last sighting 1893, much of area developed; possibly extirpated). Based on CNDDDB records, the only probably remaining population in the study area would be located along Reach 3 in the Bee Canyon tributary approximately 66 feet from Soledad Canyon Road. However, in 1993, this population was threatened by a 1,200 unit mobile home development, dumping and road realignment and its existence has not been reconfirmed since that time.

Slender-horned spineflower is known to occur in sandy soils, particularly on well developed and established alluvial fans and associated mature alluvial scrub, and in chaparral, montane woodland, and coastal sage scrub (CNPS 2001). The slender-horned spineflower is an herbaceous annual that blooms between April and June. Seed dispersal may occur via both wildlife and flooding. This species can be difficult to detect, and can often be observed only between April and June when in bloom. Populations can also vary substantially from year to year depending upon rainfall (Dudek and Associates 2001).

This species is state and federally listed as endangered, and is a CNPS List 1B species (CDFG 2001). This species is known only from a limited number of occurrences and is considered extremely endangered in portions of its range due to threats such as development, sand and gravel operations, flood control, proposed reservoir construction, off road vehicles, and non-native plants (CDFG 2000; CDFG 2001; CNPS 2001; Hickman 1993). Critical habitat does not appear to have been designated for this species.

**4.2.3 San Fernando Spineflower**  
**(*Chorizanthe parryi* var. *fernandina*)**  
**Federal Status: Endangered**  
**State Status: Endangered**  
**CNPS: List 1B**

The San Fernando spineflower was formerly found in Ventura, Los Angeles, Orange, Riverside and San Bernardino counties. Thought extinct since 1929, colonies of this plant are now known to exist in both Los Angeles and Ventura Counties. Within the project area, a number of known populations of San Fernando Spineflower exist along Reach 6, with scattered populations on hillsides and within the alluvial fans of tributaries south of the upper Santa Clara River extending from Magic Mountain roughly four miles to the west (CDFG 2005a). Additional locations include one on the Santa Clara River's north bank adjacent to Hasley Canyon and on the south bank adjacent to Portrero Canyon (CDFG 2001). The Hasley Canyon site consists of approximately 5,000 plants which occur in coastal sage scrub habitat on a slope apparently outside of the 500-year floodplain. No data was available disclosing if this population has been affected by recent development of the Valencia Commercial Center.

San Fernando spineflower is known to occur in sandy or gravelly soils along dry washes and is found in the coastal sage and alluvial fan scrub communities. In the project area, no known populations appear to have been identified within the 500-year floodplain of the mainstem and are seemingly confined to hillsides and alluvial features of minor northward draining tributaries which are outside the project area. This distribution is somewhat in contrast to historic distributions on alluvial fans (CDFG 2005b). However, seeds from hillside and tributary populations could easily have been transported downstream into Reach 6 and been overlooked by past general surveys. This species flowers from April through June. Published data on reproduction and seed dispersal appears unavailable, but may be similar to the slender-horned spine flower discussed above.

This species is federally listed as threatened and state listed as endangered, and is a CNPS List 1B species. Threats include urbanization and stream channelization. Critical habitat does not appear to have been proposed or designated for this species.



#### 4.2.4 *Spreading Navarretia* (*Navarretia fossalis*) Federal Status: *Threatened* CNPS: *List 1B*

Spreading navarretia is distributed from San Luis Obispo County south through Los Angeles, Riverside, San Diego Counties and as far south as San Quentin in northwestern Baja California (CNPS 2001; Hickman 1993). Within the project area, potentially suitable habitat for this species may occur in Reach 6 and portions of San Francisquito and Bouquet Canyons. However, within the study area, two of the known locations for this species are in vernal pools which appear to be located outside the 500-year floodplain and which may have been eliminated by past development. The third is in a vernal pool within or adjacent to Plum Canyon Creek (CDFG 2001).

Spreading navarretia is known to occur in vernal pools, marshes, swamps and other assorted shallow freshwater habitats. This low growing annual herb blooms from May through June. This species appears to be able to self pollinate with seeds spread by water transport within seasonally wet areas and possibly attached to the fur of passing mammals. This species is federally listed as threatened, is a CNPS List 1B species and is not listed by the state. Current threats include urbanization, agriculture, road construction, grazing, flood control, and vehicles (CNPS 2001). Approximately 600 acres of critical habitat has been proposed for this species within Plum Canyon to the northwest of Forest Park, between Bouquet Canyon Road and the Sierra Highway. This area extends from Vasquez Road south for almost two miles, and appears to include portions of Plum Canyon (and the associated 500-year floodplain) itself as well as the adjacent Cruzan Mesa.

#### 4.2.5 *Los Angeles Sunflower* (*Helianthus nuttallii ssp. parishii*) CNPS: *List 1A*

Los Angeles sunflower was previously known to occur in coastal salt marshes and freshwater swamps in Los Angeles, San Bernardino, and Orange Counties (CNPS 2001; Hickman 1993). This species was presumed extinct and thought to have been eliminated by urbanization, with the last historic sighting in 1937 (CDFG 2000; CDFG 2001; CNPS 2001; Hickman 1993). However, in 2002 a cluster of sunflowers with strong resemblance to this sub-species was rediscovered

along the south bank of the upper Santa Clara River opposite its confluence with Castaic Creek at the mouth of a small unnamed drainage. A cluster of five to ten individual plants was observed in 2002, growing in a freshwater seep adjacent to the channel of the upper Santa Clara River just below the river bank access road (UC Cooperative Extension, undated).

There is currently an ongoing discussion and disagreement among experts over whether this cluster of sunflowers is part of a more widespread sub-species (*H. nuttallii nuttallii*), whether it is indeed a remnant of the once widespread and thought to be extirpated Los Angeles sunflower or whether this cluster of sunflowers is an entirely new sub-species of "Newhall sunflower." This taxonomic debate centers on the number of chromosomes present in this patch of sunflowers along with other taxonomic details. Further, this tuberous sunflower grows in association with other marsh plants such as cattails and stinging nettles, seemingly differentiating it from more widespread sub-species (CDFG 2005a).

The Los Angeles sunflower historically flowers from May to September. No specific data appears to be available on this species reproductive pattern. However, sunflower seed dispersal generally occurs via wind and wildlife transport. No data is yet available on this cluster of sunflowers, but their seed appears viable (CDFG 2005a)

The Los Angeles sunflower is not listed at this time, and is a CNPS List 1A species. The final legal status of this cluster of sunflowers on Reach 6 may rest upon the outcome of the taxonomic debate. Until that is resolved, final legal action by state and federal agencies is unlikely to occur. Threats to this species may include ongoing grazing, annual or ongoing berm construction programs along farmed sections of the riverbank and possible long-term plans for channelization or other bank improvements associated with future development (CDFG 2002). The debate over this cluster of sunflowers may not be resolved in a timely manner. The most conservative approach as required under Section 15380 of the CEQA Guidelines would be to treat this cluster as a rare sub-species until this issue can be resolved.



**4.2.6 Davidson's Bush Mallow**  
**(*Malacothamnus davidsonii*)**  
**CNPS: List 1B**

The current range of Davidson's bush mallow includes portions of Los Angeles, Monterey, and San Luis Obispo Counties (CNPS 2001). Within the study area, potentially appropriate habitat for this species is found in Reaches 2 to 6 and in all tributaries. However, there are no recorded instances of Davidson's bush mallow occurring in the study area.

Davidson's bush mallow is generally known to occur in chaparral, cismontane woodland, coastal scrub, and riparian woodland. This perennial small shrub blooms from June through January with seed production following in the fall and winter months. This species is not state or federally listed, but is a CNPS List 1B species (CDFG 2001). This species is endemic to California and is endangered in a portion of its range due to threats such as urbanization (CNPS 2001).

**4.2.7 Southern Tarplant**  
**(*Centromadia parryi* var. *australis*)**  
**CNPS: List 1B**

The distribution of southern tarplant is primarily limited to in Southern California where it is known to occur in San Diego, Orange, Los Angeles, Ventura and Santa Barbara Counties. This subspecies is rare outside of California and it is estimated that there are only 1,000 to 3,000 individuals throughout the subspecies' global range (CDFG 2001). Although potentially suitable habitat exists along Reaches 5 and 6 and in moist areas of the tributaries, there are no known occurrences of southern tarplant in the study area.

Southern tarplant is known to occur on marsh and swamp margins, seasonally wet valley and foothill grasslands, and vernal pools (CNPS 2001). Southern tarplant is an annual herb from the sunflower family, blooms from June through November and sets seed between June and November. It has yellow, daisy-like flowers that occur primarily at the ends of the branches. Seed dispersal can occur through water and wind transport as well as wildlife transport.

Southern tarplant is not state or federally listed at this time, but is a CNPS List 1B species (CDFG 2001). This subspecies is known only from a limited number of occurrences and is considered very threatened in portions of its range due to threats such as urbanization, vehicles, and foot traffic (CDFG 2000; CDFG 2001; CNPS 2001).

**4.3 Special Status Wildlife Species**

A total of 21 special status wildlife species were identified with the potential to occur within the project area. Special status wildlife species are rare, threatened, or endangered with state or federal status. The state also has state candidates for listing, state species of special concern, and CDFG fully protected species. The 21 species were identified as potentially occurring in the study area based on a review of historical wildlife species locations identified in the CNDDDB), and a review of pertinent literature. Of these 21 species, eight are federally listed under the Federal Endangered Species Act (FESA). Two of these are highly unlikely to occur in the project area: the California condor (USFWS 1976) and the mountain yellow-legged frog (USFWS 2002). The Santa Ana sucker is federally threatened in other watersheds, but is not native to the Santa Clara River watershed (USFWS 2000, 2004a). The following are species accounts for those species most likely to occur in the project area, including the federally protected least Bell's vireo, southwestern willow flycatcher, arroyo toad, unarmored threespine stickleback, and Santa Ana sucker.

**4.3.1 Arroyo Toad (*Bufo californicus*)**  
**Federal Status: Endangered**  
**State Status: Endangered**

The arroyo toad is found from southern Monterey County along the upper Salinas River in the north, to the Rio Santa Maria along the Pacific Coast of Baja California in the south. In California, the arroyo toad is found primarily in coastal draining streams from Monterey to San Diego Counties, but is also known from a limited number of desert drainages, such as the Mojave and Whitewater rivers.

Within the upper Santa Clara River watershed, potentially suitable habitat for the arroyo toad could include Reaches 2 to 6 of the upper Santa Clara River and at least portions of all of its tributaries. However, the most suitable habitats appear to occur in Reaches 3 and 6 and within high quality habitats along portions of Castaic, San Francisquito and potentially Bouquet Creeks (CDFG 2001; USFWS 2001a, 2001b, 2005a). Known sightings of the arroyo toad within the project area include five locations; Reach 3 at the Bear Canyon confluence (two larvae and a single "metamorph"; 2001); Reach 6 immediately upstream/east of Interstate 5 (one adult; 1994) and downstream/west of Interstate 5 (unknown number of toadlets; date unknown); San



Francisquito Creek (location and numbers unknown) and Castaic Creek, both above and below the reservoir (numbers and exact location unknown).

The largest population of arroyo toads within the project area may reside in Castaic Creek upstream from the Elderberry fore bay, including Fish Creek for 0.7 miles upstream of the Castaic confluence. An important small breeding population exists from along the mainstem of the upper Santa Clara River from San Francisquito Creek downstream to Castaic Creek and this section has been identified as essential habitat for the arroyo toad by the US Fish and Wildlife Service. The population within Reach 3 has been identified as extending from 0.5 miles above the Agua Dulce confluence downstream three miles to the Bee Canyon Confluence within the eastern edge of Reach 4, encompassing recorded sightings at Bear Canyon (USFWS 2005).

Arroyo toads are typically associated with gravelly or sandy washes, streams, rivers, and adjacent habitats of California and northwestern Baja California. Typical arroyo toad habitat includes larger floodplains with coarse, regularly scoured substrate where shallow pools persist into summer long enough to allow for tadpole metamorphosis. Arroyo toads spend the majority of the year burrowed in the benches along the floodplain and in the adjacent upland habitats, emerging to forage or breed under suitable conditions. Upland foraging habitats include open associations of sage scrub, mixed chaparral, oak woodland, and sagebrush habitats (Sweet 1992). Arroyo toads are known to roam linearly up to one to two kilometers along stream corridors and up to one-half to two 2 kilometers into adjacent upland habitats, with use of adjacent streamside terraces and oak flats of particular importance in providing burrows and foraging areas for this species (Dudek and Associates 2001).

Breeding generally occurs between March and June, but has been observed as early as January and extending into July, depending on temperatures and precipitation (Dudek and Associates 2001). Eggs are laid on the bottom of shallow pools, usually in tangled strings of one to two rows in quiet, clear backwaters and side channels of streams as waters recede from the floods of the wet season. The eggs are sensitive to siltation and require good water quality. Because the eggs are laid in very shallow water and are not anchored or attached, rapid changes in stream flow can leave the eggs stranded and dry or wash them away. The tadpoles are solitary and extremely cryptic. They reach a maximum length

of about 1.5 inches, and are typically mottled or spotted with blackish to brown colors. Tadpoles in transition to adults are known as “metamorphs” (i.e., toadlets) and are basically small tailless young sub-adult toads, and are subsequently more difficult to spot and identify.

Activities of adult arroyo toads outside the breeding season are not well documented. The adults spend much of the year in burrows. Arroyo toads are nocturnal, and can occasionally be found at night foraging on open, sandy areas around the drainage or adjacent open habitats. Adults are likely to move into habitat outside of the typical inundation area of the drainage during the flood season.

An estimated 75 percent of the historical arroyo toad habitat range has been destroyed and many of the remaining populations are threatened (Jennings and Hayes 1994). The primary reasons for the decline in the species include dams and water projects, urban development, agriculture and grazing, and human recreational activities in breeding areas. The arroyo toad is federally listed as endangered and is a CDFG species of special concern (USFWS 1994). The critical habitat in reaches 3 and 6 was removed in 2005 (USFWS 2005).

#### 4.3.2 *Red-legged Frog (Rana aurora draytonii)* **Federal Status: Threatened** **State Status: State Species of Special Concern**

The historic range of the California red legged frog extended through the pacific slope drainages in Shasta County inland to Marin County and south to the Santa Domingo River in Baja California, Mexico. Currently large populations of this species are primarily restricted to coastal areas from Marin County to Ventura County, but do extend inland to include a small Riverside County population and limited desert areas including the Mojave River (Dudek and Associates 2001; USFWS 1996). The California red legged frog is restricted to a single tributary of the Santa Clara River—San Francisquito Creek. However, given the high rainfall of the 2004-2005, these frogs could have been flushed downstream, or may move naturally within this tributary. Several other historic sightings are recorded on Reach 3 and Reach 5 along with Aliso, Mint and lower San Francisquito Canyons (USFS; field records). These populations have not been reconfirmed in recent decades and may constitute older historic sightings or have been extirpated by development.



The California red legged frog inhabits lowland streams, wetlands, riparian woodlands and livestock ponds. The species may also occur in uplands near breeding area and along intermittent drainages connecting wetlands. The most suitable habitat for red legged frogs includes cold or relatively deepwater ponds with substantial emergent or overhanging vegetation. Red legged frogs feed upon a wide variety of insects and even small mammals such as mice. This species breeds from November to April, with females laying large egg masses in quiet waters normally from December to April. Although red legged frogs are dependent upon a continuous water source and associated vegetation, this species has been documented to move from one quarter to one and one-half miles from primary habitats, potentially without regard to topography or vegetation type (Dudek and Associates 2001).

The California red legged frog is federally listed as threatened and is a state Species of Special Concern. Red legged frogs are threatened by habitat loss, reservoir construction, stream channelization, urbanization and overgrazing. The USFWS has proposed critical habitat in San Francisquito and Amargosa Creeks (105,890 acres) which includes San Francisquito, Lancaster, Rock Creek, Acton, Bouquet (eastern), Mint Canyon, and Sierra Pelona. The U.S. Fish and Wildlife Service gave final determinations for critical habitat in 2001 and proposed designations for critical habitat in 2004 (USFWS 2001c, 2004b).

**4.3.3 Unarmored Threespine Stickleback**  
**(*Gasterosteus aculeatus williamsoni*)**  
**Federal Status: Endangered**  
**State Status: Endangered and Fully Protected**

The unarmored threespine stickleback was formerly widespread throughout Southern California but is now limited to two major and several minor populations. Major populations include three areas in the upper Santa Clara River watershed and on Vandenberg Air Force Base within San Antonio Creek in northern Santa Barbara County. Smaller populations may exist in San Luis Obispo, San Diego and San Bernardino counties (CDFG 2001). Within the upper Santa Clara River watershed, the following three areas have been identified as supporting the most significant habitats for this fish and are proposed, but not yet designated, as critical habitat under the federal Endangered Species

Act (USFWS 1980, 1985):

- *Del Valle Zone*: Along the upper Santa Clara River west from Interstate 5 for approximately six miles to the confluence with the San Martinez Grande tributary near the community of Del Valle.
  - *San Francisquito Zone*: Beginning roughly where San Francisquito Creek intersects the Angeles National Forest Boundary (2.5 miles southwest of Powerhouse #2) and extending north (upstream) approximately 8.4 miles to Powerhouse #1 near the Clearwater Canyon confluence.
  - *Soledad Canyon Zone*: In Reach 3 (Soledad Canyon) extending from Arrastre Canyon (approximately one mile SW of Acton) west for approximately 8.4 miles to the downstream extent of River's End Campground.
- In addition to these primary areas, the stickleback is abundant along the upper Santa Clara River from above McBean Parkway to the confluence with Castaic Creek and along lower Castaic and San Francisquito Creeks when water is ample (Haglund and Baskin 1995). Further, when water is flowing particularly in wet years, its presence may be anticipated in Reaches 2, 4, and 5 (previously identified), in tributaries such as the Agua Dulce (previously identified), and potentially others (CDFG 2001).

Typically sticklebacks inhabit quiet water with heavy growth of aquatic plants and feed on small invertebrates. They prefer cool and clear water since they are visual feeders and frequent areas with both mud and sand substrates. Sticklebacks avoid turbid waters. Breeding usually occurs between April and July. Males build nests of pasty materials like algae and other aquatic plants, which they wriggle through to create a tunnel into which females deposit eggs. Following egg deposition, males enter the nest and fertilize the eggs.

The unarmored threespine stickleback is listed as endangered under both the federal and endangered species acts and is also listed as fully protected under Section 5515 of the California Fish and Game Code. This is possibly the most restrictive level of protection provided under any regulations and prohibits take or possession at any time unless for valid purposes (e.g., research) for which permits have been obtained. This species is sensitive to aquatic disturbance and habitat destruction in the form of channelization, water quality degradation, sedimentation, introduced predators (e.g., bullhead catfish [*Ictalurus* sp.], sunfish [*Lepomis* sp.], and clawed frogs [*Xenopus* sp.]), off-road vehicle use of rivers, and other factors associated with urbanization and land conversion.



**4.3.4 Least Bell's Vireo (*Vireo bellii pusillus*)**  
**Federal Status: Endangered**  
**State Status: Endangered**

Historically, this subspecies was a common summer visitor to riparian habitat throughout much of California. Presently, the least Bell's vireo is found only in riparian woodlands in Southern California and northern Baja California, Mexico. In particular, large least Bell's vireo populations may be found in San Diego and Riverside counties, with smaller populations in Ventura and Santa Barbara Counties (CDFG 2000). In the project area, least Bell's vireo is known to occur in Reaches 3 and 6, and the lower reaches of Castaic and San Francisquito Creeks. Most sightings have been of transients, are concentrated along Reach 6 and its tributaries and are discussed in more detail below. However, suitable breeding habitat appears to exist downstream from McBean Parkway, at the mouth of San Francisquito Creek and throughout Reach 6 downstream of Interstate 5 to the project's western boundary (Henrickson 1993). Reflective of this importance, the section of Reach 6 from Rye Canyon Road (just east of Interstate 5) downstream to the project's western boundary has been designated critical habitat for this species.

Key least Bell's vireo sightings within the project area include:

- *San Francisquito Creek*: A migrant male two miles upstream of the confluence and a juvenile at the confluence (Guthrie 1988, 1995).
- *Lower Castaic Creek*: Several singing and non singing males observed in lower Castaic Creek in 1994, 1995 and 1996 including territorial males, sometimes indicative of possible breeding (Guthrie 1995; 1996).
- *Reach 3*: Approximately one mile upstream from the Agua Dulce confluence (USFS 1995).
- *Reach 6*: Reach 6 is the primary location for sightings of least Bell's vireos in the project area with a number of sightings of individual migrants and juveniles (extending over roughly a decade, 1988 to 1998) and at least one confirmed instance of breeding just east of Interstate 5, with an additional breeding colony being identified near the County line. However, it is unclear if this breeding colony is actually within the project boundaries (Guthrie 1988, 1990, 1992, 1995, 1996, 1997).

The least Bell's vireo is restricted to riparian woodland and the bird typically frequents areas that combine an understory of dense young willows or mule fat with a canopy of tall willows or an overstory of cottonwoods. However, this species is also known

to forage in chaparral habitats adjacent to riparian areas (Dudek and Associates 2001). The least Bell's vireo arrives for breeding in late March and early April and leaves for its wintering ground in September. Since it builds its nests in dense shrubbery three to four feet above the ground (Salata 1984), it requires young successional riparian habitat or older habitat with a dense understory. Nests are often placed along internal or external edges of riparian thickets (USFWS 1986).

The least Bell's vireo is listed as an endangered species under both the state and federal Endangered Species Acts (USFWS 1986). Critical habitat areas were established in 1994 (USFWS 1994). The decline in populations of least Bell's vireos is due to loss, degradation, and fragmentation of riparian habitat. In particular, clearing and destruction of such habitats associated with early agricultural development and more recently widespread urbanization combined with channelization of rivers and streams and the subsequent loss in aerial extent and diversity of such habitats is a major source in the decline of this species. Nest parasitism by the brown-headed cowbird (*Molothrus ater*) has also played an important role in the decline of this species (Dudek and Associates 2001).

**4.3.5 Southwestern Willow Flycatcher**  
**(*Empidonax traillii extimus*)**  
**Federal Status: Endangered**  
**State Status: Endangered**

The southwestern willow flycatcher is a summer breeding resident of riparian habitats in Southern California, southern Nevada, southern Utah, Arizona, New Mexico, western Texas, southwestern Colorado, and northwestern Mexico (USFWS 1995a). Within California, southwestern willow flycatcher breeding range reaches from Owens Valley and the south Fork of the Kern River in the north to San Diego County in the south. There do not appear to be any breeding records for this species along the upper Santa Clara River. Sightings appear to be limited to occasional individual juveniles and migrants observed over a approximately a decade and are concentrated on Reaches 3 (USFS 1990, 1995) and Reach 6 with one sighting on lower Castaic Creek (Guthrie 1988, 1990, 1995, 1997).

The southwestern willow flycatcher is generally restricted to dense riparian woodlands of willow, cottonwood, and other deciduous shrubs and trees. In general, the riparian habitat of this species tends to be isolated, small, and/or linear patches, separated



by open areas. The dense riparian thickets and with high canopy cover and dense foliage bordered by open channel present throughout Reach 6 appear to provide potentially suitable breeding habitat for this species.

Spring migration of this endangered subspecies is relatively late, beginning in early May and extending through June (Unitt 1984). Fall migration occurs from early in August through mid-October. Egg-laying by the endangered southwestern willow flycatcher occurs in Los Angeles County from the end of May through the end of August. Dense willow thickets are required for nesting, and nests are often near standing water (Zeiner et al. 1990). Willow flycatchers hunt for insects from low exposed perches, flying out to catch the insects in mid-air.

The southwestern willow flycatcher was listed as endangered due to “extensive loss of riparian breeding habitat, brood parasitism by the brown-headed cowbird (*Molothrus ater*), and lack of adequate protective regulations” (USFWS 1995a). This subspecies was previously listed as endangered by the CDFG in December 1990. The population of southwestern willow flycatcher in Southern California was estimated to be less than 80 pairs in the early 1980’s (Unitt 1984). There is no critical habitat proposed for this species within the upper Santa Clara River watershed.

**4.3.6 Coastal California Gnatcatcher**  
**(*Pilioptila californica californica*)**  
**Federal Status: Threatened**  
**State Status: Species of Special Concern**

The Coastal California gnatcatcher resides in coastal sage scrub habitats in Baja California, Mexico and coastal areas of southern California. Within California, the California gnatcatcher breeding range reaches from San Diego County northward to Ventura County. The populations with the highest densities occur in coastal areas of Orange and San Diego counties, with lower density population existing in western Riverside, southwestern San Bernardino, and inland San Diego counties. Small, now disjunct, populations are documented in Ventura and Los Angeles counties (CDFG 2004). The California gnatcatcher was listed as threatened on 30 March 1993 (USFWS 1993).

The California gnatcatcher is a non-migratory bird species whose breeding season occurs between late February and July, with nest initiation occurring most often between mid-March and mid-May. Nests are constructed using materials such as grasses, bark strips,

small leaves, spider webs, and down over a period of two to ten days and are usually placed in coastal sagebrush about three feet above the ground. First-brood eggs (two to five) are laid in late March. With a roughly 120 day breeding season, adult California gnatcatchers may be able to have as many as three broods per season. A high rate of nest predation is compensated by up to ten re-nesting attempts over the long breeding season. Survival depends on winter temperatures and rainfall. Main food intake consists of arthropods, especially leafhoppers, spiders, beetles, and true bugs.

The project area contains areas designated as critical habitat for the California gnatcatcher. The critical habitat in the project area is Unit 13, which encompasses approximately 34,339 acres along the foothills of the San Gabriel Mountains (USFWS 2000, 2003). Within the upper Santa Clara River watershed, breeding populations of the California gnatcatcher are known to reside in sage scrub habitat in the Placerita Canyon tributary of Bouquet Canyon and the Plum Canyon tributary of South Fork. These areas encompass the northern distributional extreme of the California gnatcatcher’s current range. As such, they are important and would act as a source population for any future recovery of California gnatcatcher populations to the north and west. Peripheral populations are also important in that they may contain unique genetic or behavioral adaptations that may be important to the species as environmental conditions change over time.



## 5.0 FLORA AND FAUNA FOR UPPER SANTA CLARA RIVER<sup>1</sup>

Table 5-1: Flora and Fauna Survey

### FLORA

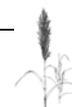
Common Name	Scientific Name
<b>FERNS AND FERN ALLIES</b>	<b>PTERIDOPHYTA</b>
<b>Polypody Fern Family</b>	<b>Polypodiaceae</b>
California Polypody	<i>Polypodium californicum</i>
<b>Fern Family</b>	<b>Pteridaceae</b>
Maiden Hair Fern	<i>Adiantum jordanii</i>
Bird's Foot Fern	<i>Pellaea mucronata</i>
Goldback Fern	<i>Pentagramma triangularis</i>
<b>Spike Moss Family</b>	<b>Selaginellaceae</b>
Spike-Moss	<i>Selaginella bigelovii</i>
<b>CONIFERS AND ALLIES</b>	<b>GYMNOSPERMS</b>
<b>Cypress Family</b>	<b>Cupressaceae</b>
Incense Cedar	<i>Calocedrus decurrens</i>
California Juniper	<i>Juniperus californica</i>
<b>Pine Family</b>	<b>Pinaceae</b>
Aleppo Pine	<i>Pinus halepensis</i>
Jeffrey Pine	<i>Pinus jeffreyi</i>
Big Cone Spruce	<i>Pseudotsuga macrocarpa</i>
<b>FLOWERING PLANTS</b>	<b>ANGIOSPERMS</b>
<b>Dicotyledons</b>	
<b>Maple Family</b>	<b>Aceraceae</b>
Big Leaf Maple	<i>Acer macrophyllum</i>
<b>Amaranthus Family</b>	<b>Amaranthaceae</b>
Pigweed	<i>Amaranthus albus</i>
<b>Cashew Family</b>	<b>Anacardiaceae</b>
Sugar Bush	<i>Rhus ovata</i>
Squaw Bush	<i>Rhus trilobata</i>
Brazilian Pepper	<i>Schinus terebenthifolius</i>
Peruvian [California] Pepper	<i>Schinus molle</i>
Poison Oak	<i>Toxicodendron diversilobum</i>
<b>Carrot Family</b>	<b>Apiaceae</b>
Woolly Lomatium	<i>Lomatium dasycarpum</i>
Hog Fennel	<i>Lomatium utriculatum</i>
<b>Periwinkle Family</b>	<b>Apocynaceae</b>
Oleander	<i>Nerium oleander</i>
Periwinkle	<i>Vinca major</i>
<b>Milkweed Family</b>	<b>Asclepiadaceae</b>
California Milkweed	<i>Asclepias californica</i>
<b>Sunflower Family</b>	<b>Asteraceae</b>
Annual Bur-Sage	<i>Ambrosia acanthicarpa</i>
Burrobush	<i>Ambrosia dumosa</i>



Common Name	Scientific Name
Western Ragweed	<i>Ambrosia psilostachya</i>
California Sagebrush	<i>Artemisia californica</i>
Mugwort	<i>Artemisia douglasiana</i>
Great Basin Sagebrush	<i>Artemisia tridentata</i>
Coyote Brush	<i>Baccharis pilularis</i>
Mule Fat	<i>Baccharis salicifolia</i>
California Brickellbush	<i>Brickellia californica</i>
Yellow Star Thistle	<i>Centaurea melitensis</i>
White Pincushion	<i>Chaenactis artemisiifolia</i>
Yellow Pincushion	<i>Chaenactis glabriuscula</i>
Pineapple Weed	<i>Chamomilla suaveolens</i>
Rubber Rabbitbrush	<i>Chrysothamnus nauseosus</i>
Thistle	<i>Cirsium</i> sp.
Horseweed	<i>Conyza canadensis</i>
Palmer's Goldenbush	<i>Ericameria palmeri</i>
Pine Bush	<i>Ericameria pinifolia</i>
Fleabane Aster	<i>Erigeron foliosus</i>
Golden Yarrow	<i>Eriophyllum confertiflorum</i>
California Filago	<i>Filago californica</i>
Everlasting	<i>Gnaphalium bicolor</i>
California Everlasting	<i>Gnaphalium californicum</i>
Cudweed	<i>Gnaphalium</i> sp.
Saw-Tooth Goldenbush	<i>Hazardia squarrosa</i>
Common Sunflower	<i>Helianthus annuus</i>
Slender Sunflower	<i>Helianthus gracilentus</i>
Telegraph Weed	<i>Heterotheca grandiflora</i>
Smooth Cat's-Ear	<i>Hypochaeris glabra</i>
Goldfields	<i>Lasthenia californica</i>
Tidy Tips	<i>Layia platyglossa</i>
Scale Broom	<i>Lepidospartum squamatum</i>
Cudweed Aster	<i>Lessingia filaginifolia</i>
Tarweed	<i>Madia gracilis</i>
Cliff Aster	<i>Malacothrix saxatilis</i>
California Chicory	<i>Rafinesquia californica</i>
California Butterweed	<i>Senecio californicus</i>
Common Groundsel	<i>Senecio vulgaris</i>
California Goldenrod	<i>Solidago californica</i>
Sow Thistle	<i>Sonchus oleraceus</i>
Wand Chicory	<i>Stephanomeria virgata</i>
Horsebrush	<i>Tetradymia comosa</i>
Dandelion	<i>Taraxacum officinale</i>
Cocklebur	<i>Xanthium strumarium</i>
<b>Birch Family</b>	<b>Betulaceae</b>
White Alder	<i>Alnus rhombifolia</i>
<b>Borage Family</b>	<b>Boraginaceae</b>



Common Name	Scientific Name
Fiddleneck	<i>Amsinckia menziesii</i> var. <i>intermedia</i>
White Forget-Me-Not	<i>Cryptantha intermedia</i>
Comb Bur	<i>Pectocarya penicillata</i>
Popcorn Flower	<i>Plagiobothrys</i> sp.
<b>Mustard Family</b>	<b>Brassicaceae</b>
Black Mustard	<i>Brassica nigra</i>
Shepherd's Purse	<i>Capsella bursa-pastoris</i>
Mediterranean Mustard	<i>Hirschfeldia incana</i>
Perennial Pepperweed	<i>Lepidium latifolium</i>
Peppergrass	<i>Lepidium nitidum</i>
Wild Radish	<i>Raphanus sativus</i>
Tumbling Mustard	<i>Sisymbrium altissimum</i>
Hedge Mustard	<i>Sisymbrium officinale</i>
<b>Cactus Family</b>	<b>Cactaceae</b>
Beavertail Cactus	<i>Opuntia basilaris</i>
Cholla	<i>Opuntia</i>
<b>Honeysuckle Family</b>	<b>Caprifoliaceae</b>
Southern Honeysuckle	<i>Lonicera subspicata</i>
Elderberry	<i>Sambucus mexicana</i>
<b>Pink Family</b>	<b>Caryophyllaceae</b>
Chickweed	<i>Stellaria media</i>
<b>Goosefoot Family</b>	<b>Chenopodiaceae</b>
Four-wing Saltbush	<i>Atriplex canescens</i>
Quail Brush	<i>Atriplex lentiformis</i>
Australian Saltbush	<i>Atriplex semibaccata</i>
Lamb's Quarters	<i>Chenopodium album</i>
Winterfat	<i>Krascheninnikovia lanata</i>
Russian Thistle	<i>Salsola tragus</i>
<b>Morning Glory Family</b>	<b>Convolvulaceae</b>
Wild Morning Glory	<i>Calystegia macrostegia</i>
Bindweed	<i>Convolvulus arvensis</i>
<b>Gourd Family</b>	<b>Cucurbitaceae</b>
Calabazilla	<i>Cucurbita foetidissima</i>
Wild Cucumber	<i>Marah macrocarpus</i>
<b>Dodder Family</b>	<b>Cuscutaceae</b>
Dodder	<i>Cuscuta</i> sp.
<b>Spurge Family</b>	<b>Euphorbiaceae</b>
California Croton	<i>Croton californica</i>
Rattlesnake Weed	<i>Chamaesyce albomarginata</i>
Turkey Mullein	<i>Eremocarpus setigerus</i>
<b>Pea Family</b>	<b>Fabaceae</b>
Wild Licorice	<i>Glycyrrhiza lepidota</i>
Sweetpea	<i>Lathyrus odoratus</i>
Birdsfoot Lotus	<i>Lotus corniculatus</i>
Spanish Clover	<i>Lotus purshianus</i> var. <i>purshianus</i>



Common Name	Scientific Name
Deerweed	<i>Lotus scoparius</i>
Strigose Lotus	<i>Lotus strigosus</i>
Miniature Lupine	<i>Lupinus bicolor</i>
Stinging Lupine	<i>Lupinus hirsutissimus</i>
Bur Clover	<i>Medicago polymorpha</i>
Alfalfa	<i>Medicago sativa</i>
White Sweet Clover	<i>Melilotus alba</i>
Sour Clover	<i>Melilotus indica</i>
Black Locust	<i>Robinia pseudoacacia</i>
Spanish Broom	<i>Spartium junceum</i>
Tree Clover	<i>Trifolium ciliolatum</i>
Tomcat Clover	<i>Trifolium willdenovii</i>
<b>Oak Family</b>	<b>Fagaceae</b>
Coast Live Oak	<i>Quercus agrifolia</i>
Scrub Oak	<i>Quercus berberidifolia</i>
Valley Oak	<i>Quercus lobta</i>
<b>Geranium Family</b>	<b>Geraniaceae</b>
Big Beak Filaree	<i>Erodium botrys</i>
Red Stem Filaree	<i>Erodium cicutarium</i>
White Stem Filaree	<i>Erodium moschatum</i>
<b>Gooseberry Family</b>	<b>Grossulariaceae</b>
Golden Currant	<i>Ribes aureum</i>
<b>Phacelia Family</b>	<b>Hydrophyllaceae</b>
Hierba Santa	<i>Eriodictyon trichocalyx</i>
Baby Blue Eyes	<i>Nemophila menziesii</i>
Caterpillar Phacelia	<i>Phacelia cicutaria</i>
Fern-Leaf Phacelia	<i>Phacelia distans</i>
Branching Phacelia	<i>Phacelia ramosissima</i>
<b>Mint Family</b>	<b>Lamiaceae</b>
Dead Nettle	<i>Lamium amplexicaule</i>
Horehound	<i>Marrubium vulgare</i>
White Sage	<i>Salvia apiana</i>
Chia	<i>Salvia columbariae</i>
Purple Sage	<i>Salvia leucophylla</i>
Black Sage	<i>Salvia mellifera</i>
Vinegar Weed	<i>Trichostema lanceolatum</i>
<b>Mallow Family</b>	<b>Malvaceae</b>
Cheeseweed	<i>Malva parviflora</i>
<b>Myrtle Family</b>	<b>Myricaceae</b>
Blue Gum	<i>Eucalyptus globulus</i>
Red Gum	<i>Eucalyptus camaldulensis</i>
<b>Olive Family</b>	<b>Oleaceae</b>
Flowering Ash	<i>Fraxinus dipetala</i>
European Olive	<i>Olea europea</i>
<b>Evening Primrose Family</b>	<b>Onagraceae</b>



Common Name	Scientific Name
Southern Suncups	<i>Camissonia bistorta</i>
Willow Herb	<i>Epilobium ciliatum</i>
<b>Wood Sorrel Family</b>	<b>Oxalidaceae</b>
Bermuda Buttercup	<i>Oxalis pescaprae</i>
<b>Poppy Family</b>	<b>Papaveraceae</b>
California Poppy	<i>Eschscholzia californica</i>
<b>Plantain Family</b>	<b>Plantaginaceae</b>
Common Plantain	<i>Plantago major</i>
<b>Sycamore Family</b>	<b>Platanaceae</b>
Western Sycamore	<i>Platanus racemosa</i>
<b>Phlox Family</b>	<b>Polemoniaceae</b>
Gilia	<i>Gilia sp.</i>
<b>Buckwheat Family</b>	<b>Polygonaceae</b>
Calif. Wild Buckwheat	<i>Eriogonum fasciculatum</i>
Annual Buckwheat	<i>Eriogonum gracile</i>
Knotweed	<i>Polygonum arenastrum</i>
Curly Dock	<i>Rumex crispus</i>
Dock	<i>Rumex sp.</i>
<b>Buckthorn Family</b>	<b>Rhamnaceae</b>
Chaparral Whitethorn	<i>Ceanothus leucodermis</i>
Red Berry	<i>Rhamnus crocea</i>
Holly-Leaf Red Berry	<i>Rhamnus ilicifolia</i>
<b>Rose Family</b>	<b>Rosaceae</b>
Chamise	<i>Adenostoma fasciculatum</i>
Mountain Mahogany	<i>Cercocarpus betuloides</i>
Toyon	<i>Heteromeles arbutifolia</i>
Holly-Leaf Cherry	<i>Prunus ilicifolia</i>
Himalayan Blackberry	<i>Rubus discolor</i>
Black Berry	<i>Rubus ursinus</i>
<b>Coffee Family</b>	<b>Rubiaceae</b>
Shrubby Bedstraw	<i>Galium angustifolium</i>
Cleavers	<i>Galium aparine</i>
<b>Willow Family</b>	<b>Salicaceae</b>
Black Cottonwood	<i>Populus balsamifera ssp. trichocarpa</i>
Fremont Cottonwood	<i>Populus fremontii ssp. fremontii</i>
Sandbar Willow	<i>Salix exigua</i>
Red Willow	<i>Salix laevigata</i>
Arroyo Willow	<i>Salix lasiolepis</i>
<b>Saxifrage Family</b>	<b>Saxifragaceae</b>
Boykinia	<i>Boykinia rotundifolia</i>
<b>Snapdragon Family</b>	<b>Scrophulariaceae</b>
Heart-Leaf Penstemon	<i>Keckiella cordifolia</i>
Bush Monkey Flower	<i>Mimulus aurantiacus</i>
Penstemon	<i>Penstemon sp.</i>
California Bee Plant	<i>Scrophularia californica</i>



Common Name	Scientific Name
Speedwell	<i>Veronica sp.</i>
<b>Nightshade Family</b>	<b>Solanaceae</b>
Jimson Weed	<i>Datura wrightii</i>
Tree Tobacco	<i>Nicotiana glauca</i>
Purple Nightshade	<i>Solanum xanti</i>
<b>Tamarisk Family</b>	<b>Tamaricaceae</b>
Tamarisk	<i>Tamarix sp.</i>
<b>Nettle Family</b>	<b>Urticaceae</b>
Stinging Nettle	<i>Urtica dioica</i>
Dwarf Nettle	<i>Urtica urens</i>
<b>Vervain Family</b>	<b>Verbenaceae</b>
Vervain	<i>Verbena lasiostachys</i>
<b>Violet Family</b>	<b>Violaceae</b>
Johnny-Jump-Up	<i>Viola pedunculata</i>
<b>Mistletoe Family</b>	<b>Viscaceae</b>
Sycamore Mistletoe	<i>Phoradendron macrophyllum</i>
<b>Caltrop Family</b>	<b>Zygophyllaceae</b>
Creosote	<i>Larrea tridentata</i>
Puncture Vine	<i>Tribulus terrestris</i>
<b>Monocotyledons</b>	
<b>Palm Family</b>	<b>Arecaceae</b>
Mexican Fan Palm	<i>Washingtonia robusta</i>
<b>Sedge Family</b>	<b>Cyperaceae</b>
Sedge	<i>Carex sp.</i>
Spike-Rush	<i>Eleocharis sp.</i>
<b>Rush Family</b>	<b>Juncaceae</b>
Wire Grass	<i>Juncus sp.</i>
<b>Lily Family</b>	<b>Liliaceae</b>
Blue Dicks	<i>Dichelostemma capitatum</i>
Chaparral Yucca	<i>Yucca whipplei</i>
<b>Grass Family</b>	<b>Poaceae</b>
Giant Reed	<i>Arundo donax</i>
Slender Oats	<i>Avena barbata</i>
Wild Oats	<i>Avena fatua</i>
Rip Gut Brome	<i>Bromus diandrus</i>
Soft Chess	<i>Bromus hordeaceus</i>
Red Brome	<i>Bromus madritensis ssp. rubens</i>
Cheat Grass	<i>Bromus tectorum</i>
Bermuda Grass	<i>Cynodon dactylon</i>
Foxtail Barley	<i>Hordeum murinum</i>
Wild Barley	<i>Hordeum vulgare</i>
Goldentop	<i>Lamarckia aurea</i>
Giant Rye Grass	<i>Leymus condensatus</i>
Rye Grass	<i>Lolium sp.</i>
Coast Range Melic	<i>Melica imperfecta</i>



Common Name	Scientific Name
Annual Bluegrass	<i>Poa annua</i>
Rabbit's Foot Grass	<i>Polypogon monspeliensis</i>
Beard Grass	<i>Schismus barbatus</i>
Needlegrass	<i>Stipa sp.</i>
Fescue	<i>Vulpia sp.</i>
Fescue	<i>Vulpia microstachys</i>
<b>Cattail Family</b>	<b>Typhaceae</b>
Cattail	<i>Typha latifolia</i>

**FAUNA**

Common Name	Scientific Name
<b>Amphibians</b>	
Western Toad	<i>Bufo boreas</i>
Pacific Treefrog	<i>Hyla regilla</i>
Bullfrog	<i>Rana catebeiana</i>
<b>Reptiles</b>	
Zebra-tailed Lizard	<i>Callisaurus draconoides</i>
Western Kingsnake	<i>Lampropeltis getulus</i>
Gopher Snake	<i>Pituophis melanoleucus</i>
Western Fence Lizard	<i>Sceloporus occidentalis</i>
Side-blotched Lizard	<i>Uta stansburiana</i>
<b>Birds</b>	
Double-Crested Cormorant	<i>Phalacrocorax auritus</i>
Great Egret	<i>Ardea alba</i>
Snowy Egret	<i>Egretta thula</i>
Great Blue Heron	<i>Ardea herodias</i>
Mallard	<i>Anas platyrhynchos</i>
Gadwall	<i>Anas strepera</i>
Northern Shoveler	<i>Anas clypeata</i>
Turkey Vulture	<i>Cathartes aura</i>
Northern Harrier	<i>Circus cyaneus</i>
White-Tailed Kite	<i>Elanus leucurus</i>
Sharp-shinned Hawk	<i>Accipiter striatus</i>
Cooper's Hawk	<i>Accipiter cooperii</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
American Kestrel	<i>Falco sparverius</i>
California Quail	<i>Callipepla californica</i>
Common Snipe	<i>Gallinago gallinago</i>
Killdeer	<i>Charadrius vociferus</i>
Rock Pigeon	<i>Columba livia</i>
Band-tailed Pigeon	<i>Columba fasciata</i>
Mourning Dove	<i>Zenaida macroura</i>
Greater Roadrunner	<i>Geococcyx californianus</i>



Common Name	Scientific Name
Barn Owl	<i>Tyto alba</i>
Great Horned Owl	<i>Bubo virginianus</i>
Lesser Nighthawk	<i>Chordeiles acutipennis</i>
Vaux's Swift	<i>Chaetura vauxi</i>
White-throated Swift	<i>Aeronautes saxatalis</i>
Black-chinned Hummingbird	<i>Archilocus alexandri</i>
Anna's Hummingbird	<i>Calypte anna</i>
Costa's Hummingbird	<i>Calypte costae</i>
Rufous Hummingbird	<i>Selasphorus rufus</i>
Allen's Hummingbird	<i>Selasphorus sasin</i>
Belted Kingfisher	<i>Ceryle alcyon</i>
Acorn Woodpecker	<i>Melanerpes formicivorus</i>
Nuttall's Woodpecker	<i>Picoides nuttallii</i>
Ladderback Woodpecker	<i>Camptorhynchus labradorius</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Hairy Woodpecker	<i>Picoides villosus</i>
Northern Flicker	<i>Colaptes auratus</i>
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>
Olive-sided Flycatcher	<i>Contopus cooperi</i>
Western Wood-Pewee	<i>Contopus sordidulus</i>
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>
Black Phoebe	<i>Sayornis nigricans</i>
Say's Phoebe	<i>Sayornis saya</i>
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
Western Kingbird	<i>Tyrannus verticalis</i>
Horned Lark	<i>Eremophila alpestris</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Violet-green Swallow	<i>Tachycineta thalassina</i>
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
Barn Swallow	<i>Hirundo rustica</i>
Western Scrub-Jay	<i>Aphelocoma californica</i>
American Crow	<i>Corvus brachyrhynchos</i>
Common Raven	<i>Corvus corax</i>
Mountain Chickadee	<i>Poecile gambeli</i>
Oak Titmouse	<i>Baeolophus inornatus</i>
Bushtit	<i>Psaltriparus minimus</i>
Rock Wren	<i>Salpinctes obsoletus</i>
Canyon Wren	<i>Catherpes mexicanus</i>
Bewick's Wren	<i>Thryomanes bewickii</i>
Marsh Wren	<i>Cistothorus palustris</i>
House Wren	<i>Troglodytes aedon</i>
Ruby-crowned Kinglet	<i>Regulus calendula</i>
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>
Western Bluebird	<i>Sialia mexicana</i>



Common Name	Scientific Name
Swainson's Thrush	<i>Catharus ustulatus</i>
Hermit Thrush	<i>Catharus guttatus</i>
American Robin	<i>Turdus migratorius</i>
American Pipit	<i>Anthus rubescens</i>
Wrentit	<i>Chamaea fasciata</i>
Northern Mockingbird	<i>Mimus polyglottos</i>
California Thrasher	<i>Toxostoma redivivum</i>
Sage Thrasher	<i>Oreoscoptes montanus</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
Phainopepla	<i>Phainopepla nitens</i>
Loggerhead Shrike	<i>Lanius ludovicianus</i>
European Starling	<i>Sturnus vulgaris</i>
Cassin's Vireo	<i>Vireo cassinii</i>
Hutton's Vireo	<i>Vireo huttoni</i>
Warbling Vireo	<i>Vireo gilvus</i>
Orange-crowned Warbler	<i>Vermivora celata</i>
Yellow Warbler	<i>Dendroica petechia</i>
Yellow-Rumped Warbler (Audubon's)	<i>Dendroica coronata</i>
Yellow-rumped Warbler (Myrtle's)	<i>Dendroica coronata</i>
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>
Townsend's Warbler	<i>Dendroica townsendi</i>
MacGillivray's Warbler	<i>Oporornis tolmiei</i>
Common Yellowthroat	<i>Geothlypis trichas</i>
Wilson's Warbler	<i>Wilsonia pusilla</i>
Western Tanager	<i>Piranga ludoviciana</i>
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
Spotted Towhee	<i>Pipilo maculatus</i>
California Towhee	<i>Pipilo crissalis</i>
Chipping Sparrow	<i>Spizella passerina</i>
Lark Sparrow	<i>Chondestes grammacus</i>
Savannah Sparrow	<i>Passerculus sandwichensis</i>
Fox Sparrow	<i>Passerella iliaca</i>
Song Sparrow	<i>Melospiza melodia</i>
Lincoln's Sparrow	<i>Melospiza lincolni</i>
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Dark-eyed Junco (Oregon)	<i>Junco hyemalis</i>
Dark-eyed Junco (Slate-colored)	<i>Junco hyemalis</i>
Western Meadowlark	<i>Sturnella neglecta</i>
Brown-headed Cowbird	<i>Molothrus ater</i>
Red-winged Blackbird	<i>Agelaius phoeniceus</i>
House Finch	<i>Carpodacus mexicanus</i>
Lesser Goldfinch	<i>Carduelis psaltria</i>
American Goldfinch	<i>Carduelis tristis</i>
House Sparrow	<i>Passer domesticus</i>



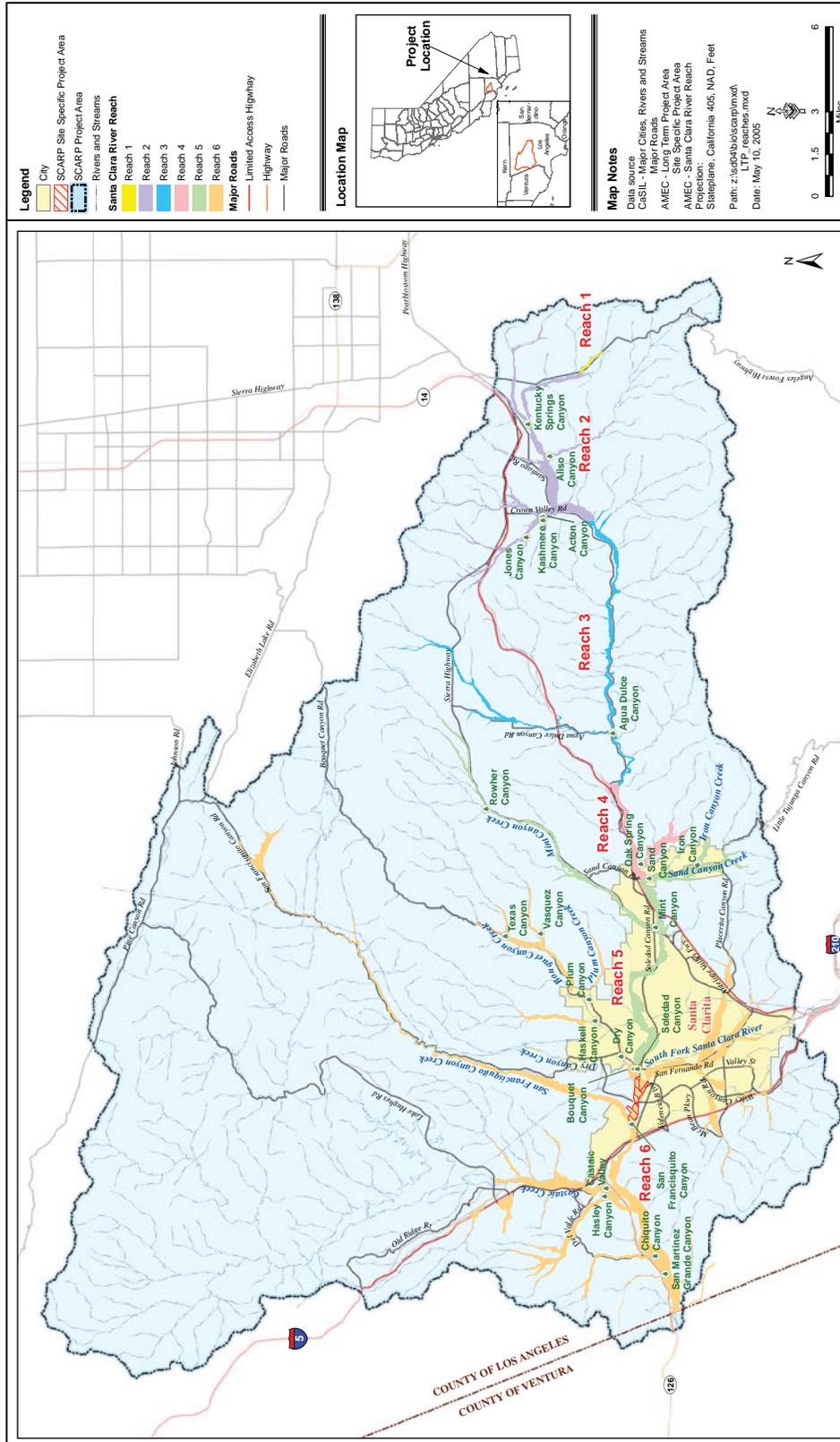
Common Name	Scientific Name
<b>Mammals</b>	
Coyote	<i>Canis latrans</i>
Opossum	<i>Didelphis marsupialis</i>
Black-tailed Jackrabbit	<i>Lepus californicus</i>
Bobcat	<i>Lynx rufus</i>
Striped Skunk	<i>Mephitis mephitis</i>
White-footed Woodrat	<i>Neotoma fuscipes</i>
Desert Woodrat	<i>Neotoma lepida</i>
Deer Mouse	<i>Peromyscus fasciculatus</i>
Raccoon	<i>Procyon lotor</i>
California Ground Squirrel	<i>Spermophilus beecheyi</i>
Audubon's Cottontail	<i>Sylvilagus audubonii</i>
Valley Pocket Gopher	<i>Thomomys bottae</i>

<sup>1</sup>Observations made during mainstem vegetation mapping in 2004 and 2005.



6.0 DESCRIPTION OF PROJECT AREA REACHES

Figure 6-a: Upper Santa Clara River Watershed - Santa Clara River Reaches



Upper Santa Clara River Watershed - Santa Clara River Reaches  
 Arundo and Tamarisk Removal Program Project Area



**6.1 Reach 1: Eastern Project Boundary to Angeles Forest Highway**

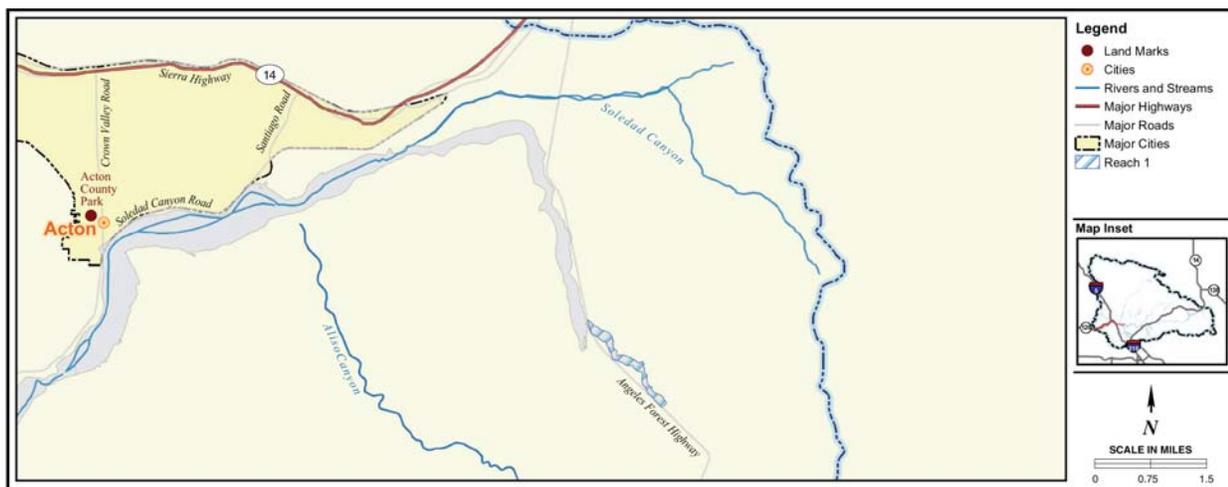
Table 6-1: Reach 1 Characteristics	
Length	3.6 miles
Floodplain Width	250-500 feet
Surface Area	50.8 acres
Tributaries	None
Eastern Boundary	Headwaters of Kentucky Springs Canyon and Soledad Canyon.
Western Boundary	Crossing of Angeles Forest Highway over Kentucky Springs Canyon.
Major Access Roads	Angeles Forest Highway; Kentucky Springs Canyon Road; Mount Emma Rd; BP&L Road; Seasoned Road
Major Landmarks	Angeles National Forest

Table 6-2: Reach 1 Channel Cover Characteristics	
Native Vegetation	Acreage
Big Sagebrush ( <i>Artemisia tridentata</i> )	24.8
Chamise ( <i>Adenostoma fasciculatum</i> )	15.0
California Juniper ( <i>Juniperus californica</i> )	4.5
Hinds Walnut ( <i>Juglans hindsii</i> )	3.7
Target Species	
Arundo (100% coverage)	0.0
Arundo (Total)	0.0
Tamarisk (100% coverage)	0.0
Tamarisk (Total)	0.0
Other	
Channel	0.0
Developed	0.2

**6.1.1 Access and Staging**

Access to Reach 1 is provided by the Angeles Forest Highway, which runs parallel to the reach for nearly its entire length (Figure 6-1). Additional access is available via Mount Emma Road for the eastern end of the reach and BP&L Road for the western end of the reach. If needed, sufficient area to accommodate staging areas exists near bridges and areas of public right-of-way.

**Figure 6-1: Reach 1 at a Glance**



6.2 *Reach 2: Angeles Forest Highway to Acton*

<b>Length</b>	8.0 miles
<b>Floodplain Width</b>	350-2,250 feet
<b>Surface Area</b>	1,064 acres
<b>Tributaries</b>	Jones, Kashmere, Acton, and Aliso Canyons
<b>Eastern Boundary</b>	Angeles Forest Highway at Kentucky Springs Canyon.
<b>Western Boundary</b>	Arrastre Canyon Road
<b>Major Access Roads</b>	Kentucky Springs Canyon Road; Aliso Canyon Road; Juniper Ridge Lane
<b>Major Landmarks</b>	Angeles National Forest

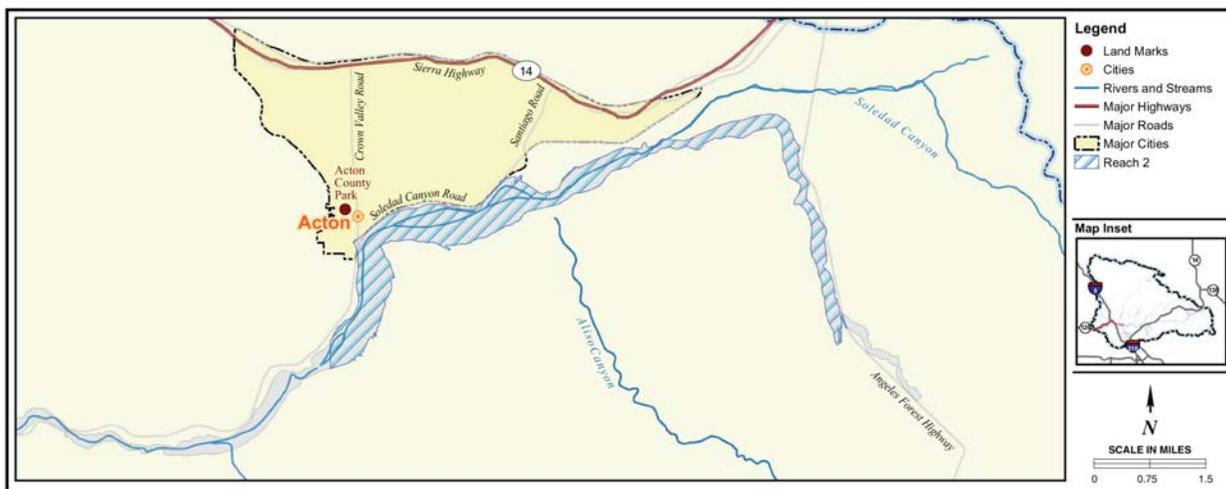
Native Vegetation	Acreage
California Juniper-Big Sagebrush-Rabbitbrush	338.7
Big Sagebrush	225.1
Big Sagebrush-Scale-Broom	164.3
California Juniper	26.4
<b>Target Species</b>	
Arundo (100% coverage)	0.0
Arundo (Total)	0.0
Tamarisk (100% coverage)	0.0
Tamarisk (Total)	2.5
<b>Other</b>	
Channel	13.8
Developed	219.3

6.2.1 *Access and Staging*

Reach 2 is generally accessible by Angeles Forest Highway in the east and Carson Mesa Road, Soledad Canyon Road, and Crown Valley Road at the western end (Figure 6-2). Access to the Santa Clara River is readily available throughout Reach 2 via several roads that cross the streambed at-grade.

As previously mentioned, the streambed is widest at the west end and could potentially provide vehicular access to the tamarisk infestation. The areas of tamarisk infestation within Reach 2 are adjacent to Crown Valley Road and likely occur on private property. Staging areas are available on areas of public right-of-way, but access to these stands may be contingent on the cooperation of private landowners in the area.

Figure 6-2: Reach 2 at a Glance



### 6.3 Reach 3: Acton to Spring Canyon

Table 6-5: Reach 3 Characteristics	
<b>Length</b>	11.4 miles
<b>Floodplain Width</b>	250-1,200 feet
<b>Surface Area</b>	755 acres
<b>Tributaries</b>	Agua Dulce Canyon
<b>Eastern Boundary</b>	Arrastre Canyon Road in Acton
<b>Western Boundary</b>	Spring Canyon - 0.5 mile after Capra Road intersects with Soledad Canyon Road
<b>Major Access Roads</b>	Soledad Canyon Road; Crown Valley Road; Heffner Road; Bootlegger Canyon Road; Briggs Road; Agua Dulce Canyon Road; Capra Road
<b>Major Landmarks</b>	Thousand Trails Campground; Cypress Park; Robin's Nest Campground; Oasis Park; White Rock Lake; River's End Campground

#### 6.3.1 Access and Staging

Reach 3 is generally accessed by Soledad Canyon Road and Crown Valley Road (Figure 6-3). Direct access to the eastern-most stands of arundo and tamarisk in the Santa Clara River is available via Heffner and Bootlegger Canyon Roads and via several at-grade "Arizona crossings" of the riverbed.

West of Soledad Canyon Road's river crossing, access becomes more challenging. Soledad Canyon Road travels along the length of the Santa Clara River but its location ranges between 50 and 300 feet north of the riverbed. Access to the arundo and tamarisk infestations located near Indian Canyon Road may be easiest to access via the privately owned Robin's Nest Campground. If permission is granted by the landowners, this campground may also provide a good staging area. There is also potential access to the target species via the USFS Soledad Campground located off of Briggs Road. At the time of this writing, the campground appears to be closed and to have suffered substantial damage from flooding, but it should still qualify as a good access point and potential staging area in the future.

Soledad Canyon Road crosses back to the north side of the Santa Clara River near where the Agua

Table 6-6: Reach 3 Channel Cover Characteristics	
Native Vegetation	Acreage
Fremont Cottonwood	329.4
Big Sagebrush	54.0
Mixed Willow	27.3
Mulefat	10.0
Target Species	
Arundo (100% coverage)	6.8
Arundo (Total)	111.1
Tamarisk (100% coverage)	1.0
Tamarisk (Total)	30.2
Other	
Channel	141.6
Developed	119.6

Dulce tributary empties into the mainstem. Located off of Soledad Canyon Road, private roads provide access to areas of arundo and tamarisk surrounding the Agua Dulce tributary; requests to gain access to these areas would require cooperation with owners of the residences bordering the river both upstream and downstream. Once access to the river is established, the channel is often wide enough to accommodate a vehicle. However, vehicle use will need to be carefully regulated and may be severely restricted to avoid impacts to the endangered arroyo toad. Coordination with the USFWS will be required prior to using a vehicle in the river channel.

Capra Road may be used to access the dense stands of arundo located near the Soledad Canyon Tunnel, at the river bend near the end of Reach 3. There is a dirt access road directly off of Capra Road into the channel. Again, the channel in this section is wide enough to accommodate a vehicle. A private campground called River's End borders the Santa Clara River at the point where the infestation is thickest. While access to the infestation may be granted through the channel via Capra Road, there may need to be coordination with the owners of the River's End campground to ensure they are aware of the project and to possibly request removal of any arundo used as landscaping on the property.

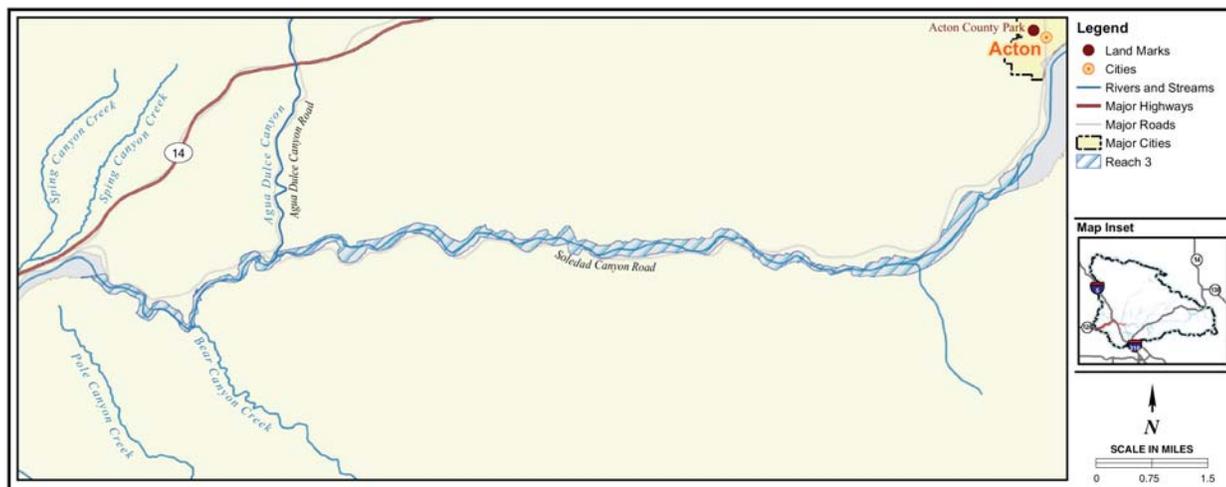
Staging areas in Reach 3 will either be in campgrounds, just off of access roads, or possibly in the channel. Soledad Canyon Road itself offers little in the way of a shoulder or public right-of-way where crews could park their vehicles. In some instances, cooperation of private landowners would need to be obtained to access target species.



Scientific Name	Common Name	Status	Habitat
<i>Bufo californicus</i>	Arroyo toad	Federal/State Endangered	Potential throughout Reach; known from above Agua Dulce to western Reach boundary
<i>Empidonax traillii extimus</i>	Southwestern willow flycatcher	Federal/State Endangered	Potential throughout Reach
<i>Gasterosteus aculeatus williamsoni</i>	Unarmored threespine stickleback	Federal/State Endangered	Known from Arrastre Canyon downstream eight miles to Rivers End Campground
<i>Dodecahema leptoceras</i>	Slender-horned spineflower	Federal/State Endangered, CNPS List 1B	Sandy soils in alluvial fans; known in Bee Canyon
<i>Catostomus santaanae</i>	Santa Ana sucker	Federal Threatened	Swift flowing stretches of river
<i>Gila orcutti</i>	Arroyo chub	State Candidate/Species of Special Concern	Potential throughout Reach
<i>Phrynosoma coronatum blainvillei</i>	Coast horned lizard	State Candidate/Species of Special Concern	Upland species
<i>Dendroica petechia brewsteri</i>	Yellow warbler	Species of Special Concern	Potential throughout Reach
<i>Calochortus plummerae</i>	Plummer's mariposa lily	CNPS List 1B	Upland species

Sources: CDFG 2004; AMEC 2004.

**Figure 6-3: Reach 3 at a Glance**



### 6.3.2 Tributaries

#### Agua Dulce Canyon

Agua Dulce Canyon Road provides the only access to Agua Dulce Canyon. The town of Agua Dulce borders the northern and western edge of Vasquez Rocks County Park.

#### Access and Staging

Access to target species in Agua Dulce Canyon will be via Agua Dulce Canyon Road. In the upper part of the canyon, there are several private establishments between the road and the tributary that may offer sufficient access and staging area potential, including Movie Ranch, Sweetwater, and Vasquez Paradise Park. Removal projects in the upper portions of this canyon would need to be coordinated with the appropriate landowner.

Closer to the intersection with the mainstem, the canyon narrows and becomes steeper. Agua Dulce Canyon Road crosses back and forth over the tributary several times towards the base of the canyon. While the terrain does not offer an ideal access point or staging area in the lower portion of this canyon, access may be achieved using undeveloped land and public right-of-way off of Agua Dulce Canyon Road.

The target species are concentrated at the bottom of the Agua Dulce Canyon. This area may be accessed via the mainstem as described in the *Access and Staging* discussion above.

### 6.4 Reach 4: Spring Canyon to Sand Canyon

Length	3.9 miles
Floodplain Width	350-1,800 feet
Surface Area	443 acres
Tributaries	None
Eastern Boundary	Spring Canyon - 0.5 mile after Capra Road intersects with Soledad Canyon Road
Western Boundary	Sand Canyon Road
Major Access Roads	Soledad Canyon Road; Land Station Road; Lost Canyon Road; Oak Spring Canyon Road
Major Landmarks	Lang Station; Lost Canyon; Sand Canyon Self Store

Native Vegetation	Acreage
Scalebroom ( <i>Lepidospartum squamatum</i> )	56.7
Mule fat ( <i>Baccharis salicifolia</i> )	31.7
Big Sagebrush ( <i>Artemisia tridentata</i> )	30.3
California Buckwheat ( <i>Eriogonum fasciculatum</i> )	23.6
Target Species	
Arundo (100% coverage)	1.4
Arundo (Total)	70.7
Tamarisk (100% coverage)	0.0
Tamarisk (Total)	21.3
Other	
Channel	160.4
Developed	91.1



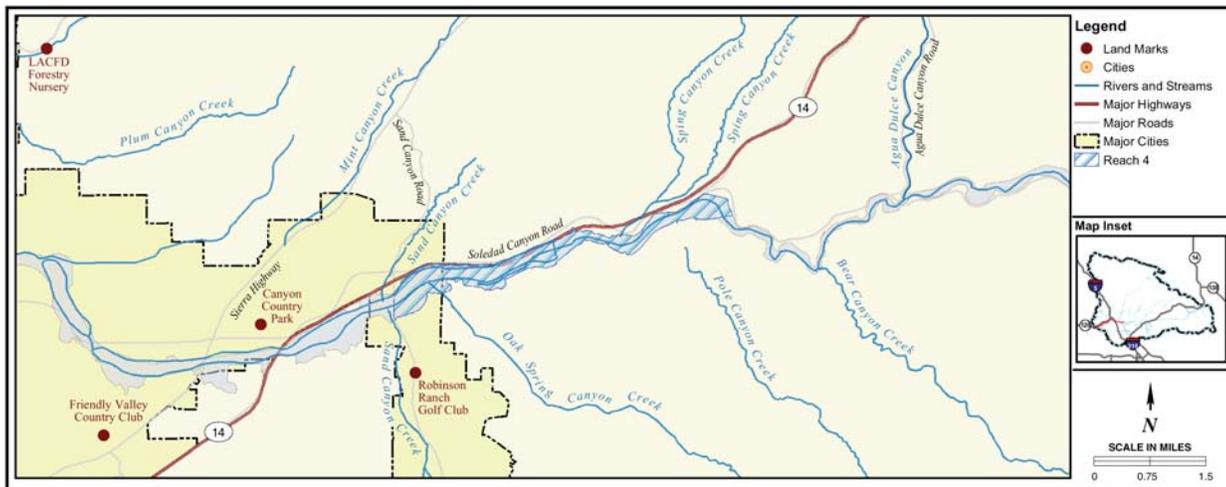
### 6.4.1 Access and Staging

The eastern section of Reach 4 is relatively inaccessible due to a lack of public roadways (Figure 6-4). For much of this reach, State Route 14 sits between Soledad Canyon Road and the Santa Clara River, making access even more difficult. Primary access to the eastern infestations may be either via Capra Road (described in Reach 3) or via the River's End Campground if permission is obtained. Access to the targeted species located near the center of the reach would be off Lang Station Road, which is used for heavy truck access to the mining areas within the floodplain. If permitted, a staging area could be established on the north bank of the Santa Clara River off Lang Station Road. The streambed west of Lang Station Road appears passable by vehicle.

Access to the western portion of Reach 4 is available from the south bank near the junction of Lost Canyon Road and Oak Spring Canyon Road. This area is suitable for staging and would provide limited access to stands of target species both upstream and downstream. The streambed in this area is wide and flat and would also be accessible to vehicles.

Norland Drive is a gated road off of Oak Spring Canyon Road providing access to mining activity upstream. With permission, it could provide an alternate access point to the western portion of Reach 4 and could be used for staging and removal of larger stands of arundo and tamarisk.

Figure 6-4: Reach 4 at a Glance



6.5 Reach 5: Sand Canyon to Bouquet Canyon

<b>Length</b>	7.9 miles
<b>Floodplain Width</b>	500-2,500 feet
<b>Surface Area</b>	1,277 acres
<b>Tributaries</b>	Mint Canyon; Sand Canyon
<b>Eastern Boundary</b>	Sand Canyon Road
<b>Western Boundary</b>	Bouquet Canyon Road
<b>Major Access Roads</b>	Soledad Canyon Road; Golden Triangle Road; Lost Canyon; Woodfall Road; Sand Canyon Road; Sierra Highway
<b>Major Landmarks</b>	Rio Vista Elementary School; Sulphur Springs School; Pinecrest Toddler and Middle Schools; Greenbrier; Central Park; River Park; Canyon Country Park; Adult Day Health Care; Canyon Center Shopping Center

Native Vegetation	Acreage
Scalebroom ( <i>Lepidospartum squamatum</i> )	108.5
Nonnative grassland	96.0
Big Sagebrush ( <i>Artemisia tridentata</i> )	91.8
Mule fat ( <i>Baccharis salicifolia</i> )	74.7
Target Species	
<i>Arundo</i> (100% coverage)	1.7
<i>Arundo</i> (total)	98.7
<i>Tamarisk</i> (100% coverage)	17.7
<i>Arundo</i> (Total)	202.5
Other	
Developed	359.7
Channel	404.0

6.5.1 Access and Staging

Lost Canyon Road and Woodfall Road on the northern bank of the mainstem provide excellent access points and potential staging areas for target species removal in the eastern portion of the reach (Figure 6-5). Additional access to this end of the reach may be available from the Santa Clara River Recreational Trail, which extends from this area west adjacent to the north bank of the Santa Clara River until it crosses Soledad Canyon Road. Given past development approvals in this area, large portions of the Santa Clara River may be under either public ownership or include easements permitting public vegetation maintenance (flood control) activities.

A few small stands of arundo and little or no tamarisk are present in the middle portion of this reach. Access to this portion is more difficult, but

may be obtained through a Los Angeles County access road behind a locked gate east of Langside Avenue or from the streambed from access points further up or downstream.

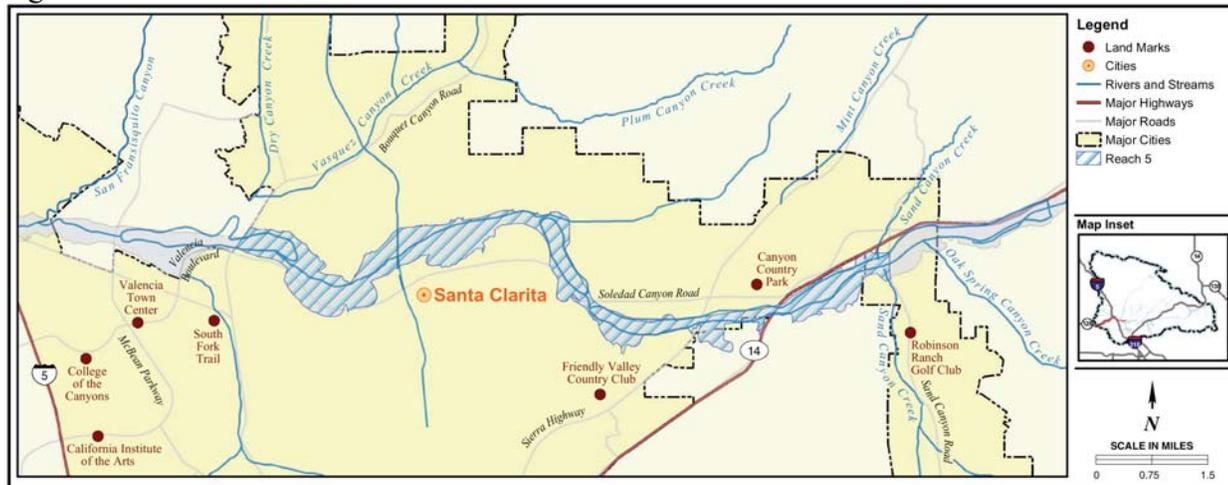
The Chuck Pontius Commuter Rail Trail runs adjacent to the Santa Clara River’s south bank for approximately 1.5 miles, from the Metrolink Santa Clara Clarita Station to Reach 5’s western boundary. This trail provides designated access points and staging areas for the site-specific demonstration project area (discussed in more detail in Reach 6) within the Reach 6 boundary and could potentially be used for staging and access to arundo and tamarisk infestations in the western extent of Reach 5. Santa Clara River access to this section from the north bank would require entry through the gate at the eastern end of Newhall Ranch Road.



Table 6-12: Sensitive Species Located in Reach 5			
Scientific Name	Common Name	Status	General Location
<i>Gasterosteus aculeatus williamsoni</i>	Unarmored threespine stickleback	Federal/State Endangered	Near Dry Canyon Creek
<i>Dodecahema leptoceras</i>	Slender-horned spineflower	Federal/State Endangered, CNPS List 1B Rare, Threatened, Endangered	Sandy soils/alluvial fans
<i>Navarretia fossalis</i>	Spreading navarretia	Federal Threatened, CNPS List 1B Rare, Threatened, Endangered	Along stream channel banks
<i>Phrynosoma coronatum</i>	Coast horned lizard	State candidate	Upland habitats
<i>Cnemidophorus tigris</i>	Western whiptail	State candidate	Upland habitats
<i>Scaphiopus hammondi</i>	Western spadefoot toad	State candidate	Western half of reach
<i>Gila orcutti</i>	Arroyo chub	State candidate	Near Dry Canyon Creek

Source: CDFG 2001; AMEC 2004.

Figure 6-5: Reach 5 at a Glance



## 6.5.2 *Tributaries*

### *Sand Canyon Tributaries*

Sand Canyon Road provides primary access to Sand Canyon, Iron Canyon, and Oak Spring Canyon. Iron Canyon Road and Oak Spring Canyon Road provide the main access to their respective tributaries and can be reached from Sand Canyon Road. Although mapping of the 500-year floodplain indicates these tributaries should be broad, the construction of rural residences, ranches, and a golf course has included measures to constrict the stream channel.

### *Mint Canyon Tributaries*

#### *Access and Staging*

Mint Canyon is approximately 13.6 miles long from its headwaters in Angeles National Forest to its confluence with the Santa Clara River. Primary access

to the canyon is from Sierra Highway, which winds along the lower 10.5 miles of the tributary. The majority of land in the lowest three miles of the canyon is developed in urban and suburban uses. The land use transitions to rural residential and more open space further up the canyon. Rowher Canyon is located about eight miles upstream from the mainstem and winds in and out of Angeles National Forest. Rowher Canyon Road provides access to Rowher Canyon as well as access to Rowher Flats, an off-highway vehicle area on USFS land. Sleepy Valley, a community of rural residences, is located about 0.75 miles upstream from Rowher Canyon in Mint Canyon. Upstream from Sleepy Valley, Mint Canyon creek enters Angeles National Forest and is accessible by unpaved, unmaintained roads.



6.6 Reach 6: Bouquet Canyon to Ventura County Line

<b>Length</b>	11.0 miles
<b>Floodplain Width</b>	700-3,000 feet
<b>Surface Area</b>	1,830 acres
<b>Tributaries</b>	Bouquet Canyon; San Francisquito Canyon; Castaic Creek; Hasley Canyon; Chiquito Canyon; South Fork
<b>Eastern Boundary</b>	Bouquet Canyon
<b>Western Boundary</b>	Ventura County/Los Angeles County Line
<b>Major Access Roads</b>	Soledad Canyon Road; The Old Road; Feedmill Road; Henry Mayo Drive; Highway 126; Seasoned Road
<b>Major Landmarks</b>	Six Flags Magic Mountain; Valencia Water Reclamation Plant; Bridgeport Community; Valencia Mart Shopping Center

Native Vegetation	Acreage
Fremont Cottonwood ( <i>Populus fremontii</i> )	401.6
Mixed Willow	166.2
Mule fat ( <i>Baccharis salicifolia</i> )	22.4
Big Sagebrush ( <i>Artemisia tridentata</i> )	21.5
Target Species	
Arundo (100% coverage)	2.7
Arundo (Total)	464.3
Tamarisk (100% coverage)	2.6
Tamarisk (Total)	190.3
Other	
Channel	611.6
Agriculture	379.4

In Reach 6, extensive infestations of arundo and tamarisk are often heavily intermixed with high value native riparian vegetation. The infestations are described extending from east to west below:

1. In the Site Specific Project Area, heavy infestations of arundo and tamarisk intermixed with important cottonwood and willow woodlands over 297 acres from Bouquet Canyon Road extending downstream past the confluence with San Francisquito Creek, including the lower reaches of San Francisquito and Bouquet Canyons. This area is currently planned and funded for removal in late summer and fall of 2005.
2. Low-to-moderate density arundo infestations extending 500 feet downstream of the San Francisquito Creek confluence to the I-5 bridge. This infestation is heavily intermixed with cottonwood and mixed willow woodland and occurs in an area of known arroyo toad and unarmored threespine stickleback populations.
3. Low-to-moderate density arundo infestations along the Santa Clara River's south bank extending

from the I-5 bridge downstream for almost two miles, heavily intermixed with cottonwood forest and associated willow species. This is an area of known least Bell's vireo activity and appears to have supported southwestern willow flycatcher nesting.

4. Medium-to-high density arundo infestations and one stand of tamarisk along the north bank of the Santa Clara River extending from the I-5 bridge almost two miles downstream to the confluence with Castaic Creek. This infestation is heavily intermixed with mixed willow woodland and cottonwood forest. Known sensitive species occurrences here include sightings of horned lark and yellow billed cuckoo and nesting by tricolored blackbirds.
5. Low-to-moderate arundo infestations extending from Castaic Creek more than three miles downstream to the County boundary. These infestations are broken up by agricultural land and open channel, but are often intermixed with a variety of native habitats, primarily cottonwood and mixed willow woodlands.



### 6.6.1 Access and Staging

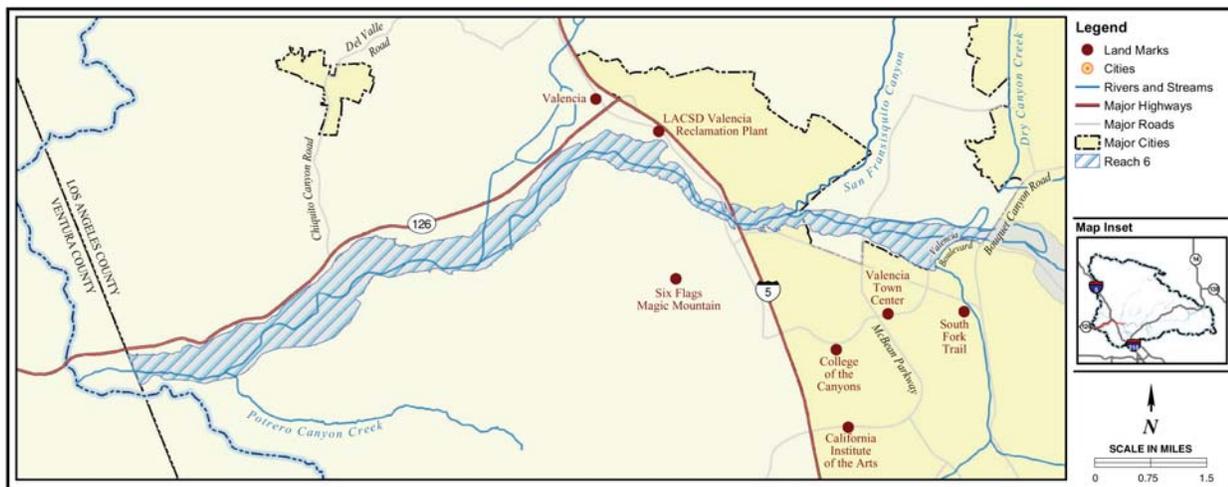
Nearly all of the arundo and tamarisk located in Reach 6 that occurs east of I-5 will be removed during implementation of the site-specific demonstration project. Access, staging areas, removal methods, permit coordination, and disposal methods were coordinated during preparation of the Santa Clarita Site Specific Plan. Both access and staging areas along this segment of the reach are generally via public bike paths and open space along the top of the Santa Clara riverbank (Figure 6-6).

On the west side of I-5, most arundo occurs on or in areas surrounded by private property, owned by Newhall Land and Farming Company. Access to many of these stands may be possible only with the permission of property owners. One public facility, the Valencia Water Reclamation Plant, may provide adequate access and staging areas to the large arundo stands near the intersection of Rye Canyon Road and The Old Road. These stands of arundo and the minor stands of arundo that occur between the site-specific project's western boundary and I-5 are accessible via the Valencia Water Reclamation Plant, which has access roads that provide direct access into the streambed. For the stands of arundo on the south bank of the Santa Clara River across from the Valencia Water Reclamation Plant, access may be necessary via the north bank, as the south bank is

very steep and surrounded by a chainlink fence. With permission, what appears to be a damaged parking area and property belonging to Six Flags Magic Mountain Theme Park may serve as this staging area. If no water is present in the channel, then the cut arundo may be transported to a staging area set up on the north bank at the Valencia Water Reclamation Plant.

Stands west of the Valencia Water Reclamation Plant have few options for access and all potential access would be through private land. The following are potential options that may be pursued with the permission of landowners. From the north bank, the densest stands of arundo may be accessed via the private (gated) road that continues beyond Castaic Canyon Road (Castaic Canyon Road is accessed off of Henry Mayo Road). The back side of Valencia Travel Village, a recreational vehicle park located off of Highway 126, offers ideal north bank access to the streambed and adequate room for a staging area in an area surrounded by stands of arundo. From this point west, any access to the Santa Clara River would be via private land belonging to Newhall Land and Farming Company. Private (gated) roads belonging to the Newhall Land and Farming Company, including Seasoned Road and Pico Canyon Road, would offer both north and south bank access to stands of arundo and tamarisk.

Figure 6-6: Reach 6 at a Glance



<b>Table 6-15: Sensitive Species in Reach 6</b>			
<b>Scientific Name</b>	<b>Common Name</b>	<b>Status</b>	<b>General Location</b>
<i>Bufo californicus</i>	Arroyo toad	Federal/State Endangered	I-5 bridge
<i>Vireo bellii pusillus</i>	Least Bell's vireo	Federal/State Endangered	McBean Parkway downstream to west project boundary
<i>Empidonax traillii extimus</i>	Southwestern willow flycatcher	Federal/State Endangered	Downstream McBean Parkway to west project boundary
<i>Gasterosteus aculeatus williamsoni</i>	Unarmored threespine stickleback	Federal/State Endangered	Between McBean Parkway, west project boundary, lower Castaic Creek and lower San Francisquito Creek
<i>Catostomus santaanae</i>	Santa Ana sucker	Federal Threatened	Between McBean Parkway and The Old Road
<i>Chorizanthe parryi</i> var. <i>fernandina</i>	San Fernando Valley spineflower	Federal/State Candidate, CNPS List 1B	Known on hillsides and tributaries above Reach 6
<i>Gila orcutti</i>	Arroyo chub	State Candidate, Species of Special Concern	Between McBean Parkway and Castaic Creek and in some sections of San Francisquito Creek
<i>Thamnophis hammondi</i>	Two-striped garter snake	State Candidate, Species of Special Concern	Between I-5 and Castaic Creek ponds and aquatic habitats
<i>Scaphiopus hammondi</i>	Western spadefoot toad	State Candidate, Species of Special Concern	Near Bouquet Canyon confluence with the mainstem
<i>Phrynosoma coronatum</i>	Coast horned lizard	State Candidate, Species of Special Concern	Upland dry habitats
<i>Phrynosoma coronatum blainvillei</i>	Coastal western whiptail lizard	State Candidate	Upland dry habitats
<i>Clemmys marmorata pallida</i>	Western pond turtle	Species of Special Concern	Between I-5 and Castaic Creek in permanent ponds and pools
<i>Icteria virens</i>	Yellow breasted chat	Species of Special Concern	McBean Parkway west of project boundary
<i>Dendroica petechia</i>	Yellow warbler	Species of Special Concern	Along cottonwood woodlands
<i>Eremophila alpestris</i>	California horned lark	Species of Special Concern	Grasslands near mainstem and San Francisquito Creek
<i>Agelaius tricolor</i>	Tricolor black bird	Species of Special Concern	Castaic Junction marsh
<i>Lanius ludovicianus</i>	Loggerhead shrike	Species of Special Concern	Coastal scrub and chaparral habitats
<i>Helianthus nuttallii</i> ssp. <i>parishii</i>	Los Angeles sunflower	CNPS List 1A	Known in Reach 6 west of I-5
Sources: RECON 1995; CDFG 2004; Impact Sciences 1995; Guthrie 1988, 1990, 1992, 1995, 1996, 1997, 1998; AMEC 2004; CDFG 2005a; Haglund and Baskin 1995, 2004; Henrickson 1998; CDFG 2005a; Henrickson 1993; USFWS 1996.			



## 6.6.2 Tributaries

### Bouquet Canyon Tributaries

#### Characteristics

The Bouquet Canyon tributaries are located on the north side of the mainstem and include Bouquet Canyon, Dry Canyon, Haskell Canyon, Texas Canyon, Vasquez Canyon, and Plum Canyon. Bouquet Canyon Road is the main road that accesses Bouquet Canyon. Bouquet Canyon joins the mainstem in Santa Clarita near the intersection of Bouquet Canyon Road and Soledad Canyon Road.

#### Access and Staging

North of the Angeles National Forest boundary, access to Bouquet Canyon is available via Bouquet Canyon Road. The tributary is fairly shallow and easily accessed by foot. Staging areas in this area would likely be either in campgrounds or in public right-of-way areas located adjacent to Bouquet Canyon Road.

Access to Bouquet Canyon may be difficult in areas south of the USFS boundary. Multiple parcels of private property, ranchettes, stand between the main access road and the tributary. There are several private roads that

lead between Bouquet Canyon Road and the tributary. This particular part of the tributary is heavily infested with arundo. If permission is granted by the owners of these roads and land parcels, access to the arundo stands should be relatively simple. Another option for access to arundo in this area is just south of the private ranchettes at the intersection of Bouquet Canyon Road and Vasquez Canyon Road. This intersection offers a good access point and staging area for arundo removal. Approximately 0.5 mile north of the channelized portion of the tributary, there is a very dense stand of arundo. A nursery located in this area may provide an ideal access point and staging area. The channel in this area is wide enough to accommodate a vehicle. The Los Angeles County Probation Department has two juvenile probation facilities adjacent to the nursery: Camp Joseph Scott and Camp Kenyon Scutter. These facilities should be considered sensitive receptors and appropriate BMPs should be employed for arundo removal activities.

Scientific Name	Common Name	Status	General Location
<i>Navarretia fossalis</i>	Spreading navarretia	Federal Threatened, CNPS List 1B	Plum Canyon
<i>Scaphiopus hammondi</i>	Western spadefoot toad	State Candidate, Species of Special Concern	Plum Canyon
<i>Orcuttia californica</i>	California Orcutt grass	CNPS List 1B	Plum Canyon
<i>Opuntia basilaris</i>	Short-joint beaver tail	CNPS List 1B	Plum Canyon



**South Fork Tributaries**

**Table 6-17: Sensitive Species in South Fork**

Scientific Name	Common Name	Status	General Location
<i>Dodecahema leptoceras</i>	Slender-horned spineflower	Federal/State Endangered, CNPS List 1B	Sandy soils/alluvial fans, possibly extirpated
<i>Senecio aphanactis</i>	Rayless ragwort	CNPS List 2	Upland species, possibly extirpated
<i>Orcuttia californica</i>	California Orcutt grass	CNPS List 1B	Upland species, possibly extirpated
<i>Calochortus plummerae</i>	Plummer's mariposa lily	CNPS List 1B	Upland species, possibly extirpated
<i>Neotoma lepida intermedia</i>	San Diego desert woodrat	Species of Special Concern	Upland species, possibly extirpated

Source: CDFG 2001.

Access and Staging

The recreational path and residential roads may provide adequate access to the tributaries if needed for future removal efforts. Hacienda Lane may provide access to any arundo stands that become established in Placerita Creek.

**San Francisquito Canyon**

**Table 6-18: Sensitive Species in San Francisquito Canyon**

Scientific Name	Common Name	Status	General Location
<i>Gasterosteus aculeatus williamsoni</i>	Unarmored threespine stickleback	Federal/State Endangered; State Fully Protected	Throughout the canyon
<i>Berberis nevadensis</i>	Nevin's barberry	Federal/State Endangered, CNPS List 1B	Throughout the canyon
<i>Vireo bellii pusillus</i>	Least Bell's vireo	Federal/State Endangered	May be present within scattered stands of willow woodlands (no records)
<i>Rana aurora draytonii</i>	Red legged frog	Federal Endangered	Throughout the canyon
<i>Scaphiopus hammondi</i>	Western spadefoot toad	State Candidate, Species of Special Concern	Between mainstem and intersection of the canyon with San Francisquito Road
<i>Calochortus clavatus</i> var. <i>gracilis</i>	Slender mariposa lily	CNPS List 1B	Near the headwaters

Source: CDFG 2001.

Access and Staging

Access to San Francisquito Canyon is available via San Francisquito Canyon Road. There are several minor private and public roads from San Francisquito Canyon Road that cross San Francisquito at-grade, including Lady Linda Lane and Quail Trail. There is also a recreational trail that borders the tributary from its

intersection with the mainstem to Copper Hill Drive. The tributary is fairly shallow, so direct access off the road should not be a problem. There is also ample public right-of-way space in the lower reaches to provide adequate staging areas for arundo removal projects.



***Castaic Creek Tributaries***

<b>Table 6-19: Sensitive Species in Castaic Creek</b>			
<b>Scientific Name</b>	<b>Common Name</b>	<b>Status</b>	<b>General Location</b>
<i>Vireo bellii pusillus</i>	Least Bell's vireo	Federal/State Endangered	Downstream reaches
<i>Bufo californicus</i>	Arroyo toad	Federal/State Endangered	Upstream of the western finger of Castaic Lake
<i>Catostomus santaanae</i>	Santa Ana sucker	Federal Threatened	Between confluence with the mainstem and intersection with I-5
<i>Chorizanthe parryi</i> var. <i>fernandina</i>	San Fernando Valley spineflower	Federal/State Candidate, CNPS List 1B	On hillsides above creek
<i>Thamnophis hammondi</i>	Two-striped garter snake	State Candidate, Species of Special Concern	Upstream of the western finger of Castaic Lake
<i>Aspidoscelis tigris stejnegeri</i>	Coastal western whiptail	State Candidate	Upstream of the eastern finger of Castaic Lake
<i>Allium howellii</i> var. <i>clokeyi</i>	Mt. Pinos onion	CNPS List 1B	Northwest bank of the western finger of Castaic Lake
<i>Galium grande</i>	San Gabriel bedstraw	CNPS List 1B	Upstream of the eastern finger of Castaic Lake

Source: CDFG 2001.

**Target Species and Access**

Tamarisk and arundo are present in the area of Castaic Creek near where Commerce Center Drive meets Highway 126 and upstream of Castaic Lake on USFS property. If permission is granted, access to Castaic Creek in this area will most likely be via a private access route that goes from Highway 126 just downstream of Commerce Center Drive to the Santa Clara River.

***Hasley Canyon Tributary***

A large construction effort has widened the stream channel near the intersection of Hasley Canyon Road and Commerce Center Drive. Rural residential land surrounds most of Hasley Canyon, although the mouth of the tributary does pass through an unincorporated urbanized area.

***Chiquito Canyon Tributaries***

These canyons are minor tributaries located on the western-most boundary of the project area and can be accessed by Chiquito Canyon Road and San Martinez Road. The stream channels tend to be narrow, and are sometimes paved over at road crossings and other areas to avoid erosion.



## **7.0 UPPER SANTA CLARA RIVER REACH AND TRIBUTARY MAPS**

All maps associated with the SCARP project can be found as individual files within the Appendices folder on the CD.



## 8.0 COOPERATIVE AGREEMENT FOR LANDOWNERS

Landowner's Name: \_\_\_\_\_ No. \_\_\_\_\_  
Operator's Name: \_\_\_\_\_ Acres Owned. \_\_\_\_\_

### **RESOURCE CONSERVATION AGREEMENT**

The DISTRICT Agrees to:

1. Participate in planning a program for soil and water and related resources conservation on the land indicated in the Plan; make soil, environmental and impact surveys and collect other basic data helpful in developing the Resource Conservation Plan; supply maps and furnish a copy of the recommendations and plan to the landowner/operator.
2. Assist in application of the conservation practices recommended and planned.
3. Assist in the initiation and trial of improved conservation and environmental practices, methods, and applications as provided in the Plan.

The LANDOWNER (Farm/Ranch: Owner/Operator) Agrees to:

1. Carry out the soil and water and related resources conservation and environmental practices improvement program and recommendations on the land indicated in the Plan, to the best of his ability including essential maintenance work.
2. Use seed, trees, fertilizers or other materials which may be furnished by the District according to Plan and/or recommendations.
3. Help the District by observing the effects and value of conservation and environmental measures, and informing the Directors about the results obtained.

It is Mutually Agreed:

1. This Agreement shall become effective on the date of the last signature to it. It will remain in force until either party gives written notice to the contrary.
2. It will be cancelled automatically if the land is sold.
3. The Conservation Plan and recommendations which are part of this Agreement, will be revised to keep it current as needed.
4. Neither Party shall be liable for damages to the other's property resulting from carrying out the Plan or recommendations. The District assumes no responsibility for legal establishment of any property and/or boundary lines, water rights or acreages.

Consideration for this Agreement is mutual responsibility for cooperation and assistance between the parties. It is recognized that in carrying out a sound program of conservation operations and environmental improvement recommendations on the land indicated in the Plan, the LANDOWNER (Farmer/Rancher, Owner/Operator) is participating in the District's Program of comprehensive conservation of its soil and water and related land and environmental resources.

Landowner: \_\_\_\_\_ Telephone: \_\_\_\_\_  
(Signature)

Address: \_\_\_\_\_  
(Street) (City) (Zip)

Operator: \_\_\_\_\_ Telephone: \_\_\_\_\_  
(Signature)

Address: \_\_\_\_\_  
(Street) (City) (Zip)

VENTURA COUNTY RESOURCE CONSERVATION DISTRICT

By \_\_\_\_\_ Date: \_\_\_\_\_  
(Signature)



## 9.0 *DETAIL ON HERBICIDES*

There are many types of herbicides that can be used depending on the species, level of infestation, proximity to water, and desired goal. Herbicides must be registered for use in California by the USEPA and the California DPR. Herbicides generally need to be applied with a surfactant. The surfactant helps to achieve optimum efficacy from the herbicide on the plant. In some cases the herbicide will already have the surfactant included, but in other cases it will not and it will be necessary to buy one (e.g., Aquamaster® does not have a surfactant included).

Herbicides work by affecting the physical structures within a plant or a physiological process. Herbicides can be applied by aerial methods (e.g., helicopter) or by ground methods (e.g., backpack sprayer, handwand, or handgun). Contact herbicides affect the cell walls or membranes while systemic herbicides affect the plant physiology. A selective herbicide will only kill plants in certain groups, such as monocots but not dicots, or they can be restricted to specific plant families. Pre-emergence herbicides will kill seeds and seedlings as they emerge while a post-emergence herbicide is used to treat the plant once it has emerged.

Herbicides should be applied according to label directions in order to be effective. Specific directions might be to treat leaves and stems, basal bark, or cut stumps. Thorough coverage is very important. The best time or season to apply herbicides depends upon the specific chemistry and mode of action. Glyphosate, for example, is most effective on perennial species when it is applied in the fall because the herbicide will travel with sugars in the phloem down to the roots. A spring application of glyphosate on a perennial species such as arundo is less effective because the movement of sugars is up into growing stems and leaves. Pressurized sprayers (mounted on an all-terrain vehicle) and the use of ladders is typically helpful where plants are tall, otherwise herbicide would be applied using hand-held sprayers (TNC 2003).

### 9.1 *Types of Applicable Herbicides*

The commonly used herbicides, glyphosphate, imazapyr, and triclopyr and any necessary additives are described below.

#### 9.1.1 *Glyphosate*

Glyphosate is the active ingredient in the retail

products Rodeo®, Aquamaster®, and Roundup®. Glyphosate works by interfering with a plant's protein production system and disrupting its metabolic functions, particularly energy use and growth. Specifically, it controls weeds by inhibiting the synthesis of aromatic amino acids necessary for protein formation in susceptible plants (Tu et al. 2001). This metabolic pathway is not present in humans or other animals and therefore not directly relevant to human health risk assessment. It is systemic in action, transferred through the plant's vascular system from the tissues that absorb it to all parts of the plant. Glyphosate is a non-selective herbicide, generally affecting all species of vascular plants; however, it is strongly adsorbed to soil particles, which prevents it from excessive leaching or from being taken-up from the soil by non-target plants (Tu et al. 2001). This can permit its use in areas of intermixed native and invasive plants. Although it is highly toxic to plants, glyphosate has exceptionally low toxicity to mammals, birds, and fish (Tu, et al. 2001). The USEPA has approved glyphosate for use in aquatic environments.

#### 9.1.2 *Imazapyr*

Imazapyr is the active ingredient in Stalker® and the new aquatic habitat formulation, Habitat® and can be used to treat arundo and tamarisk. Imazapyr is also sold as Arsenal® and Chopper® in other states. Imazapyr is a selective herbicide used for the control of a broad range of weeds including terrestrial annual and perennial grasses and broadleaved herbs, wood species, and riparian and emergency aquatic species (Tu et al. 2001). Imazapyr is absorbed by the leaves and roots and moves rapidly through the plant. It accumulates in the meristem region (active growth region) of the plant, and disrupts protein synthesis, and interferes with cell growth and DNA synthesis. This metabolic pathway is not present in humans or other animals and therefore not directly relevant to human health risk assessment. Imazapyr is strongly adsorbed by soil particles and can remain active in the soil for six months to two years following treatment. It is also highly water-soluble and therefore dissolves in the soil creating a low potential for leaching into groundwater. It has low toxicity to invertebrates and is non-toxic to fish, mammals, and birds (USFS 1995). Unlike glyphosate, imazapyr application to broadleaf (dicot) plants has the potential to cause damage to adjacent non-target plants by transfer between root networks. However, there are anecdotal



observations of its application to monocot plants such as arundo that do not cause damage to adjacent dicots or broad leaf plants.

### 9.1.3 *Triclopyr*

Triclopyr is a selective systemic herbicide used to control woody and herbaceous broadleaf plants along right-of-ways, in forests, grasslands, and parklands. It has little or no impact on grasses (e.g., arundo) but is very effective on tamarisk. It is the active ingredient in Garlon® and Pathfinder® formulations. Triclopyr controls target weeds by mimicking the plant hormone auxin, causing uncontrolled plant growth. This metabolic pathway is not present in humans or other animals and therefore not directly relevant to human health risk assessment. It is most effective with cut-stump or basal bark treatments or with an effective surfactant if applied to the bark and leaves only. Offsite movement through surface or sub-surface runoff is a possibility with triclopyr, as it is relatively persistent and has only moderate rates of adsorption to soil particles. Triclopyr can be found in two formulations: amine or salt (Garlon® 3A) and ester (Garlon® 4 and Pathfinder® II). The ester formulation is not water-soluble and can take significantly longer to degrade. It can bind with the organic fraction of the water column and be transported to soil sediments. Both the amine and ester formulations are relatively non-toxic to terrestrial vertebrates and invertebrates. The ester formulation, however, can be extremely toxic to fish and aquatic invertebrates (Tu et al. 2001).

### 9.1.4 *Adjuvants/Surfactants*

All herbicide labels recommend surfactants and other additives to improve herbicide effectiveness, but a few examples are listed below.

A nonionic surfactant or ammonium sulfate can be added to glyphosate (Aquamaster®, Rodeo®, and Glypro®, and Roundup®) to improve its performance in the aquatic environment. An oil concentrate, nonionic surfactant, or silicone-based surfactant should be added to Imazapyr and triclopyr. Surfactants, also known as sticker/spreaders, are similar to detergents in their action, reducing water surface tension to allow wetting and penetration of the plant tissues. The surfactants approved by the USEPA that are the least toxic include Agridex®, R-11® Spreader Activator, and LI-700®. USFWS opposes the use of R-11® Spreader Activator. Colorants should be added to the herbicide solutions to

enable spray crews to see where they have sprayed after initial evaporation of the solution.

## 9.2 *Herbicide Application Protocol*

The scope of this application protocol is to focus on preventing pesticides, fertilizers, and herbicides from entering the storm drain system and discharging to receiving waters. This protocol is applicable to 1) the outdoor use of pesticides, herbicides, and fertilizers; 2) the use of pesticides and fertilizers where the materials may come into contact with precipitation; 3) the use of pesticides, herbicides, and fertilizers where these materials may come into contact with runoff (natural or induced); and 4) the use of pesticides, herbicides, or fertilizers anywhere where they may be directly or indirectly discharged to a storm drainage system.

This protocol is applicable to any staff and contracted services that apply pesticides, fertilizers, or herbicides. Such staff commonly include, park, public works, purchasing, building/grounds maintenance, hazardous materials, and pesticide application staff.

This protocol is not applicable to the indoor use of pesticides, herbicides, or fertilizers, but is applicable to the consequential outdoor handling, mixing, transport, or disposal of materials related to indoor use. This protocol does not apply when another NPDES permit and/or abatement orders are in effect at the selected site.

Furthermore, this protocol is not intended to replace federal or state requirements or provide complete directions for applying, handling, transporting, mixing, or storing pesticides, fertilizers, or herbicides. Consult federal and state requirements for this additional information. Use information for each pesticide, fertilizer, or herbicide can be found on the manufacturer's label. Additional safety information can be found in chemical-specific material safety data sheets (MSDSs).

### 9.2.1 *Definitions*

**Application** – means the use of the product as a fumigant, direct surface spray, treatment, drench, injection, incorporation, side-dressing, pre-emergent, furrowed spread, or broadcast agent.

**California Department of Pesticide Regulation (CDPR)** – The state agency responsible for regulating the use of pesticides in California.



**Direct On-site Supervision** – A QAC (or QAL, if services contracted) is physically present and available, on-site (within the location as specified in the Monthly Summary Pesticide Use Report Form located on the Colorado Department of Pesticide Regulation website: <http://www.cdpr.ca.gov/docs/pur/forms/enf060.pdf>) to directly manage and control the application (of any pesticide, herbicide, or fertilizer) by supervising others. The QAC or QAL manages and controls the application of pesticides, herbicides, and fertilizers through available verbal communication to include direct interaction, telephones, cellular phones, 800 MHz phones, and radios.

**Feasible** – means capable of being accomplished in a successful manner, within a reasonable period of time, taking into account economic, environmental, social, and technological factors.

**Forecasted Storm Event** – A weather event predicted to commence within the next 24-hour time window, where at least 0.25 inches of rain or more is forecasted to fall.

**Herbicide** – A common pesticide focused on killing weeds and other plants that grow where they are not wanted.

**Manufacturer’s Label** – The main source of information on how to use the product correctly, safely, and legally. The main sections of a label are: common name and brand name, active ingredient, EPA registration number, signal words, first aid, directions for use, and storage/disposal.

**Material Safety Data Sheets (MSDSs)** – An information sheet provided by a chemical manufacturer describing chemical qualities, hazards, safety precautions, and emergency procedures to be followed in case of a spill, fire, or other emergency.

**Non-Routine Application** – A non-scheduled application to include a “one-time” or an “emergency” use of pesticides, herbicides, and fertilizers.

**Notice of Intent (NOI) for Pesticide Usage** – An oral or written notification submitted prior to the use of a restricted use pesticide, pursuant to a permit.

**Pesticide** – Defined by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) as “...any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any insects, rodents, nematodes, fungi, weeds, or any other

forms of life declared to be pests, and any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.

**Qualified Applicator Certificate Holder (QAC)** – Any person who has successfully passed the California State Pesticide Laws and Regulations exam, and qualified in one or more pest control categories and may therefore apply restricted materials, supervise pesticide application, but who is not entitled to supervise the operations of a pest control business.

**Qualified Applicator License Holder (QAL)** – Any person who has successfully passed the California State Pesticide Laws and Regulations exam, and qualified in one or more pest control categories and may therefore apply restricted materials and supervise the pesticide application/operations made by a licensed pest control business.

**Routine Application** – A scheduled (weekly, quarterly, annually, etc.) use of a pesticide, herbicide, or fertilizer to attain a specific goal.

**Signal Word** – Defines approximately how hazardous a pesticide could be to people by using descriptors such as DANGER, WARNING, CAUTION, or DANGER-POISON.

**Storm Event** – A weather event where there is rainfall and measurable precipitation.

**Use** – means any pesticide related activity including: Pre-application to include arranging for application, mixing, loading, and making necessary preparations for application; application of the pesticide; and Post-application activities – control of the treated area, management of the treated area, transportation, storage, disposal of excess pesticides, equipment wash, containers, and cleaning of equipment.

Use does not include emergency responders, commercial transportation, manufacturing, formulating, or packaging.

### 9.2.2 Responsibilities

*Staff shall:*

- Designate a QAC or QAL holder, to provide advice and assistance in all matters related to pesticide usage, disposal of products, and safety.
- Provide pesticide applicators (including contracted businesses) with appropriate record keeping forms to document pesticide use <http://www.cdpr.ca.gov/docs/pur/forms/enf060.pdf>.



- Annually verify that the purchasing, storing, mixing, loading, and safety tasks for pesticide, fertilizer, and herbicide use are in accordance with this protocol, applicable laws, and regulations including the current and valid QAC/QAL certifications.
- Coordinate annual refresher training courses for all pesticide handlers to meet the continuing education requirements.

Pesticide applicators shall:

- Be certified as or under the direct on-site supervision of, a QAC or QAL holder and be properly trained to start work with pesticides, fertilizers, and/or herbicides.
- Follow manufacturer’s label instructions and this SOP. When such instruction is in conflict with this SOP, the label instructions will be followed.
- Follow the policies and procedures established in this application protocol.
- Report any unsafe work practices to their respective supervisors.

### 9.2.3 Environmental Conditions

Environmental conditions (weather and site conditions) required for application of pesticides, fertilizers, and herbicides are dependent upon label. Site conditions are determined by visually (V) observing the area for situations or by collecting information from recognized weather forecasting (F) organizations. For example, storm events can be tracked by using any Internet web link that forecasts rainfall (e.g. [www.weather.com](http://www.weather.com)).

Table 9-1 is provided as a guide to applicators where weather or site conditions may impact the application of the pesticide, fertilizer, or herbicide. Weather/Site conditions must be verified for all listed conditions. Forecasting may be used for other weather/site conditions, but is necessary to establish a 24-hour timeframe prior to actual rainfall. A “Yes” indicates the weather/site conditions where application of pesticides, fertilizers, and herbicides may occur. A “No” indicates weather/site conditions where application of pesticides, fertilizers, and herbicides may not occur.

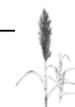
### 9.2.4 Pollution Prevention and Spill Control

Irrigation canals, open trenches, surface waters, wetlands, designated 303(d) waterbodies, and ground-water sources should be noted and application shall be made to prevent contamination of these areas.

In the event that pesticides, fertilizers, and/or herbicides not intended for water application are inadvertently sprayed or spilled into the water sources listed above, the following steps are to be taken:

- Stop all pesticide applications and assess the situation.
- Prevent further contamination of water sources by using control measures such as storm drain inlet protection, absorbent materials, sandbags, or trenching.
- Mark the area where the spill or overspray occurred.

Table 9-1: Pesticide Application Guide			
Weather/Site Conditions	Form of Determining Weather/Site Conditions	Routine Application	Non-routine Application
Wind-free (sufficient to avoid spray drift from point of application)	V	Yes	Yes
Storm events (see definition)*	V	No	No
Within one day of a forecasted storm event (see definition) > 0.25 inches*	V, F	No (except for application of pre-emergents)	No
After a storm event where water is leaching or running*	V	No	No
Water is running off-site*	V	No	No
Rising groundwater*	V	No	No
Ground is saturated	V	No	No



- d. Contact the environmental coordinator in your jurisdiction.
- e. Report the spill to the appropriate department for clean up.
- f. Contact governmental agency of reportable quantities.

to thoroughly wash their hands when in the field),

- Paper or other disposable towels,
- A full tyvek coverall with foot covers, and
- A map and directions to the nearest medical facilities.

### 9.2.5 *Aquatic Pesticide Application*

For control of pests and weeds in open water, storm drainage system, and flood control channel areas, only those materials specifically designed and registered for direct water application may be used. Directions on the labels must be followed as well as evaluating the application for the potential to harm the environment. Currently, the following is required prior to applying an aquatic pesticide.

- a. Directions on the label are followed.
- b. The application site is evaluated prior to application for the potential of the pesticide to harm the environment.

## 9.3 *Training and Documentation*

### 9.3.1 *QAC and QAL Requirements*

Staff (including contracted businesses) will only be used that are under the direct on-site supervision of a QA

### 9.4 *Safety Measures for Using Herbicides (TNC Weed Handbook)*

Work crews will follow all safety measures outlined on herbicide packages and will follow all federal, state, and local regulations regarding herbicide use. Work crews involved in mixing or applying herbicide will wear protective gear consisting of: 1) rubber boots; 2) protective clothing such as long sleeve shirts; 3) overalls or aprons which are not used for other activities; 4) tyvek or nitril rubber gloves; and 5) safety glasses or goggles.

Emergency decontamination kits and first aid kits will be kept at each staging area when herbicide is being applied. Decontamination kits will include:

- Two (or more) 1-gallon containers filled with potable water,
- Eyewash kits or eyewash bottles with buffered isotonic eyewash,
- Hand or body soap (enough for all workers

Herbicides stored at staging areas during the day while work is being performed will be kept on an impermeable surface such as a plastic tarp in a well-ventilated dry area away from any food or drinking water. Heavy plastic garbage bags, a shovel and a soil absorbent will be available for use at each staging area for use in cleaning up small spills or leaks. Herbicides will be transported to and from the project area each day in a tightly sealed container placed in a well-constructed and watertight carrying box such as a plastic tub.

All herbicide solutions will be prepared in the staging area prior to starting work. All herbicides, surfactants, and colorants will be removed from the staging area at the end of each workday. No herbicide or other chemical solution will remain on-site when work crews are not present.

Herbicide application will be carried out during dry weather and low-wind conditions to minimize accidental discharge into waterways and to prevent chemical drift during spraying.



10.0 HERBICIDE LABELS AND MATERIAL SAFETY DATA SHEETS (MSDS)

# Habitat<sup>®</sup>

herbicide

Applications may only be made for the control of undesirable emergent and floating aquatic vegetation in and around standing and flowing water, including estuarine and marine sites. Applications may be made to control undesirable wetland, riparian and terrestrial vegetation growing in or around surface water when applications may result in inadvertent applications to surface water.

**Active ingredient:**

Isopropylamine salt of Imazapyr (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid)\* .....28.7%

**Inert ingredients** .....71.3%

**Total** .....100.0%

\* Equivalent to 22.6% 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid or 2 pounds acid per gallon.

EPA Reg. No. 241-426

U.S. Patent No. 4,798,619

EPA Est. No.

**KEEP OUT OF REACH OF CHILDREN.  
CAUTION/PRECAUCIÓN**

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.  
(If you do not understand the label, find someone to explain it to you in detail.)

**In case of an emergency endangering life or property involving this product, call day or night,  
800-832-HELP.**

See Next Page for Additional Precautionary Statements

For more information, please visit our web site:

[www.vmanswers.com](http://www.vmanswers.com)

Net contents: \_\_\_\_\_



BASF Corporation  
26 Davis Drive  
Research Triangle Park, NC 27709



<b>FIRST AID</b>	
<b>If on skin or clothing</b>	<ul style="list-style-type: none"> <li>• Take off contaminated clothing.</li> <li>• Rinse skin immediately with plenty of water for 15-20 minutes.</li> <li>• Call a poison control center or doctor for treatment advice.</li> </ul>
<b>If in eyes</b>	<ul style="list-style-type: none"> <li>• Hold eye open and rinse slowly and gently with water for 15-20 minutes.</li> <li>• Remove contact lenses, if present, after first 5 minutes, then continue rinsing eye.</li> <li>• Call a poison control center or doctor for treatment advice.</li> </ul>
<b>If inhaled</b>	<ul style="list-style-type: none"> <li>• Move person to fresh air.</li> <li>• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible.</li> <li>• Call a poison control center or doctor for further treatment advice.</li> </ul>
<b>HOT LINE NUMBER</b>	
Have the product container or label with you when calling a poison control center or doctor or going for treatment. You may also contact BASF Corporation for emergency medical treatment information: 1-800-832-HELP (4357).	

**PRECAUTIONARY STATEMENTS**

**HAZARDS TO HUMANS**

**CAUTION!**

Avoid contact with skin, eyes or clothing. Avoid breathing spray mist. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

**PERSONAL PROTECTIVE EQUIPMENT(PPE):**

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category A on an EPA chemical-resistant category selection chart.

Applicators and other handlers must wear:

- Long-sleeve shirt and long pants
- Chemical-resistant gloves, Category A
- shoes plus socks

Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions are given for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

**PHYSICAL AND CHEMICAL HAZARDS**

Spray solutions of **HABITAT® herbicide** should be mixed, stored and applied only in stainless steel, fiberglass, plastic and plastic-lined steel containers.

DO NOT mix, store or apply **HABITAT herbicide** or spray solutions of **HABITAT herbicide** in unlined steel (except stainless steel) containers or spray tanks.

**ENVIRONMENTAL HAZARDS**

DO NOT apply to water except as specified in this label. Treatment of aquatic weeds may result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss may cause the suffocation of some aquatic organisms. Do not treat more than one half of the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in

bands to allow aquatic organisms to move into untreated areas. Do not contaminate water when disposing of equipment washwaters or rinsate.

This pesticide is toxic to vascular plants and should be used strictly in accordance with the drift precautions on the label.

**DIRECTIONS FOR USE**

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

**HABITAT herbicide** should be used only in accordance with recommendations on the leaflet label attached to the container. Keep containers closed to avoid spills and contamination.

**STORAGE AND DISPOSAL**

DO NOT contaminate water, food or feed by storage or disposal.

**PESTICIDE STORAGE:** DO NOT store below 10° F.

**PESTICIDE DISPOSAL:** Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

**CONTAINER DISPOSAL:** Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in an approved sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

**IMPORTANT**

**DO NOT** use on food crops. **DO NOT** apply this product within one-half mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within one-half mile of an active potable water intake in a standing body of water, such as a lake, pond or reservoir. **DO NOT** apply to water used for irrigation except as described in APPLICATION TO WATERS USED FOR IRRIGATION section of this label. Keep from contact with fertilizers, insecticides, fungicides and seeds. **DO NOT** drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the treated soil may be washed or moved into contact with their roots.



**DO NOT** use on lawns, walks, driveways, tennis courts, or similar areas. **DO NOT** side trim desirable vegetation with this product unless severe injury and plant death can be tolerated. Prevent drift of spray to desirable plants.

Clean application equipment after using this product by thoroughly flushing with water.

### GENERAL USE PRECAUTIONS AND RESTRICTIONS

Applications may only be made for the control of undesirable emergent and floating aquatic vegetation in and around standing and flowing water, including estuarine and marine sites. Applications may be made to control undesirable wetland, riparian and terrestrial vegetation growing in or around surface water when applications may result in inadvertent applications to surface water.

Do not apply more than 6 pints of product (1.5 lbs. acid equivalent) per acre per year.

Aerial application is restricted to helicopter only.

Application of **HABITAT® herbicide** can only be made by federal or state government entities or applicators who are licensed or certified applicators making applications under a program sponsored by federal or state government entities.

Treatment to other than non-native invasive species is limited to only those plants that have been determined to be a nuisance by a federal or state government entity.

**Applications to private waters:** Applications may be made to private waters that are still, such as ponds, lakes and drainage ditches where there is minimal or no outflow to public waters.

**Application to public waters:** Applications may be made to public waters such as ponds, lakes, reservoirs, marshes, bayous, drainage ditches, canals, streams, rivers, and other slow-moving or quiescent bodies of water for control of aquatic weeds or for control of riparian and wetland weed species. Applications of **HABITAT herbicide** to public waters can only be made by Federal or State agencies such as Water Management District personnel, municipal officials and the U.S. Army Corps of Engineers or those applicators who are licensed or certified as aquatic pest control applicators and are authorized by the State or local government.

Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.

**Recreational Use of Water in Treatment Area:** There are no restrictions on the use of water in the treatment area for recreational purposes, including swimming and fishing.

**Livestock Use of Water in/from Treatment Area:** There are no restrictions on livestock consumption of water from the treatment area.

**Precautions for Potable Water Intakes:** Do not apply **HABITAT herbicide** directly to water within one-half mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within one-half mile of an active potable water intake in a standing body of water such as lake, pond or reservoir. To make aquatic applications around and within one-half mile of active potable water intakes, the water intake must be turned off during application and for a minimum of 48 hours after the application. These aquatic applications may be made only in the cases where there are alternative water sources or holding ponds, which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications. Note: Existing potable water intakes which are no longer in use, such as those replaced by connections to wells or a municipal water system, are not considered to be active potable water intakes. This restriction does not apply to intermittent, inadvertent overspray of water in terrestrial use sites.

### APPLICATION TO WATERS USED FOR IRRIGATION

Water treated with **HABITAT herbicide** may not be used for irrigation purposes for 120 days after application or until **HABITAT herbicide** residue levels are determined by laboratory analysis, or other appropriate means of analysis, to be 1.0 ppb or less.

**Seasonal Irrigation Waters:** **HABITAT herbicide** may be applied during the off-season to surface waters that are used for irrigation on a seasonable basis, provided that there is a minimum of 120 days between **HABITAT herbicide** application and the first use of treated water for irrigation purposes or until **HABITAT herbicide** residue levels are determined by laboratory analysis, or other appropriate means of analysis, to be 1.0 ppb or less.

**Irrigation Canals/Ditches:** DO NOT apply **HABITAT herbicide** to irrigation canals/ditches unless the 120-day restriction on irrigation water usage can be observed or **HABITAT herbicide** residue levels are determined by laboratory analysis, or other appropriate means of analysis, to be 1.0 ppb or less. DO NOT apply **HABITAT herbicide** to dry irrigation canals/ditches.

**Quiescent or Slow Moving Waters:** In lakes and reservoirs DO NOT apply **HABITAT herbicide** within one (1) mile of an active irrigation water intake during the irrigation season. Applications less than one (1) mile from an inactive irrigation water intake may be made during the off-season, provided that the irrigation intake will remain inactive for a minimum 120 days after application or until **HABITAT herbicide** residue levels



are determined by laboratory analysis, or other appropriate means of analysis, to be 1.0 ppb or less.

**Moving water:** DO NOT apply within one-half mile downstream of an active irrigation water intake. When making applications upstream from an active irrigation water intake, the intake must be turned off for a period of time sufficient to allow the upstream portion of treated water to completely flow past the irrigation intake before use can resume. Shut off time will be determined by the speed of water flow and the distance and length of water treated upstream from the intake. Consult local, state and/or federal authorities before making any applications upstream from an active irrigation water intake.

### GENERAL INFORMATION

**Use Sites:** **HABITAT® herbicide** is an aqueous solution to be mixed with water and a surfactant and applied as a spray solution to control floating and emergent undesirable vegetation (see **AQUATIC WEEDS CONTROLLED** section and the **ADDITIONAL WEEDS CONTROLLED BY HABITAT HERBICIDE** section) in or near bodies of water which may be flowing, non-flowing, or transient. **HABITAT herbicide** may be applied to aquatic sites that include lakes, rivers, streams, ponds, seeps, drainage ditches, canals, reservoirs, swamps, bogs, marshes, estuaries, bays, brackish water, transitional areas between terrestrial and aquatic sites and seasonal wet areas. See **AQUATIC USE** section of this label for precautions, restrictions, and instructions on aquatic uses.

Read and observe the following directions if aquatic sites are present in terrestrial noncrop areas and are part of the intended treatment area:

**Herbicidal Activity:** **HABITAT herbicide** will control most annual and perennial grasses and broadleaf weeds in addition to many brush and vine species with some residual control of undesirable species that germinate above the waterline. **HABITAT herbicide** is readily absorbed through emergent leaves and stems and is translocated rapidly throughout the plant, with accumulation in the meristematic regions. Treated plants stop growing soon after spray application. Chlorosis appears first in the newest leaves, and necrosis spreads from this point. In perennials, the herbicide is translocated into, and kills, underground or submerged storage organs which prevents regrowth. Chlorosis and tissue necrosis may not be apparent in some plant species until two or more weeks after application. Complete kill of plants may not occur for several weeks. Applications of **HABITAT herbicide** are rainfast one hour after treatment.

**HABITAT herbicide does not control plants which are completely submerged or have a majority of their foliage under water.**

**Application Methods:** **HABITAT herbicide** must be applied to the emergent foliage of the target vegetation and has little to no activity on submerged aquatic vegetation. **HABITAT herbicide** concentrations resulting from direct application to water are not expected to be of sufficient concentration nor duration to provide control of target vegetation. Application should be made in such a way as to maximize spray interception by the target vegetation while minimizing the amount of overspray that enters the water. For maximum activity, weeds should be growing vigorously at the time of application and the spray solution should include a surfactant (See **ADJUVANTS** section for specific recommendations). **HABITAT herbicide** may be selectively applied by using low-volume directed application techniques or may be broadcast applied by using ground equipment, watercraft or by helicopter. In addition, **HABITAT herbicide** may also be used for cut stump, cut stem and frill and girdle treatments within aquatic sites (see **AERIAL APPLICATIONS** and **GROUND APPLICATIONS** sections for additional details).

**HABITAT herbicide** should be applied with surface or helicopter application equipment in a minimum of 5 gallons of water per acre. When applying by helicopter, follow directions under the **AERIAL APPLICATIONS** section of this label, otherwise refer to section on **GROUND APPLICATIONS** when using surface equipment.

Applications made to moving bodies of water should be made while traveling upstream to prevent concentration of this herbicide in water. DO NOT apply to bodies of water or portions of bodies of water where emergent and/or floating weeds do not exist.

When application is to be made to target vegetation that covers a large percentage of the surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in the suffocation of some sensitive aquatic organisms. Do not treat more than one half of the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms to move into untreated areas.

Avoid wash-off of sprayed foliage by spray boat or recreational boat backwash for one hour after application.

Apply **HABITAT herbicide** at 2 to 6 pints per acre depending on species present and weed density. DO NOT exceed the maximum label rate of 6 pints per acre (1.5 lb ai/A) per year. Use the higher labeled rates for heavy weed pressure. Consult the **AQUATIC WEEDS CONTROLLED** section and the **ADDITIONAL WEEDS CONTROLLED BY HABITAT HERBICIDE** section of this label for specific rates.



**HABITAT® herbicide** may be applied as a draw down treatment in areas described above. Apply **HABITAT herbicide** to weeds after water has been drained and allow 14 days before reintroduction of water.

### PRECAUTIONS FOR AVOIDING INJURY TO NON-TARGET PLANTS

Untreated desirable plants can be affected by root uptake of **HABITAT herbicide** from treated soil. Injury or loss of desirable plants may result if **HABITAT herbicide** is applied on or near desirable plants, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots. When making applications along shorelines where desirable plants may be present, caution should be exercised to avoid spray contact with their foliage or spray application to the soil in which they are rooted. Shoreline plants that have roots that extend into the water in an area where **HABITAT herbicide** has been applied generally will not be adversely affected by uptake of the herbicide from the water.

If treated vegetation is to be removed from the application site, DO NOT use the vegetative matter as mulch or compost on or around desirable species.

### MANAGING OFF-TARGET MOVEMENT

**Spray Drift:** Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determines the potential for spray drift. The applicator and the entity authorizing spraying are responsible for considering all these factors when making decisions.

Spray drift from applying this product may result in damage to sensitive plants adjacent to the treatment area. Only apply this product when the potential for drift to these and other adjacent sensitive areas (e.g. residential areas, bodies of water, known habitat for threatened or endangered species, or non-target crops) is minimal. Do not apply when the following conditions exist that increase the likelihood of spray drift from intended targets: high or gusty winds, high temperatures, low humidity, temperature inversions.

To minimize spray drift, the applicator should be familiar with and take into account the following drift reduction advisory information. Additional information may be available from state enforcement agencies or the Cooperative Extension on the application of this product.

The best drift management strategy and most effective way to reduce drift potential are to apply large droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see WIND, TEMPERATURE AND HUMIDITY, and TEMPERATURE INVERSIONS).

### CONTROLLING DROPLET SIZE

- Volume - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- Pressure - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- Number of Nozzles - Use the minimum number of nozzles that provide uniform coverage.
- Nozzle Orientation - Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is recommended practice. Significant deflection from the horizontal will reduce droplet size and increase drift potential.
- Nozzle Type - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift. Do not use nozzles producing a mist droplet spray.

### APPLICATION HEIGHT

Making applications at the lowest possible height (helicopter, ground driven spray boom) that is safe and practical reduces exposure of droplets to evaporation and wind.

### SWATH ADJUSTMENT

When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the treatment area, the applicator must compensate for this displacement by adjusting the path of the application equipment (e.g. aircraft, ground) upwind. Swath adjustment distance should increase with increasing drift potential (higher wind, smaller droplets, etc.).

### WIND

Drift potential is lowest between wind speeds of 3-10 mph. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Application should be avoided below 3 mph due to variable wind direction and high inversion potential. NOTE: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

### TEMPERATURE AND HUMIDITY

When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.



### TEMPERATURE INVERSIONS

Drift potential is high during a temperature inversion. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud, which can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

### WIND EROSION

Avoid treating powdery dry or light sandy soils when conditions are favorable for wind erosion. Under these conditions, the soil surface should first be settled by rainfall or irrigation.

### AERIAL APPLICATION METHODS AND EQUIPMENT HELICOPTERS ONLY

**Water Volume:** Use 2 or more gallons of water per acre. The actual minimum spray volume per acre is determined by the spray equipment used. Use adequate spray volume to provide accurate and uniform distribution of spray particles over the treated area and to avoid spray drift.

**Managing spray drift from aerial applications:** Applicators must follow these requirements to avoid off-target drift movement: 1) boom length - the distance of the outermost nozzles on the boom must not exceed  $\frac{3}{4}$  the length of the rotor, 2) nozzle orientation - nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees, and 3) application height - without compromising helicopter safety, applications should be made at a height of 10 feet or less above the crop canopy or tallest plants. Applicators must follow the most restrictive use cautions to avoid drift hazards, including those found in this labeling as well as applicable state and local regulations and ordinances.

### GROUND APPLICATION (BROADCAST)

**Water Volume:** Use 5 or more gallons of water per acre. The actual minimum spray volume per acre is determined by the spray equipment used. Use adequate spray volume to provide accurate and uniform distribution of spray particles over the treated area and to avoid spray drift.

### ADJUVANTS

Postemergence applications of **HABITAT® herbicide** require the addition of a spray adjuvant. Only spray adjuvants that are approved or appropriate for aquatic use should be utilized.

**Nonionic Surfactants:** Use a nonionic surfactant at the rate 0.25% v/v or higher (see manufacturer's label) of the spray solution (0.25% v/v is equivalent to 1 quart in 100 gallons). For best results, select a nonionic surfactant with a HLB (hydrophilic to lipophilic balance) ratio between 12 and 17 with at least 70% surfactant in the formulated product (alcohols, fatty acids, oils, ethylene glycol or diethylene glycol should not be considered as surfactants to meet the above requirements).

**Methylated Seed Oils or Vegetable Oil Concentrates:** Instead of a surfactant, a methylated seed oil or vegetable-based seed oil concentrate may be used at the rate of 1.5 to 2 pints per acre. When using spray volumes greater than 30 gallons per acre methylated seed oil or vegetable based seed oil concentrates should be mixed at a rate of 1% of the total spray volume or alternatively use a nonionic surfactant as described above. Research indicates that these oils may aid in **HABITAT herbicide** deposition and uptake by plants under moisture or temperature stress.

**Silicone Based Surfactants:** See manufacturer's label for specific rate recommendations. Silicone-based surfactants may reduce the surface tension of the spray droplet allowing greater spreading on the leaf surface as compared to conventional nonionic surfactants. However, some silicone-based surfactants may dry too quickly, limiting herbicide uptake.

**Invert emulsions:** **HABITAT herbicide** can be applied as an invert emulsion. The spray solution results in an invert (water-in-oil) spray emulsion designed to minimize spray drift and spray run-off, resulting in more herbicide on the target foliage. The spray emulsion may be formed in a single tank (batch mixing) or injected (in-line mixing). Consult the invert chemical label for proper mixing directions.

**Other:** An antifoaming agent, spray pattern indicator or drift reducing agent may be applied at the product labeled rate if necessary or desired.

### TANK MIXES

**HABITAT herbicide** may be tank-mixed with other aquatic use herbicides for the control of emergent and floating aquatic vegetation.

Consult manufacturer's labels for specific rates and weeds controlled. Always follow the more restrictive label when making an application involving tank-mixes.



**AERIAL APPLICATIONS**

All precautions should be taken to minimize or eliminate spray drift. Helicopters can be used to apply **HABITAT® herbicide**; however, DO NOT make applications by helicopter unless appropriate buffer zones can be maintained to prevent spray drift out of the target area, or when spray drift as a result of helicopter application can be tolerated. Aerial equipment designed to minimize spray drift, such as a helicopter equipped with a Microfoil™ boom, Thru-Valve™ boom or raindrop nozzles, must be used and calibrated. Except when applying with a Microfoil boom, a drift control agent may be added at the recommended label rate. To avoid drift, applications should not be made during inversion conditions, when winds are gusty, or any other conditions which allow drift. Side trimming is not recommended with **HABITAT herbicide** unless death of treated tree can be tolerated.

Uniformly apply the recommended amount of **HABITAT herbicide** in 5 to 30 gallons of water per acre; include in the spray solution a nonionic surfactant or methylated seed oil or manufacturer's label rate of a silicone-based surfactant (See the Adjuvant section of this label for specific recommendations). A foam reducing agent may be added at the recommended label rate, if needed.

**IMPORTANT:** Thoroughly clean application equipment, including landing gear, immediately after use of this product. Prolonged exposure of this product to uncoated steel (except stainless steel) surfaces may result in corrosion and failure of the exposed part. The maintenance of an organic coating (paint) may prevent corrosion.

**GROUND APPLICATIONS**

**FOLIAR APPLICATIONS**

**Low Volume Foliar:**

Use equipment calibrated to deliver 5 to 20 gallons of spray solution per acre. To prepare the spray solution, thoroughly mix in water 0.5 to 5% **HABITAT herbicide** plus surfactant (see the ADJUVANTS section of this label for specific recommendations). A foam reducing agent may be applied at the recommended label rate, if needed. For control of difficult species (see AQUATIC WEEDS CONTROLLED section and the ADDITIONAL WEEDS CONTROLLED BY **HABITAT HERBICIDE** section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes but do not apply more than 6 pints of **HABITAT herbicide** per acre. Excessive wetting of foliage is not recommended. See the Mixing Guide below for some suggested volumes of **HABITAT herbicide** and water.

For low volume, select proper nozzles to avoid over-application. Proper application is critical to ensure desirable results. Best results are achieved when the

spray covers the crown and approximately 70 percent of the plant. The use of an even flat fan tip with a spray angle of 40 degrees or less will aid in proper deposition.

Recommended tip sizes include 4004E, or 1504E. For a straight stream and cone pattern, adjustable cone nozzles such as 5500 X3 or 5500 X4 may be used. Attaching a rollover valve onto a Spraying Systems Model 30 gunjet or other similar spray guns allows for the use of both a flat fan and cone tips on the same gun.

Moisten, but do not drench target vegetation causing spray solution to run off.

**Low Volume Foliar with Backpacks:**

For low growing species, spray down on the crown, covering crown and penetrating approximately 70% of the plant.

For target species 4 to 8 feet tall, swipe the sides of target vegetation by directing spray to at least two sides of the plant in smooth vertical motions from the crown to the bottom. Make sure to cover the crown whenever possible.

For target species over 8 feet tall, lace sides of the target vegetation by directing spray to at least two sides of the target in smooth zigzag motions from crown to bottom.

**Low Volume Foliar with Hydraulic Handgun Application Equipment:**

Use same technique as described above for Low Volume with Backpacks.

For broadcast applications, simulate a gentle rain near the top of target vegetation, allowing spray to contact the crown and penetrate the target foliage without falling to the understory. Herbicide spray solution which contacts the understory may result in severe injury or death of plants in the understory.

**SPRAY SOLUTION MIXING GUIDE FOR LOW-VOLUME FOLIAR APPLICATIONS**

AMOUNT OF SPRAY SOLUTION BEING PREPARED	DESIRED CONCENTRATION (fluid volume)				
	0.5%	0.75%	1%	1.5%	5%
	(amount of <b>HABITAT</b> to use)				
1 gallon	0.6 oz.	0.9 oz.	1.3 oz.	1.9 oz.	6.5 oz.
3 gallons	1.9 oz.	2.8 oz.	3.8 oz.	5.8 oz.	1.2 pint
4 gallons	2.5 oz.	3.8 oz.	5.1 oz.	7.7 oz.	1.6 pint
5 gallons	3.2 oz.	4.8 oz.	6.5 oz.	9.6 oz.	2 pints
50 gallons	2 pints	3 pints	4 pints	6 pints	10 quarts
100 gallons	4 pints	6 pints	8 pints	6 quarts	5 gallons

2 tablespoons = 1 fluid ounce



#### High Volume Foliar:

For optimum performance when spraying medium to high-density vegetation, use equipment calibrated to deliver up to 100 gallons of spray solution per acre (GPA). Spray solutions exceeding 100 GPA may result in excessive spray run-off, causing increased ground cover injury, and injury to desirable species. To prepare the spray solution, thoroughly mix **HABITAT® herbicide** in water and add a surfactant (see Adjuvant section for specific recommendations and rates of surfactants). A foam reducing agent may be added at the recommended label rate, if needed. For control of difficult species (see **AQUATIC WEEDS CONTROLLED** section and the **ADDITIONAL WEEDS CONTROLLED BY HABITAT HERBICIDE** section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes but do not apply more than 6 pints of **HABITAT herbicide** per acre. Uniformly cover the foliage of the vegetation to be controlled but do not apply to run-off. Excessive wetting of foliage is not recommended.

#### Side Trimming:

DO NOT side trim with **HABITAT herbicide** unless severe injury or death of the treated tree can be tolerated. **HABITAT herbicide** is readily translocated and can result in death of the entire tree.

#### CUT SURFACE TREATMENTS

**HABITAT herbicide** may be used to control undesirable woody vegetation by applying the **HABITAT herbicide** solution to the cambium area of freshly cut stump surfaces or to fresh cuts on the stem of the target woody vegetation. Applications can be made at any time of the year except during periods of heavy sap flow in the spring. Do not overapply solution causing run-off from the cut surface.

Injury may occur to desirable woody plants if the shoots extend from the same root system or their root systems are grafted to those of the treated tree.

#### Cut Surface Applications with Dilute and Concentrate Solutions:

**HABITAT herbicide** may be mixed as either a concentrated or dilute solution. The dilute solution may be used for applications to the cut surface of the stump or to cuts on the stem of the target woody vegetation. Concentrated solutions may be used for applications to cuts on the stem. Use of the concentrated solution permits application to fewer cuts on the stem, especially for large diameter trees. Follow the application instructions to determine proper application techniques for each type of solution.

- To prepare a dilute solution, mix 8 to 12 fluid ounces of **HABITAT herbicide** with one gallon of water. The use of a surfactant or penetrating agent may improve uptake through partially callused cambiums.

- To prepare a concentrated solution, mix 2 quarts of **HABITAT herbicide** with no more than 1 quart of water.

#### Cut stump treatments:

- Dilute Solution- spray or brush the solution onto the cambium area of the freshly cut stump surface. Insure that the solution thoroughly wets the entire cambium area (the wood next to the bark of the stump).

#### Cut stem (injection, hack & squirt) treatments:

- Dilute Solutions- Using standard injection equipment, apply 1 milliliter of solution at each injection site around the tree with no more than one-inch intervals between cut edges. Insure that the injector completely penetrates the bark at each injection site.
- Concentrate Solutions- Using standard injection equipment, apply 1 milliliter of solution at each injection site. Make at least one injection cut for every 3 inches of Diameter at Breast Height (DBH) on the target tree. For example, a 3-inch DBH tree will receive 1 injection cut and a 6-inch DBH tree will receive 2 injection cuts. On trees requiring more than one injection site place the injection cuts at approximately equal intervals around the tree.

#### Frill or girdle treatments:

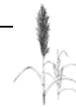
- Using a hatchet, machete, or chainsaw, make cuts through the bark and completely around the tree to expose the cambium. The cut should angle downward extending into the cambium enough to expose at least two growth rings. Using a spray applicator or brush, apply a 25% to 100% solution of **HABITAT herbicide** into each cut until thoroughly wet. Avoid applying so much herbicide that runoff to the ground or water occurs.



**AQUATIC SPECIES CONTROLLED**

**HABITAT® herbicide** will control the following target species as specified in the BASF RECOMMENDATION section of the table. Rate recommendations are expressed in terms of product volume for broadcast applications and as a %solution for directed applications including spot treatments. **For % solution applications, DO NOT apply more than the equivalent of 3 quarts of HABITAT herbicide per acre.**

COMMON NAME	SCIENTIFIC NAME	BASF RECOMMENDATION
<b>Floating Species</b>		
Duckweed	<i>Lemna minor</i>	2-3 pints/acre (1% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Duckweed, Giant	<i>Spirodela polyrriza</i>	2-3 pints/acre (1% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Frogbit	<i>Limnobium spongia</i>	1-2 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Spatterdock	<i>Nuphar luteum</i>	Apply a tank-mix of 2-4 pints/acre <b>HABITAT herbicide</b> + 4 to 6 pints/acre glyphosate (0.5% <b>HABITAT herbicide</b> + 1.5% glyphosate) in 100 GPA water for best control. Ensure 100% coverage of actively growing, emergent foliage.
Water Hyacinth	<i>Eichhornia crassipes</i>	1-2 pints/acre (0.5% solution) applied in 100 GPA water to actively growing foliage.
Water Lettuce	<i>Pistia stratiotes</i>	1-2 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
<b>Emerged Species</b>		
Alligatorweed	<i>Alternanthera philoxeroides</i>	1 to 4 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage. Tank-mix with glyphosate is NOT recommended, and may reduce alligatorweed control, requiring higher <b>HABITAT herbicide</b> rates.
Arrowhead, Duck-potato	<i>Sagittaria</i> spp.	1-2 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Bacopa, lemon	<i>Bacopa</i> spp.	1-2 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Parrot feather	<i>Myriophyllum aquaticum</i>	Must be foliage above water for sufficient HABITAT uptake. Apply 2 - 4 pints to actively growing emergent foliage.
Pennywort	<i>Hydrocotyle</i> spp.	1-2 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Pickernelweed	<i>Pontederia cordata</i>	2-3 pints/acre (1% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Taro, wild; Dasheen; Elephant's Ear; Coco Yam	<i>Colocasia esculentum</i>	4-6 pints/acre (1.5% solution) applied in 100 GPA with a high quality 'sticker' adjuvant. Ensure good coverage of actively growing, emergent foliage.
Water lily	<i>Nymphaea odorata</i>	2-3 pints/acre (1% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Water primrose	<i>Ludwigia uruguayensis</i>	4-6 pints/acre (1.5% solution), ensure 100% coverage of actively growing, emergent foliage. Tank-mix with glyphosate is NOT recommended and may reduce water primrose control.



**AQUATIC SPECIES CONTROLLED (CONT.)**

COMMON NAME	SCIENTIFIC NAME	BASF RECOMMENDATION
<b>Terrestrial/Marginal</b>		
Soda Apple, aquatic; Nightshade	<i>Solanum tampicense</i>	2 pts./acre applied to foliage
Bamboo, Japanese	<i>Phyllostachys</i> spp.	3 to 4 pints/acre applied to the foliage when plant is actively growing. Before setting seed head. More foliage will result in greater herbicide uptake, resulting in greater root kill.
Brazilian Pepper; Christmasberry	<i>Schinus terebinthifolius</i>	2 - 4 pints/acre applied to foliage
Cattail	<i>Typha</i> spp.	2-4 pints (1% solution) applied to actively growing, green foliage after full leaf elongation. Lower rates will control cattail in the north; higher rates are needed in the south.
Chinese Tallow Tree	<i>Sapium sebiferum</i>	16 to 24 oz applied to foliage
Cogon Grass	<i>Imperata cylindrica</i>	Burn foliage, till area, that fall spray 2 qt./acre <b>HABITAT herbicide</b> + MSO applied to new growth.
Cordgrass, prairie	<i>Spartina</i> spp.	4-6 pints applied to actively growing foliage
Cutgrass	<i>Zizaniopsis miliacea</i>	4-6 pints applied to actively growing foliage
Elephant Grass; Napier Grass-	<i>Pennisetum purpureum</i>	3 pts./acre applied to actively growing foliage
Flowering rush	<i>Butumu typla</i>	2-3 pints applied to actively growing foliage
Giant Reed, Wild Cane	<i>Arundo donax</i>	4 to 6 pints/acre applied in spring to actively growing foliage
Golden Bamboo	<i>Phyllostachys aurea</i>	3 to 4 pints/acre applied to the foliage when plant is actively growing. Before setting seed head. More foliage will result in greater herbicide uptake, resulting in greater root kill.
Junglerice	<i>Echinochloa colonum</i>	3-4 pints applied to actively growing foliage
Knapweeds	<i>Centaurea species</i>	Russian Knapweed - 2 to 3 pints + 1 qt./acre MSO fall applied after senescence begins
Knotweed, Japanese (see Fallopia japonica)	<i>Polygonum cuspidatum</i>	3 to 4 pts./acre applied postemergence to actively growing foliage
Melaleuca; Paperbark Tree	<i>Melaleuca quinquenervia</i>	For established stands, apply 6 pints/acre <b>HABITAT® herbicide</b> + 6 pints/acre glyphosate + spray adjuvant. For best results use 4 qt./A methylated seed oil as an adjuvant. For ground foliar application, uniformly apply to ensure 100% coverage. For broadcast foliar control, apply aerially in a minimum of two passes at 10 gallons/acre applied cross treatment. For spot treatment use a 25% <b>HABITAT herbicide</b> + 25% solution of + glyphosate + 1.25% MSO in water applied as a frill or stump treatment.
Nutgrass; Kill'p'opu	<i>Cyperus rotundus</i>	2 pints <b>HABITAT</b> + 1 qt./acre MSO applied early postemergence
Nutsedge	<i>Cyperus</i> spp.	2 to 3 pints postemergence to foliage or pre-emergence incorporated, non-incorporated preemergence applications will not control.



**AQUATIC SPECIES CONTROLLED (CONT.)**

COMMON NAME	SCIENTIFIC NAME	BASF RECOMMENDATION
<b>Terrestrial/Marginal (Cont.)</b>		
Phragmites; Common Reed	<i>Phragmites australis</i>	4 to 6 pints/acre applied to actively growing, green foliage after full leaf elongation, ensure 100% coverage. If stand has a substantial amount of old stem tissue, mow or burn, allow to regrow to approximately 5' tall before treatment. Lower rates will control phragmites in the north; higher rates are needed in the south.
Poison Hemlock	<i>Conium maculatum</i>	2 pints <b>HABITAT herbicide</b> + 1 qt./acre MSO applied pre-emergence to early postemergence to rosette, prior to flowering
Purple Loosestrife	<i>Lythrum salicaria</i>	1 pint/acre applied to actively growing foliage
Reed canarygrass	<i>Phalaris arundinacea</i>	3 to 4 pints/acre applied to actively growing foliage
Rose, swamp	<i>Rosa palustris</i>	2 to 3 pts./acre applied to actively growing foliage
Russian-Olive	<i>Elaeagnus angustifolia</i>	2 to 4 pints/acre or a 1% solution, applied to foliage
Saltcedar; Tamarisk	<i>Tamarix</i> species	Aerial apply 2 qts. <b>HABITAT herbicide</b> + 0.25%v/v NIS applied to actively growing foliage during flowering. For spot spraying use 1% solution of <b>HABITAT herbicide</b> + 0.25%v/v NIS and spray to wet foliage. After application wait at least two years before disturbing treated saltcedar. Earlier disturbance can reduce overall control.
Smartweed	<i>Polygonum</i> spp.	2 pints/acre applied early postemergence
Sumac	<i>Rhus</i> spp.	2 to 3 pts./acre applied to foliage
Swamp Morning Glory; Water Spinach; Kangkong	<i>Ipomoea aquatica</i>	1 to 2 pints/acre <b>HABITAT herbicide</b> + 1 qt./acre MSO applied early postemergence
Torpedo Grass	<i>Panicum repens</i>	4 pints/acre (1 - 1.5% solution), ensure good coverage to actively growing foliage.
White Top; Hoary Cress	<i>Cardaria draba</i>	1 to 2 pints/acre applied in spring, to foliage, during flowering.
Willow	<i>Salix</i> spp.	2 to 3 pts./acre <b>HABITAT herbicide</b> applied to actively growing foliage, ensure good coverage.

**ADDITIONAL WEEDS CONTROLLED BY HABITAT HERBICIDE**

In terrestrial sites, **HABITAT® herbicide** will provide preemergence or postemergence control with residual control of the following target vegetation species at the rates listed. Residual control refers to control of newly germinating seedlings in both annuals and perennials. In general, annual weeds may be controlled by preemergence or postemergence applications of **HABITAT herbicide**. **For established biennials and perennials postemergence applications of HABITAT herbicide are recommended.**

The rates shown below pertain to broadcast applications and indicate the relative sensitivity of these weeds. The relative sensitivity should be referenced when preparing low volume spray solutions (see "Low Volume" section of "Ground Applications"); low volume applications may provide control of the target species with less **HABITAT**

**herbicide** per acre than is shown for the broadcast treatments. **HABITAT herbicide** should be used only in accordance with the recommendations on this label and the leaflet label.

The relative sensitivity of the species listed below can also be used to determine the relative risk of causing non-target plant injury if any of the below listed species are considered to be desirable within the area to be treated.

**Resistant Biotypes:** Naturally occurring biotypes (a plant within a given species that has a slightly different, but distinct genetic makeup from other plants of the same species) of some weeds listed on this label may not be effectively controlled. If naturally occurring resistant biotypes are present in an area, **HABITAT herbicide** should be tank-mixed or applied sequentially with an appropriate registered herbicide having a different mode of action to ensure control.



**GRASSES**

COMMON NAME	SPECIES	GROWTH HABIT <sup>2</sup>
<b>Apply 2-3 pints per acre<sup>1</sup></b>		
Annual bluegrass	<i>(Poa annua)</i>	A
Broadleaf signalgrass	<i>(Brachiaria platyphylla)</i>	A
Canada bluegrass	<i>(Poa compressa)</i>	P
Downy brome	<i>(Bromus tectorum)</i>	A
Fescue	<i>(Festuca spp.)</i>	A/P
Foxtail	<i>(Setaria spp.)</i>	A
Italian ryegrass	<i>(Lolium multiflorum)</i>	A
Johnsongrass	<i>(Sorghum halepense)</i>	P
Kentucky bluegrass	<i>(Poa pratensis)</i>	P
Lovegrass	<i>(Eragrostis spp.)</i>	A/P
Napier grass	<i>(Pennisetum purpureum)</i>	P
Orchardgrass	<i>(Dactylis glomerata)</i>	P
Paragrass	<i>(Brachiaria mutica)</i>	P
Quackgrass	<i>(Agropyron repens)</i>	P
Sandbur	<i>(Cenchrus spp.)</i>	A
Sand dropseed	<i>(Sporobolus cryptandrus)</i>	P
Smooth brome	<i>(Bromus inermis)</i>	P
Vaseygrass	<i>(Paspalum urvillei)</i>	P
Wild oats	<i>(Avena fatua)</i>	A
Witchgrass	<i>(Panicum capillare)</i>	A
<b>Apply 3-4 pints per acre<sup>1</sup></b>		
Barnyardgrass	<i>(Echinochloa crus-gali)</i>	A
Beardgrass	<i>(Andropogon spp.)</i>	P
Bluegrass, Annual	<i>(Poa annua)</i>	A
Bulrush	<i>(Scirpus validus)</i>	P
Cheat	<i>(Bromus secalinus)</i>	A
Crabgrass	<i>(Digitaria spp.)</i>	A
Crowfootgrass	<i>(Dactyloctenium aegyptium)</i>	A
Fall panicum	<i>(Panicum dichotomiflorum)</i>	A
Goosegrass	<i>(Eleusine indica)</i>	A
Itchgrass	<i>(Rottboellia exaltata)</i>	A
Lovegrass	<i>(Eragrostis spp.)</i>	A
Maidencane	<i>(Panicum hemitomon)</i>	A
Panicum, Browntop	<i>(Panicum fasciculatum)</i>	A
Panicum, Texas	<i>(Panicum texanum)</i>	A
Prairie threeawn	<i>(Aristida oligantha)</i>	P
Sandbur, Field	<i>(Cenchrus incertus)</i>	A
Signalgrass	<i>(Brachiaria platyphylla)</i>	A
Wild barley	<i>(Hordeum spp.)</i>	A
Wooly Cupgrass	<i>(Eriochloa villosa)</i>	A

**GRASSES (CONT)**

COMMON NAME	SPECIES	GROWTH HABIT <sup>2</sup>
<b>Apply 4-6 pints per acre<sup>1</sup></b>		
Bahiagrass	<i>(Paspalum notatum)</i>	P
Bermudagrass <sup>3</sup>	<i>(Cynodon dactylon)</i>	P
Big bluestem	<i>(Andropogon gerardii)</i>	P
Dallisgrass	<i>(Paspalum dilatatum)</i>	P
Feathertop	<i>(Pennisetum villosum)</i>	P
Guineagrass	<i>(Panicum maximum)</i>	P
Saltgrass <sup>3</sup>	<i>(Distichlis stricta)</i>	P
Sand dropseed	<i>(Sporobolus cryptandrus)</i>	P
Sprangletop	<i>(Leptochloa spp.)</i>	A
Timothy	<i>(Phleum pratense)</i>	P
Wirestem muhly	<i>(Muhlenbergia frondosa)</i>	P

**BROADLEAF WEEDS**

COMMON NAME	SPECIES	GROWTH HABIT <sup>2</sup>
<b>Apply 2-3 pints per acre<sup>1</sup></b>		
Burdock	<i>(Arctium spp.)</i>	B
Carpetweed	<i>(Mollugo verticillata)</i>	A
Carolina geranium	<i>(Geranium carolinianum)</i>	A
Clover	<i>(Trifolium spp.)</i>	A/P
Common chickweed	<i>(Stellaria media)</i>	A
Common ragweed	<i>(Ambrosia artemisiifolia)</i>	A
Dandelion	<i>(Taraxacum officinale)</i>	P
Dog fennel	<i>(Eupatorium capillifolium)</i>	A
Filaree	<i>(Erodium spp.)</i>	A
Fleabane	<i>(Erigeron spp.)</i>	A
Hoary vervain	<i>(Verbena stricta)</i>	P
Indian mustard	<i>(Brassica juncea)</i>	A
Kochia	<i>(Kochia scoparia)</i>	A
Lambsquarters	<i>(Chenopodium album)</i>	A
Lespedeza	<i>(Lespedeza spp.)</i>	P
Miners lettuce	<i>(Montia perfoliata)</i>	A
Mullein	<i>(Verbascum spp.)</i>	B
Nettleleaf goosefoot	<i>(Chenopodium murale)</i>	A
Oxeye daisy	<i>(Chrysanthemum leucanthemum)</i>	P
Pepperweed	<i>(Lepidium spp.)</i>	A
Pigweed	<i>(Amaranthus spp.)</i>	A
Puncturevine	<i>(Tribulus terrestris)</i>	A
Russian thistle	<i>(Salsola kali)</i>	A
Smartweed	<i>(Polygonum spp.)</i>	A/P
Sorrell	<i>(Rumex spp.)</i>	P
Sunflower	<i>(Helianthus spp.)</i>	A



**BROADLEAF WEEDS (CONT)**

COMMON NAME	SPECIES	GROWTH HABIT <sup>2</sup>
Sweet clover	( <i>Mellilotus</i> spp.)	A/B
Tansymustard	( <i>Descurainia pinnata</i> )	A
Western ragweed	( <i>Ambrosia psilostachya</i> )	P
Wild carrot	( <i>Daucus carota</i> )	B
Wild lettuce	( <i>Lactuca</i> spp.)	A/B
Wild parsnip	( <i>Pastinaca sativa</i> )	B
Wild turnip	( <i>Brassica campestris</i> )	B
Woollyleaf bursage	( <i>Franseria tomentosa</i> )	P
Yellow woodsorrel	( <i>Oxalis stricta</i> )	P

**Apply 3-4 pints per acre<sup>1</sup>**

Broom snakeweed <sup>4</sup>	( <i>Gutierrezia sarothrae</i> )	P
Bull thistle	( <i>Cirsium vulgare</i> )	B
Burclover	( <i>Medicago</i> spp.)	A
Chickweed, Mouseear	( <i>Cerastium vulgatum</i> )	A
Clover, Hop	( <i>Trifolium procumbens</i> )	A
Cocklebur	( <i>Xanthium strumarium</i> )	A
Cudweed	( <i>Gnaphalium</i> spp.)	A
Desert Camelthorn	( <i>Alhagi pseudalhagi</i> )	P
Dock	( <i>Rumex</i> spp.)	P
Fiddleneck	( <i>Amsinckia intermedia</i> )	A
Goldenrod	( <i>Solidago</i> spp.)	P
Henbit	( <i>Lamium aplexicaule</i> )	A
Knotweed, prostrate	( <i>Polygonum aviculare</i> )	A/P
Pokeweed	( <i>Phytolacca americana</i> )	P
Purslane	( <i>Portulaca</i> spp.)	A
Pusley, Florida	( <i>Richardia scabra</i> )	A
Rocket, London	( <i>Sisymbrium irio</i> )	A
Rush skeletonweed <sup>4</sup>	( <i>Chondrilla juncea</i> )	B
Saltbush	( <i>Atriplex</i> spp.)	A
Shepherd's-purse	( <i>Capsella bursa-pastoris</i> )	A
Spurge, Annual	( <i>Euphorbia</i> spp.)	A
Stinging nettle <sup>4</sup>	( <i>Urtica dioica</i> )	P
Velvetleaf	( <i>Abutilon theophrasti</i> )	A
Yellow starthistle	( <i>Centaurea solstitialis</i> )	A

**Apply 4-6 pints per acre<sup>1</sup>**

Arrowwood	( <i>Pluchea sericea</i> )	A
Canada thistle	( <i>Cirsium arvense</i> )	P
Giant ragweed	( <i>Ambrosia trifida</i> )	A
Grey rabbitbrush	( <i>Chrysothamnus nauseosus</i> )	P
Little mallow	( <i>Malva parviflora</i> )	B
Milkweed	( <i>Asclepias</i> spp.)	P
Primrose	( <i>Oenothera kunthiana</i> )	P

**BROADLEAF WEEDS (CONT)**

COMMON NAME	SPECIES	GROWTH HABIT <sup>2</sup>
Silverleaf nightshade	( <i>Solanum eleagnifolium</i> )	P
Sowthistle	( <i>Sonchus</i> spp.)	A
Texas thistle	( <i>Cirsium texanum</i> )	P

**VINES AND BRAMBLES**

COMMON NAME	SPECIES	GROWTH HABIT <sup>2</sup>
<b>Apply 1 pint per acre</b>		
Field bindweed	( <i>Convolvulus arvensis</i> )	P
Hedge bindweed	( <i>Calystegia sepium</i> )	A

**Apply 2-3 pints per acre<sup>1</sup>**

Wild buckwheat	( <i>Polygonum convolvulus</i> )	P
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**Apply 3-4 pints per acre<sup>1</sup>**

Greenbriar	( <i>Smilax</i> spp.)	P
Honeysuckle	( <i>Lonicera</i> spp.)	P
Morningglory	( <i>Ipomoea</i> spp.)	A/P
Poison ivy	( <i>Rhus radicans</i> )	P
Redvine	( <i>Brunnichia cirrhosa</i> )	P
Wild rose	( <i>Rosa</i> spp.)	P

Including:

Multiflora rose	( <i>Rosa multiflora</i> )	P
McCartney rose	( <i>Rosa bracteata</i> )	P

**Apply 4-6 pints per acre<sup>1</sup>**

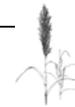
Kudzu <sup>3</sup>	( <i>Pueraria lobata</i> )	P
Trumpet creeper	( <i>Campsis radicans</i> )	P
Virginia creeper	( <i>Parthenocissus quinquefolia</i> )	P
Wild grape	( <i>Vitis</i> spp.)	P

**BRUSH SPECIES**

COMMON NAME	SPECIES	GROWTH HABIT <sup>2</sup>
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**Apply 4-6 pints per acre<sup>1</sup>**

American beech	( <i>Fagus grandifolia</i> )	P
Ash	( <i>Fraxinus</i> spp.)	P
Bald cypress	( <i>Taxodium distichum</i> )	P
Bigleaf Maple	( <i>Acer macrophyllum</i> )	P
Black Locust <sup>5</sup>	( <i>Robinia pseudoacacia</i> )	P
Black gum	( <i>Nyssa sylvatica</i> )	P
Box elder	( <i>Acer negundo</i> )	P
Cherry	( <i>Prunus</i> spp.)	P
Chinaberry	( <i>Melia azadarach</i> )	P
Dogwood	( <i>Cornus</i> spp.)	P
Elm <sup>6</sup>	( <i>Ulmus</i> spp.)	P



**BRUSH SPECIES (CONT)**

COMMON NAME	SPECIES	GROWTH HABIT <sup>2</sup>
Hawthorn	<i>(Crataegus spp.)</i>	P
Hickory	<i>(Carya spp.)</i>	P
Honeylocust <sup>5</sup>	<i>(Gleditsia triacanthos)</i>	P
Maple	<i>(Acer spp.)</i>	P
Mulberry	<i>(Morus spp.)</i>	P
Oak	<i>(Quercus spp.)</i>	P
Persimmon	<i>(Diospyros virginiana)</i>	P
Pine <sup>5</sup>	<i>(Pinus spp.)</i>	P
Poplar	<i>(Populus spp.)</i>	P
Privet	<i>(Ligustrum vulgare)</i>	P
Red Alder	<i>(Alnus rubra)</i>	P
Red Maple	<i>(Acer rubrum)</i>	P
Russian Olive	<i>(Eleagnus angustifolia)</i>	P
Sassafras	<i>(Sassafras albidum)</i>	P
Sourwood	<i>(Oxydendrum arboreum)</i>	P
Sweetgum	<i>(Liquidambar styraciflua)</i>	P
Water willow	<i>(Justica americana)</i>	P
Willow	<i>(Salix spp.)</i>	P
Yellow poplar	<i>(Liriodendron tulipifera)</i>	P

<sup>1</sup> The higher rates should be used where heavy or well-established infestations occur.

<sup>2</sup> Growth Habit - A = Annual, B = Biennial, P = Perennial



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BASF Corporation  
26 Davis Drive  
Research Triangle Park, NC 27709

**BASF**











# MATERIAL SAFETY DATA SHEET



Emergency Phone: 800-992-5994  
Dow AgroSciences LLC  
Indianapolis, IN 46268

Effective Date: 2/11/02  
Product Code: 41753  
MSDS: 004778

## PATHFINDER\* II HERBICIDE

### 1. PRODUCT AND COMPANY IDENTIFICATION:

**PRODUCT:** Pathfinder\* II Herbicide

#### COMPANY IDENTIFICATION:

Dow AgroSciences  
9330 Zionsville Road  
Indianapolis, IN 46268-1189

### 2. COMPOSITION/INFORMATION ON INGREDIENTS:

Triclopyr: ((3,5,6-trichloro-2-pyridinyl)oxy)acetic acid, butoxyethylester	CAS# 064700-56-7	13.6%
Inert Ingredients, Total, Including: Proprietary Solvent		86.4%

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

### 3. HAZARDOUS IDENTIFICATIONS:

#### EMERGENCY OVERVIEW

Hazardous Chemical. Yellow to amber liquid. May cause eye and skin irritation. LD<sub>50</sub> for skin absorption in rabbits is >2000 mg/kg. Oral LD<sub>50</sub> for rats is 2389 mg/kg (males) and 1000 mg/kg (females). LC<sub>50</sub> for rats is >5.0 mg/L for 4 hours. Toxic to aquatic organisms.

**EMERGENCY PHONE NUMBER:** 800-992-5994

**POTENTIAL HEALTH EFFECTS:** This section includes possible adverse effects, which could occur if this material is not handled in the recommended manner.

**EYE:** May cause slight temporary eye irritation. Corneal injury is unlikely. Vapor may cause eye irritation experienced as mild discomfort and redness.

**SKIN:** Prolonged contact may cause skin irritation with local redness. Repeated exposure may cause irritation, even a burn. Repeated contact may cause drying or flaking of the skin. Prolonged skin contact is unlikely to result in absorption of harmful amounts. The LD<sub>50</sub> for skin absorption in rabbits is >2000 mg/kg. Did not cause allergic skin reactions when tested in guinea pigs.

**INGESTION:** Low toxicity if swallowed. The oral LD<sub>50</sub> for rats was 2389 mg/kg (males) and 1000 mg/kg (females). Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury. Aspiration into the lungs may occur during ingestion or vomiting, causing lung damage or even death due to chemical pneumonia.

**INHALATION:** The LC<sub>50</sub> for rats is >5.0 mg/L for 4 hours. Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs. May cause central nervous system effects. Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed.

**SYSTEMIC (OTHER TARGET ORGAN) EFFECTS:** For triclopyr butoxy ether ester, in animals, effects have been reported on the following organs: blood, kidney and liver.

**CANCER INFORMATION:** Triclopyr butoxyethyl ester did not cause cancer in laboratory animals.

**TERATOLOGY (BIRTH DEFECTS):** For triclopyr butoxyethyl ester, birth defects are unlikely. Exposures having no effect on the mother should have no effect on the fetus. Did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic effects to the mother.

**REPRODUCTIVE EFFECTS:** For triclopyr butoxyethyl ester, in laboratory animal studies, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals.

### 4. FIRST AID:

**EYES:** Flush eyes thoroughly with water for several minutes. Remove contact lenses after initial 1-2 minutes and continue flushing for several additional minutes.

**SKIN:** Wash skin with plenty of water.

**INGESTION:** Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.

**INHALATION:** Move person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

\*Trademark of Dow AgroSciences



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MSDS: 004778

### PATHFINDER\* II HERBICIDE

**NOTE TO PHYSICIAN:** The decision of whether to induce vomiting or not should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

#### 5. FIRE FIGHTING MEASURES:

**FLASH POINT:** 350°F, 177°C  
**METHOD USED:** SFCC

#### FLAMMABLE LIMITS

LFL: Not determined  
UFL: Not determined

**EXTINGUISHING MEDIA:** Water fog, foam.

**FIRE & EXPLOSION HAZARDS:** May emit toxic, irritating vapors if involved in a fire.

**FIRE-FIGHTING EQUIPMENT:** Use positive pressure self-contained breathing apparatus and full protective clothing.

#### 6. ACCIDENTAL RELEASE MEASURES:

**ACTION TO TAKE FOR SPILLS/LEAKS:** Dike large spills. Keep out of streams and domestic water supplies. Absorb small spills in inert material such as dry sand. Eliminate all ignition sources. Report large spills to Dow AgroSciences at 800-992-5994.

#### 7. HANDLING AND STORAGE:

**PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:** Keep out of reach of children. Harmful if swallowed, inhaled, or absorbed through skin. Avoid contact with skin, eyes, and clothing. Avoid breathing vapor or spray mist. Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet. Store in the original container with the lid tightly closed.

#### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

These precautions are suggested for conditions where a potential for exposure exists. Emergency conditions may require additional precautions.

#### EXPOSURE GUIDELINE(S):

3,5,6-trichloro-2-pyridinyloxyacetic acid, Dowanol EB ester: Dow AgroSciences Industrial Hygiene Guide is 2 mg/M3 as acid equivalent, Skin.

A "skin" notation following the exposure guideline refers to the potential for dermal absorption of the material. It is intended to alert the reader that inhalation may not be the only route of exposure and that measures to minimize dermal exposures should be considered.

**ENGINEERING CONTROLS:** Provide general and/or local exhaust ventilation to control airborne levels below the exposure guideline.

#### RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

**RESPIRATORY PROTECTION:** Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use a NIOSH approved air-purifying respirator.

**SKIN PROTECTION:** When prolonged or frequently repeated contact could occur, use chemically protective clothing resistant to this material. Selection of specific items such as faceshield, gloves, boots, apron or full-body suit will depend on operation.

**EYE/FACE PROTECTION:** Use safety glasses. If exposure causes eye discomfort, use a NIOSH approved full-face respirator.

**APPLICATORS AND ALL OTHER HANDLERS:** Refer to the product label for personal protective clothing and equipment recommendations.

\*Trademark of Dow AgroSciences



## MATERIAL SAFETY DATA SHEET



Emergency Phone: 800-992-5994  
Dow AgroSciences LLC  
Indianapolis, IN 46268

Effective Date: 2/11/02  
Product Code: 41753  
MSDS: 004778

### PATHFINDER\* II HERBICIDE

#### 9. PHYSICAL AND CHEMICAL PROPERTIES:

**BOILING POINT:** 425°F (218.5°C) @ 20mmHg  
**VAPOR PRESSURE:** Not determined  
**VAPOR DENSITY:** Not determined  
**SOLUBILITY IN WATER:** Insoluble  
**SPECIFIC GRAVITY:** 0.920 at 20°C (68°F)  
**APPEARANCE:** Yellow to amber liquid  
**ODOR:** Minimal  
**FREEZING POINT:** -10°C, 13°F

#### 10. STABILITY AND REACTIVITY:

**STABILITY:** (CONDITIONS TO AVOID) Stable under normal storage and handling conditions. Product will burn; keep away from heat and open flame.

**INCOMPATIBILITY:** (SPECIFIC MATERIALS TO AVOID) Acids, bases, and strong oxidizers.

**HAZARDOUS DECOMPOSITION PRODUCTS:** Carbon monoxide, nitrogen oxides, hydrogen chloride, and phosgene may be formed if product is involved in fire.

**HAZARDOUS POLYMERIZATION:** Not known to occur.

#### 11. TOXICOLOGICAL INFORMATION:

**MUTAGENICITY:** For triclopyr butoxyethyl ester, in-vitro and animal mutagenicity studies were negative.

#### 12. ECOLOGICAL INFORMATION:

##### ENVIRONMENTAL DATA

##### MOVEMENT & PARTITIONING:

Based largely or completely on information for triclopyr butoxyethyl ester.  
Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5).

#### DEGRADATION & PERSISTENCE:

Based largely or completely on information for triclopyr butoxyethyl ester.  
Based on the stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions.  
The photolysis half-life in water is 6.6 days.

#### ECOTOXICOLOGY:

Based largely or completely on information for triclopyr butoxyethyl ester.  
Material is highly toxic to aquatic organisms on an acute basis (LC<sub>50</sub>/EC<sub>50</sub> between 0.1 and 1 mg/L in most sensitive species.)

#### 13. DISPOSAL CONSIDERATIONS:

**DISPOSAL METHOD:** Product, spray mixture, or rinsate that cannot be used according to label instructions must be disposed of according to applicable federal, state, or local procedures.

#### 14. TRANSPORT INFORMATION:

##### U.S. DEPARTMENT OF TRANSPORTATION (DOT) INFORMATION:

This material is not regulated for transportation.

#### 15. REGULATORY INFORMATION:

**NOTICE:** The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

#### U.S. REGULATIONS

**SARA 313 INFORMATION:** To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

\*Trademark of Dow AgroSciences



## MATERIAL SAFETY DATA SHEET



Emergency Phone: 800-992-5994  
Dow AgroSciences LLC  
Indianapolis, IN 46268

Effective Date: 2/11/02  
Product Code: 41753  
MSDS: 004778

### PATHFINDER\* II HERBICIDE

**SARA HAZARD CATEGORY:** This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard  
A delayed health hazard

**TOXIC SUBSTANCES CONTROL ACT (TSCA):** All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

**STATE RIGHT-TO-KNOW:** This product is not known to contain any substances subject to the disclosure requirements of

New Jersey  
Pennsylvania

#### NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:

Category	Rating
Health	1
Flammability	1
Reactivity	0

**COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA, or SUPERFUND):** To the best of our knowledge, this product contains no chemical subject to reporting under CERCLA.

#### 16. OTHER INFORMATION:

**MSDS STATUS:** Revised Sections: 3, 4, 7, 8, & 14  
Reference: DR-0298-9448  
Replaces MSDS dated: 12/9/99  
Document Code: D03-104-003  
Replaces Document Code: D03-104-002

The Information Herein Is Given In Good Faith, But No Warranty, Express or Implied, Is Made. Consult Dow AgroSciences for Further Information.

\*Trademark of Dow AgroSciences



## Specimen Label



### Specialty Herbicide

\*Trademark of Dow AgroSciences LLC

A ready-to-use herbicide for the control of woody plants on:

- Forests
- Non-crop areas including: Industrial manufacturing and storage sites, rights-of-way, non-irrigation ditch banks
- Rangeland and permanent pastures
- Grazed areas and maintenance of wildlife openings on those sites

Active Ingredient:	
triclopyr: 3,5,6-trichloro-2-pyridinyloxyacetic acid, butoxyethyl ester.....	13.6%
Inert Ingredients .....	86.4%
Total.....	100.0%

Acid Equivalent: triclopyr – 9.81% – 0.75 lb/gal

EPA Reg. No. 62719-176

Keep Out of Reach of Children

### CAUTION PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

#### Precautionary Statements

#### Hazards to Humans and Domestic Animals

Harmful If Swallowed, Inhaled Or Absorbed Through The Skin

Avoid contact with skin, eyes or clothing. Avoid breathing vapor or spray mist. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

#### Personal Protective Equipment (PPE)

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category E on an EPA chemical resistance category selections chart.

#### Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves such as Barrier Laminate, Nitrile Rubber, Neoprene Rubber, or Viton
- Shoes plus socks

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

#### User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

#### First Aid

**If on skin:** Wash with plenty of soap and water. Get medical attention.  
**If inhaled:** Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.  
**If swallowed:** Call a physician or Poison Control Center. Drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person.

#### Environmental Hazards

This pesticide is toxic to fish. Keep out of lakes, ponds or streams. Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters.

#### Physical or Chemical Hazards

**Combustible - Do not use or store near heat or open flame. Do not cut or weld container.**

**Notice:** Read the entire label. Use only according to label directions. Before buying or using this product, read "Warranty Disclaimer" and "Limitation of Remedies" elsewhere on this label.

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at [www.dowagro.com](http://www.dowagro.com).

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.



### Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all Directions for Use carefully before applying.

#### Ready-To-Use, No Mixing Required.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

### Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves such as Barrier Laminate, Nitrile Rubber, Neoprene Rubber, or Viton
- Shoes plus socks

### Storage and Disposal

Do not contaminate water, food or feed by storage or disposal. Open dumping is prohibited.

**Storage:** Store above 28°F or agitate before use.

**Pesticide Disposal:** Pesticide, spray mixture, or rinsate that cannot be used according to label instructions must be disposed of according to applicable federal, state, or local procedures.

**Container Disposal:** Triple rinse (or equivalent) with 10 drops or more of a liquid hand soap and water or an oil based product such as kerosene or diesel fuel and spray rinsate on undesirable vegetation, in target area. Offer containers for recycling or reconditioning where allowed, or puncture and dispose of in a sanitary landfill, or by incineration if approved by state and local procedures.

**Container Disposal for Refillable Containers:** Close all openings which have been opened during use and replace all caps. Return the empty container to a collection site designated by Dow AgroSciences. If the container has been damaged and cannot be returned according to the recommended procedures, contact the Dow AgroSciences Customer Service Center at 1-800-258-1470 to obtain proper handling instructions.

**General:** Consult federal, state, or local disposal authorities for approved alternative procedures.

### General Information

Pathfinder II herbicide is a ready-to-use product which is recommended for the control of unwanted woody plants through the use of basal bark application techniques in forests, rangeland and permanent pastures, and on non-crop areas including industrial manufacturing and storage sites, rights-of-way such as electrical power lines, communication lines, pipelines, road sides and railroads, fence rows, non-irrigation ditch banks and around farm buildings. Use on these sites may include application to grazed areas as well as establishment and maintenance of wildlife openings.

### General Use Precautions

The state of Arizona has not approved Pathfinder II for use on plants grown for commercial production; specifically forests grown for commercial timber production, or on designated grazing areas.

Apply this product only as specified on this label.

Do not apply this product through any type of irrigation system.

It is permissible to treat non-irrigation ditch banks, seasonally dry wetlands, flood plains, deltas, marshes, swamps, bogs, and transitional areas between upland and lowland sites. Do not apply to open water (such as lakes, reservoirs, rivers, streams, creeks, salt water bays or estuaries) nor to water present in fresh water wetlands, deltas, marshes, swamps, bogs or potholes, or to salt water marshes below the mean high water mark.

Do not apply Pathfinder II herbicide directly to, or otherwise permit it to come into direct contact with grapes, tobacco, vegetable crops, flowers or other desirable broadleaf plants, and do not permit spray mists containing it to drift onto them.

**Avoid Injurious Spray Drift:** Applications should be made only when there is little or no hazard from spray drift. Very small quantities of spray, which may not be visible, may seriously injure susceptible plants. Do not spray when wind is blowing toward susceptible crops or ornamental plants near enough to be injured.

With ground equipment, spray drift can be reduced by using spray pressures no greater than are required to obtain adequate coverage; by using large droplet producing nozzle tips; and by spraying when wind velocity is low. Do not apply with nozzles that produce a fine droplet spray. Do not apply with an orchard type mist blower.

Do not apply on snow or frozen ground.

Untreated trees occasionally can be affected by movement of the herbicide through root grafting with the treated trees.

Since this herbicide moves within the treated plant, do not use Pathfinder II on parts of a multiple stem plant if injury to the untreated portions (cut or standing stems) cannot be tolerated.

Do not apply on ditches used to transport irrigation water. Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result.

Be sure that use of this product conforms to all applicable regulations.



**Grazing and Haying Restrictions**

**Grazing or harvesting green forage:**

- 1) Lactating dairy animals
  - 2.5 gallons/acre or less: Do not graze or harvest green forage from treated area for 14 days after treatment.
  - Greater than 2.5 gallons/acre: Do not graze or harvest green forage until the next growing season.
- 2) Other Livestock
  - 2.5 gallons/acre or less: No grazing restrictions.
  - Greater than 2.5 to 7.5 gallons/acre: Do not graze or harvest green forage from treated area for 14 days after treatment.
  - Note:** If less than 25% of a grazed area is treated, there is no grazing restriction.

**Haying (harvesting of dried forage):**

- 1) Lactating dairy animals
  - Do not harvest hay until the next growing season.
- 2) Other Livestock
  - 2.5 gallons/acre or less: Do not harvest hay for 7 days after treatment.
  - Greater than 2.5 to 5 gallons/acre: Do not harvest hay for 14 days after treatment.
  - Greater than 5 gallons/acre: Do not harvest hay until the next growing season.

**Slaughter Restrictions:** Withdraw livestock from grazing treated grass or consumption of treated hay at least 3 days before slaughter. This restriction applies to grazing during the season following treatment or hay harvested during the season following treatment.

**Among The Woody Plant Species Controlled Are:**

ailanthus	hackberry	oak, water
alder, red	hazel	oak, white
alder, speckled	hercules club	olive, autumn
ash, green	hickory, mockernut	olive, Russian
ash, white	hickory, pignut	persimmon, common
aspen <sup>†</sup>	honeylocust	pine, jack
Australian pine	hornbeam (blue beach)	pine, loblolly
basswood	locust, black <sup>†</sup>	pine, ponderosa
beech, American	madrone, Pacific	pine, red
birch, black	manzanita, greenleaf	pine, white
birch, gray	maple, bigleaf <sup>†</sup>	poison ivy
birch, paper	maple, mountain	poison oak
blackberry	maple, red	poplar, balsam
black locust	maple, silver	redcedar, eastern
blackgum	maple, striped	salt cedar <sup>†</sup>
boxelder	maple, sugar	sassafras <sup>†</sup>
Brazilian pepper	maple, vine	sumac, smooth <sup>†</sup>
cherry, black <sup>†</sup>	mesquite <sup>†/††</sup>	sumac, staghorn <sup>†</sup>
cherry, choke	mountain-laurel	sweetgum
cherry, pin	oak, black <sup>††</sup>	sycamore
cottonwood	oak, blackjack <sup>††</sup>	tamarack
dogwood, flowering	oak, chestnut	tanoak
dogwood, red-osier	oak, post <sup>††</sup>	walnut
elm, American	tanoak	waxmyrtle
elm, winged <sup>†</sup>	walnut	willow
gallberry	oak, red	yaupon
guava	oak, scarlet	yellow poplar

<sup>†</sup> Some resprouting may occur.  
<sup>††</sup> Not recommended for streamline basal treatment.  
<sup>†††</sup> Suppression only with streamline basal bark treatment.

**Approved Uses**

**Forest Uses**

**Agricultural Use Requirements for Forest Use:** For the following crop and forestry uses, follow PPE and Reentry instructions in the "Agricultural Use Requirements" section of this label.

**Non-crop Uses Such As Rights-of-Way, Industrial Sites, Rangeland and Permanent Pastures, Non-irrigation Ditch Banks and Wildlife Openings.**

**Use Requirements for Non-cropland Areas:** No Worker Protection Standard worker entry restrictions or worker notification requirements apply when this product is applied to non-cropland areas.

**Low Volume Basal Bark Treatment**

To control susceptible woody plants with stems less than 6 inches in basal diameter, apply Pathfinder II with a backpack or knapsack sprayer using low pressure and a solid cone or flat fan nozzle. Spray the basal parts of brush and tree trunks in a manner which thoroughly wets the lower 12 to 15 inches of stems, including the root collar area, but not to the point of runoff. Herbicide concentration should vary with size and susceptibility of species treated. Apply at any time, including the winter months, except when snow or water prevent spraying to the ground line.

**Treatment of Cut Stumps**

To control resprouting, apply undiluted Pathfinder II to wet the area adjacent to the cambium and bark around the entire circumference and the sides of cut stumps. Sides of stumps should be thoroughly wetted down to the root collar area, but not to the point of runoff. Treatments may be applied throughout the year, except when snow or water prevent spraying to the ground line. Control may be reduced with treatment during periods of moisture stress as in late summer.

**Streamline Basal Bark Treatment (Southern States)**

To control or suppress susceptible woody plants for conifer release or in rangeland and pasture, apply Pathfinder II with a backpack or knapsack sprayer using equipment which provides a directed straight-stream spray. Apply sufficient spray to one side of stems less than 3 inches in basal diameter to form a treated zone that is 6 inches in height. When the optimum amount of spray mixture is applied, the treated zone should widen to encircle the stem within approximately 30 minutes. Treat both sides of stems which are 3 to 4 inches in basal diameter. Direct the spray at bark that is approximately 12 to 24 inches above ground. Pines (loblolly, slash, shortleaf, and Virginia) up to 2 inches in diameter breast height (dbh) can be controlled by directing the spray at the point approximately 4 feet above ground. Best results are achieved when applications are made to young vigorously growing stems which have not developed the thicker bark characteristic of slower growing, understory trees in older stands. This technique is not recommended for scrub and live oak species, including blackjack, turkey, post, live, bluejack and laurel oaks. Apply from approximately 6 weeks prior to hardwood leaf expansion in the spring until approximately 2 months after leaf expansion is completed. Do not apply when snow or water prevent spraying at the desired height above ground level.



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**Warranty Disclaimer**

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Dow AgroSciences warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. Dow AgroSciences MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

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**Inherent Risks of Use**

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It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperature, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. All such risks shall be assumed by buyer.

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**Limitation of Remedies**

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The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

1. Refund of purchase price paid by buyer or user for product bought, or
2. Replacement of amount of product used

Dow AgroSciences shall not be liable for losses or damages resulting from handling or use of this product unless Dow AgroSciences is promptly notified of such loss or damage in writing. In no case shall Dow AgroSciences be liable for consequential or incidental damages or losses.

The terms of the "Warranty Disclaimer" above and this "Limitation of Remedies" cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Dow AgroSciences or the seller is authorized to vary or exceed the terms of the "Warranty Disclaimer" or this "Limitation of Remedies" in any manner.

\*Trademark of Dow AgroSciences LLC  
Dow AgroSciences LLC • Indianapolis, IN 46268 U.S.A.

Label Code: D02-104-007  
Replaces Label: D02-104-006

EPA Accepted 05/17/94

**Revisions:**

1. General Use Precautions (The following statement was deleted from this section): "Do not use for manufacturing or formulating."



# MATERIAL SAFETY DATA SHEET



## RODEO\* HERBICIDE

Emergency Phone: 800-992-5994  
Dow AgroSciences LLC  
Indianapolis, IN 46268

Effective Date: 3/23/04  
Product Code: 84825  
MSDS: 006694

### 1. PRODUCT AND COMPANY IDENTIFICATION:

**PRODUCT:** Rodeo\* Herbicide

#### COMPANY IDENTIFICATION:

Dow AgroSciences LLC  
9330 Zionsville Road  
Indianapolis, IN 46268-1189

### 2. COMPOSITION/INFORMATION ON INGREDIENTS:

Glyphosate IPA: N-(phosphono-methyl) glycine, Isopropylamine Salt	CAS # 038641-94-0	53.8%
Balance, Total		46.2%

### 3. HAZARDOUS IDENTIFICATIONS:

#### EMERGENCY OVERVIEW

Clear, pale yellow liquid. May cause eye irritation. Slightly toxic to aquatic organisms.

**EMERGENCY PHONE NUMBER:** 800-992-5994

### 4. FIRST AID:

**EYE:** Flush eyes thoroughly with water for several minutes. Remove contact lenses after initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

**SKIN:** Wash skin with plenty of water.

**INGESTION:** No emergency medical treatment necessary.

**INHALATION:** Remove person to fresh air; if effects occur, consult a physician.

**NOTE TO PHYSICIAN:** No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

### 5. FIRE FIGHTING MEASURES:

**FLASH POINT:** >214°F (>101°C)

**METHOD USED:** Setaflash

#### FLAMMABLE LIMITS:

LFL: Not applicable  
UFL: Not applicable

**EXTINGUISHING MEDIA:** Foam, CO<sub>2</sub>, Dry Chemical

**FIRE AND EXPLOSION HAZARDS:** Foam fire extinguishing system is preferred because uncontrolled water can spread possible contamination. Toxic irritating gases may be formed under fire conditions.

**FIRE-FIGHTING EQUIPMENT:** Use positive-pressure, self-contained breathing apparatus and full protective equipment.

### 6. ACCIDENTAL RELEASE MEASURES:

**ACTION TO TAKE FOR SPILLS:** Absorb small spills with an inert absorbent material such as Hazorb, Zorb, sand, or dirt. Report large spills to Dow AgroSciences on 800-992-5994.

### 7. HANDLING AND STORAGE:

**PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:** Keep out of reach of children. Do not swallow. Avoid contact with eyes, skin, and clothing. Avoid breathing vapors and spray mist. Handle concentrate in ventilated area. Wash thoroughly with soap and water after handling and before eating, chewing gum, using tobacco, using the toilet or smoking. Keep away from food, feedstuffs, and water supplies. Store in original container with the lid tightly closed. Store above 10°F (-12°C) to keep from crystallizing.

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

These precautions are suggested for conditions where the potential for exposure exists. Emergency conditions may require additional precautions.

**EXPOSURE GUIDELINES:** None established

**ENGINEERING CONTROLS:** Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

#### RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

**EYE/FACE PROTECTION:** Use safety glasses.

**SKIN PROTECTION:** No precautions other than clean body-covering clothing should be needed.

\*Trademark of Dow AgroSciences LLC



## MATERIAL SAFETY DATA SHEET



### RODEO\* HERBICIDE

Emergency Phone: 800-992-5994  
Dow AgroSciences LLC  
Indianapolis, IN 46268

Effective Date: 3/23/04  
Product Code: 84825  
MSDS: 006694

**RESPIRATORY PROTECTION:** For most conditions, no respiratory protection should be needed; however, if discomfort is experienced, use a NIOSH approved air-purifying respirator.

**APPLICATIONS AND ALL OTHER HANDLERS:** Please refer to the product label for personal protective clothing and equipment.

#### 9. PHYSICAL AND CHEMICAL PROPERTIES:

**APPEARANCE:** Clear, pale yellow liquid  
**DENSITY:** 10.0 - 10.5 lbs/gal  
**pH:** 4.8 - 5.0  
**ODOR:** None  
**SOLUBILITY IN WATER:** Miscible  
**SPECIFIC GRAVITY:** 1.21 gm/L  
**FREEZING POINT:** -7°F - -10°F (-21°C - -25°C)

#### 10. STABILITY AND REACTIVITY:

**STABILITY:** (CONDITIONS TO AVOID) Stable under normal storage conditions.

**INCOMPATIBILITY:** (SPECIFIC MATERIALS TO AVOID) Galvanized or unlined steel (except stainless steel) containers or spray tanks may produce hydrogen gas which may form a highly combustible gas mixture.

**HAZARDOUS DECOMPOSITION PRODUCTS:** None known.

**HAZARDOUS POLYMERIZATION:** Not known to occur.

#### 11. TOXICOLOGICAL INFORMATION:

**EYE:** May cause slight temporary eye irritation. Corneal injury is unlikely.

**SKIN:** Essentially non-irritating to skin. Prolonged skin contact is unlikely to result in absorption of harmful amounts. The LD<sub>50</sub> for skin absorption in rabbits is >5000 mg/kg. Did not cause allergic skin reactions when tested in guinea pigs.

**INGESTION:** Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts. The oral LD<sub>50</sub> for rats is >5000 mg/kg.

**INHALATION:** Brief exposure (minutes) is not likely to cause adverse effects. The aerosol LC<sub>50</sub> for rats is >6.37 mg/L for 4 hours.

**SYSTEMIC (OTHER TARGET ORGAN) EFFECTS:** For a similar material, glyphosate, in animals, effects have been reported on the following organ: liver.

**CANCER INFORMATION:** A similar material, glyphosate, did not cause cancer in laboratory animals.

**TERATOLOGY (BIRTH DEFECTS):** For glyphosate IPA, available data are inadequate for evaluation of potential to cause birth defects.

**REPRODUCTIVE EFFECTS:** For glyphosate IPA, available data are inadequate to determine effects on reproduction.

**MUTAGENICITY:** For a similar material, glyphosate, in-vitro and animal genetic toxicity studies were negative.

#### 12. ECOLOGICAL INFORMATION:

##### ENVIRONMENTAL DATA:

##### ECOTOXICOLOGY:

Material is practically non-toxic to aquatic organisms on an acute basis (LC<sub>50</sub> or EC<sub>50</sub> is >100 mg/L in most sensitive species tested).

Acute LC<sub>50</sub> for rainbow trout (*Oncorhynchus mykiss*) is >2500 mg/L.

Acute immobilization EC<sub>50</sub> in water flea (*Daphnia magna*) is 918 mg/L.

Material is practically non-toxic to birds on an acute basis (LD<sub>50</sub> is >2000 mg/kg).

Acute oral LD<sub>50</sub> in bobwhite (*Colinus virginianus*) is >2000 mg/kg.

The LC<sub>50</sub> in earthworm *Eisenia foetida* is >1000 mg/kg. Acute contact LD<sub>50</sub> in honey bee (*Apis mellifera*) is >100 µg/bee.

Acute oral LD<sub>50</sub> in honey bee (*Apis mellifera*) is >100 µg/bee.

Growth inhibition EC<sub>50</sub> in green alga (*Selenastrum capricornutum*) is 127 mg/L.

Growth inhibition EC<sub>50</sub> in duckweed (*Lemna sp.*) is 24.4 mg/L.

#### 13. DISPOSAL CONSIDERATIONS:

**DISPOSAL METHOD:** If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities.

\*Trademark of Dow AgroSciences LLC

## MATERIAL SAFETY DATA SHEET



### RODEO\* HERBICIDE

Emergency Phone: 800-992-5994  
Dow AgroSciences LLC  
Indianapolis, IN 46268

Effective Date: 3/23/04  
Product Code: 84825  
MSDS: 006694

This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

If the material as supplied becomes a waste, follow all applicable regional, national and local laws and regulations.

#### 14. TRANSPORT INFORMATION:

##### U.S. DEPARTMENT OF TRANSPORTATION (DOT) INFORMATION:

For all package sizes and modes of transportation:  
This material is not regulated for transport.

#### 15. REGULATORY INFORMATION:

**NOTICE:** The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

##### U.S. REGULATIONS

**SARA 313 INFORMATION:** To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

**SARA HAZARD CATEGORY:** This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Not to have met any hazard category

**TOXIC SUBSTANCES CONTROL ACT (TSCA):** All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

**STATE RIGHT-TO-KNOW:** This product is not known to contain any substances subject to the disclosure requirements of

New Jersey  
Pennsylvania

**OSHA HAZARD COMMUNICATION STANDARD:** This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA, or SUPERFUND):** To the best of our knowledge, this product contains no chemical subject to reporting under CERCLA.

##### NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:

CATEGORY	RATING
Health	1
Flammability	1
Reactivity	0

#### 16. OTHER INFORMATION:

**MSDS STATUS:** Revised Sections: 3,4,11,12,13,14 & 15  
Reference: DR-0361-8028  
Replaces MSDS Dated: 1/12/00  
Document Code: D03-148-002  
Replaces Document Code: D03-148-001

The Information Herein Is Given In Good Faith, But No Warranty, Express Or Implied, Is Made. Consult Dow AgroSciences For Further Information.

\*Trademark of Dow AgroSciences LLC



BASF Corporation

**BASF**

**MATERIAL SAFETY DATA SHEET**

Agricultural Products Group  
 P.O.Box 13528,  
 Research Triangle Park, NC 27709  
 (919) 547-2000

**EMERGENCY TELEPHONE NUMBERS:**

**BASF Corporation: 1 (800) 832-HELP**  
**CHEMTREC: 1 (800) 424-9300**

**Product No.:** 579674                      **Stalker® herbicide**

**Date Prepared:** 7/27/2000    **Date Revised:** 6/7/2002

<b>SECTION I</b>	
<b>Trade Name:</b> Stalker® herbicide	
<b>Chemical Name:</b> 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid, salt with 2-propanamine (1:1)	
<b>Synonyms:</b> Isopropylamine of imazapyr; AC252, 925	<b>Formula:</b> C(13)H(15)N(3)O(3).C(3)H(9)N
<b>Chemical Family:</b> Imidazolinone	<b>Mol Wt:</b> 320.4

<b>SECTION II - INGREDIENTS</b>			
COMPONENT	CAS NO.	%	PEL/TLV - SOURCE
Isopropylamine salt of Imazapyr	81510-83-0	27.6	TWA 0.5 mg/m3 - BASF recommended
Inerts	N/A	72.4	None established

**SARA Title III Section 313:** Not Listed

<b>SECTION III - PHYSICAL DATA</b>	
<b>BOILING/MELTING POINT@760mm Hg:</b>	N/D                      pH: 6 - 7.5
<b>VAPOR PRESSURE mmHg @ 20°C:</b>	N/D
<b>SPECIFIC GRAVITY OR BULK DENSITY:</b>	1.05 - 1.07 g/mL
<b>SOLUBILITY IN WATER:</b>	Soluble
<b>APPEARANCE:</b> Pale yellow to dark green liquid	<b>ODOR:</b> Ammonia <b>INTENSITY:</b> Slight

<b>SECTION IV - FIRE AND EXPLOSION DATA</b>	
<b>FLASH POINT (TEST METHOD):</b> >200°F SFCC	<b>AUTOIGNITION TEMP:</b> N/D
<b>FLAMMABILITY LIMITS IN AIR (% BY VOL):</b>	<b>LOWER:</b> N/D <b>UPPER:</b> N/D
<b>NFPA 704 HAZARD CODES</b>	
<b>HEALTH:</b> 2 <b>FLAMMABLE:</b> 1 <b>INSTABILITY:</b> N/R <b>OTHER:</b> N/R	
<b>NFPA 30 STORAGE CLASSIFICATION:</b> Class IIIB	

<b>EXTINGUISHING MEDIUM</b>	Use water fog, foam, CO(2), or dry chemical extinguishing media.
<b>SPECIAL FIREFIGHTING PROCEDURES</b>	Firefighters should be equipped with self-contained breathing apparatus and turnout gear.
<b>UNUSUAL FIRE EXPLOSION HAZARDS</b>	None known.

<b>SELECT ACRONYM KEY</b>	
N/A - Not available; N/D - Not determined; N/R - Not rated; N/E - Not established	

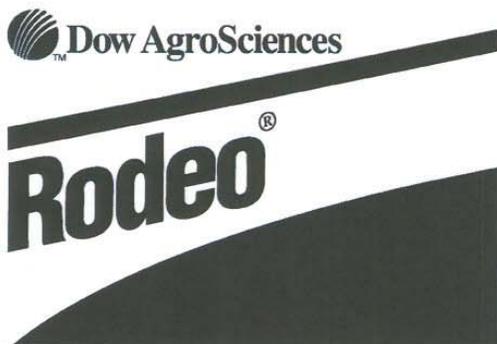








## Specimen Label



### Herbicide

For aquatic weed and brush control. For control of annual and perennial weeds and woody plants in and around aquatic and other noncrop sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression.

**Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.**

Active Ingredient(s):	
glyphosate <sup>1</sup> : N-(phosphonomethyl)glycine, isopropylamine salt .....	53.8%
Inert Ingredients .....	46.2%
Total Ingredients.....	100.0%

<sup>1</sup> Contains 5.4 pounds per gallon glyphosate, isopropylamine salt (4 pounds per gallon glyphosate acid).

EPA Reg. No. 62719-324

### Keep Out of Reach of Children

## CAUTION PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

### Precautionary Statements

#### Hazards to Humans and Domestic Animals

##### Harmful If Inhaled

**Avoid breathing spray mist. Remove contaminated clothing and wash before reuse. Wash thoroughly with soap and water after handling.**

### Personal Protective Equipment (PPE)

#### Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE (Personal Protective Equipment). If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

### Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

### User Safety Recommendations

#### Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

### First Aid

**If inhaled:** Remove individual to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

### Environmental Hazards

Do not contaminate water when disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of leak or spill, soak up and remove to a landfill.

### Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

**Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks.** This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas, which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

**Notice:** Read the entire label. Use only according to label directions. **Before buying or using this product, read "Warranty Disclaimer" and "Limitation of Remedies" elsewhere on this label.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at [www.dowagro.com](http://www.dowagro.com).

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.



### Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all Directions for Use carefully before applying.

**This is an end-use product. Dow AgroSciences does not intend and has not registered it for reformulation. See individual container label for repackaging limitations.**

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

### Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical resistant gloves made of any waterproof material
- Shoes plus socks

### Storage and Disposal

Do not contaminate water, food, feed or seed by storage or disposal.

**Storage: Store above 10°F (-12°C) to keep product from crystallizing.** Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68°F (20°C) for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.

**Pesticide Disposal:** Wastes resulting from use of this product that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticide disposal or in accordance with applicable Federal, state or local procedures.

**Container Disposal:** Emptied container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed. Do not reuse this container. Triple rinse (or equivalent). Then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

### General Information (How this product works)

This product herbicide is a water-soluble liquid which mixes readily with water and nonionic surfactant to be applied as a foliar spray for the control or destruction of many herbaceous and woody plants. Rodeo is intended for control of annual and perennial weeds and woody plants in and around aquatic and other noncrop sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression.

The active ingredient in Rodeo moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days, 7 days or more on most perennial weeds, and 30 days or more on most woody plants. Extremely cool or cloudy weather following treatment may slow the activity of this product and delay visual effects of control. Visible effects include gradual wilting and yellowing of the plant which advances to complete browning of above-ground growth and deterioration of underground plant parts.

Unless otherwise directed on this label, delay application until vegetation has emerged and reached the stages described for control of such vegetation under the "Weeds Controlled" section of this label.

Unemerged plants arising from unattached underground rhizomes or root stocks of perennials or brush will not be affected by the spray and will continue to grow. For this reason best control of most perennial weeds or brush is obtained when treatment is made at late growth stages approaching maturity.

Always use the higher rate of Rodeo and surfactant within the recommended range when vegetation is heavy or dense.

Do not treat weeds, brush or trees under poor growing conditions such as drought stress, disease or insect damage, as reduced control may result. Reduced control of target vegetation may also occur if foliage is heavily covered with dust at the time of treatment.

Reduced control may result when applications are made to woody plants or weeds following site disturbance or plant top growth removal from grazing, mowing, logging or mechanical brush control. For best results, delay treatment of such areas until resprouting and foliar growth has restored the target vegetation to the recommended stage of growth for optimum herbicidal exposure and control.

Rainfall or irrigation occurring within 6 hours after application may reduce effectiveness. Heavy rainfall or irrigation within 2 hours after application may wash the product off the foliage and a repeat treatment may be required.

Rodeo does not provide residual weed control. For subsequent residual weed control, follow a label-approved herbicide program. Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used.

**NOTE:** Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of this product or other materials that are not expressly recommended in this label. Mixing this product with herbicides or other materials not recommended in this label may result in reduced performance.

**ATTENTION: Avoid drift. Extreme care must be used when applying this product to prevent injury to desirable plants and crops.**



Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **Avoid applying at excessive speed or pressure.**

### Mixing and Application Instructions

Clean sprayer and parts immediately after using this product by thoroughly flushing with water and dispose of rinsate according to labeled use or disposal instructions.

Apply these spray solutions in properly maintained and calibrated equipment capable of delivering desired volumes. Hand-gun applications should be properly directed to avoid spraying desirable plants. **Note: reduced results may occur if water containing soil is used, such as water from ponds and unlined ditches.**

#### Mixing

Rodeo mixes readily with water. Mix spray solutions of this product as follows:

1. Fill the mixing or spray tank with the required amount of water while adding the required amount of this product (see "Directions for Use" and "Weeds Controlled" sections of this label).
2. Near the end of the filling process, add the required surfactant and mix well. Remove hose from tank immediately after filling to avoid siphoning back into the water source.

**Note:** If tank mixing with Garlon® 3A herbicide, ensure that Garlon 3A is well mixed with at least 75 percent of the total spray volume before adding Rodeo to the spray tank to avoid incompatibility.

During mixing and application, foaming of the spray solution may occur. To prevent or minimize foam, avoid the use of mechanical agitators, place the filling hose below the surface of the spray solution (only during filling), terminate by-pass and return lines at the bottom of the tank, and, if needed, use an approved anti-foam or defoaming agent.

Keep by-pass line on or near bottom of tank to minimize foaming. Screen size in nozzle or line strainers should be no finer than 50 mesh. Carefully select correct nozzle to avoid spraying a fine mist. For best results with conventional ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

**IMPORTANT:** When using this product, unless otherwise specified, mix 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution. Use a nonionic surfactant labeled for use with herbicides. The surfactant must contain 50 percent or more active ingredient.

Always read and follow the manufacturer's surfactant label recommendations for best results.

These surfactants should not be used in excess of 1 quart per acre when making **broadcast** applications.

Carefully observe all cautionary statements and other information appearing in the surfactant label.

**Colorants or marking dyes** approved for use with herbicides may be added to spray mixtures of this product. Colorants or dyes used in spray solutions of this product may reduce performance, especially at lower rates or dilutions. Use colorants or dyes according to the manufacturer's label recommendations.

### Application Equipment and Techniques

**ATTENTION: AVOID DRIFT. EXTREME CARE MUST BE EXERCISED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.**

Do not allow the herbicide solution to mist, drip, drift, or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to crops, plants, or other areas on which the treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **AVOID APPLYING AT EXCESSIVE SPEED OR PRESSURE.**

**Note:** Use of this product in a manner not consistent with this label may result in injury to persons, animals, or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

#### Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions. The following drift management requirements must be followed to avoid off-target drift movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses or to applications using dry formulations.

1. The distance of the outer most nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees. Where states have more stringent regulations, they should be observed.

The applicator should be familiar with and take into account the information covered in the following **Aerial Drift Reduction Advisory Information:**

**Importance of Droplet Size:** The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversion section of this label).



**Controlling Droplet Size:** Volume-Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.

Pressure-Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.

Number of nozzles-Use the minimum number of nozzles that provide uniform coverage.

Nozzle Orientation-Orienting nozzles so that the spray is released backwards, parallel to the airstream will produce larger droplets than other orientations. Significant deflection from the horizontal will reduce droplet size and increase drift potential.

Nozzle Type-Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce larger droplets than other nozzle types.

Boom Length-For some use patterns, reducing the effective boom length to less than  $\frac{3}{4}$  of the wingspan or rotor length may further reduce drift without reducing swath width.

Application-Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

**Swath Adjustment:** When applications are made with a cross-wind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

**Wind:** Drift potential is lowest between wind speeds of 2-10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect drift.

**Temperature and Humidity:** When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

**Temperature Inversions:** Applications should not occur during a temperature inversion, because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud

cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a connected cloud (under low wind conditions) indicates an inversion, while smoke that moves upwards and rapidly dissipates indicates good vertical air mixing.

**Sensitive Areas:** The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

### Aerial Equipment

**For aerial application of this product in California, refer to Federal supplemental label for Rodeo herbicide entitled "For Aerial Application in California Only".** In California, aerial application may be made in aquatic sites and noncrop areas, including aquatic sites present in noncrop areas that are part of the intended treatment.

**For control of weed or brush species listed in this label using aerial application equipment:** For aerial broadcast application, unless otherwise specified, apply the rates of Rodeo and surfactant recommended for broadcast application in a spray volume of 3 to 20 gallons of water per acre. See the "Weeds Controlled" section of this label for labeled annual and herbaceous weeds and woody plants and broadcast rate recommendations. Aerial applications of this product may only be made as specifically recommended in this label.

**AVOID DRIFT. Do not apply during inversion conditions, when winds are gusty or under any other condition which will allow drift. Drift may cause damage to any vegetation contacted to which treatment is not intended. To prevent injury to adjacent desirable vegetation, appropriate buffer zones must be maintained.**

Coarse sprays are less likely to drift; therefore, do not use nozzles or nozzle configurations which dispense spray as fine spray droplets. Do not angle nozzles forward into the airstream and do not increase spray volume by increasing nozzle pressure.

Drift control additives may be used. When a drift control additive is used, read and carefully observe the cautionary statements and all other information appearing in the additive label. The use of a drift control agent for conifer and herbaceous release applications may result in conifer injury and is not recommended.

**Ensure uniform application.** To avoid streaked, uneven or overlapped application, use appropriate marking devices.

Thoroughly wash aircraft, especially landing gear, after each day of spraying to remove residues of this product accumulated during spraying or from spills. **Prolonged exposure of this product to uncoated steel surfaces may result in corrosion and possible failure of the part. Landing gear are most susceptible.** The maintenance of an organic coating (paint) which meets aerospace specification MIL-C-38413 may prevent corrosion.



### Ground Broadcast Equipment

**For control of weed or brush species listed in this label using conventional boom equipment:** For ground broadcast application, unless otherwise specified, apply the rates of Rodeo and surfactant recommended for broadcast application in a spray volume of 3 to 30 gallons of water per acre. See the "Weeds Controlled" section of this label for labeled annual and herbaceous weeds and woody plants and broadcast rate recommendations. As density of vegetation increases, spray volume should be increased within the recommended range to ensure complete coverage. Carefully select correct nozzle to avoid spraying a fine mist. For best results with ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

### Hand-Held and High-Volume Equipment (Use Coarse Sprays Only)

**For control of weeds listed in this label using knapsack sprayers or high-volume spraying equipment utilizing handguns or other suitable nozzle arrangements:**

**High volume sprays:** Prepare a **3/4 to 2 percent solution** of this product in water, add a nonionic surfactant and apply to foliage of vegetation to be controlled. For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section in this label.

Applications should be made on a spray-to-wet basis. Spray coverage should be uniform and complete. Do not spray to point of runoff.

**Low volume directed sprays:** Rodeo may be used as a **5 to 8 percent solution** in low-volume directed sprays for spot treatment of trees and brush. This treatment method is most effective in areas where there is a low density of undesirable trees or brush. If a straight stream nozzle is used, start the application at the top of the targeted vegetation and spray from top to bottom in a lateral zig-zag motion. Ensure that at least 50 percent of the leaves are contacted by the spray solution. For flat fan and cone nozzles and with hand-directed mist blowers, mist the application over the foliage of the targeted vegetation. Small, open-branched trees need only be treated from one side. If the foliage is thick or there are multiple root sprouts, applications must be made from several sides to ensure adequate spray coverage.

Prepare the desired volume of spray solution by mixing the amount of this product in water, shown in the following table:

#### Spray Solution

Desired Volume	Amount of Rodeo						
	3/4%	1%	1 1/4%	1 1/2%	2%	5%	8%
1 gal	1 fl oz	1 1/3 fl oz	1 2/3 fl oz	2 fl oz	2 2/3 fl oz	6 1/2 fl oz	10 1/4 fl oz
25 gal	1 1/2 pt	1 qt	1 1/4 qt	1 1/2 qt	2 qt	5 qt	2 gal
100 gal	3 qt	1 gal	1 1/4 gal	1 1/2 gal	2 gal	5 gal	8 gal

2 tablespoons = 1 fluid ounce

For use in knapsack sprayers, it is suggested that the recommended amount of this product be mixed with water in a larger container. Fill the knapsack sprayer with the mixed solution and add the correct amount of surfactant.

#### Wiper Applications

For wick or wiper applications, mix 1 gallon of this product with 2 gallons of clean water to make a 33 percent solution. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

Wiper applications can be used to control or suppress annual and perennial weeds listed on this label. In heavy weed stands, a double application in opposite directions may improve results. See the "Weed Controlled" section in this label for recommended timing, growth stage and other instructions for achieving optimum results

### Aquatic and Other Noncrop Sites

Apply Rodeo as directed and under conditions described to control or partially control weeds and woody plants listed in the "Weeds Controlled" section in industrial, recreational and public areas or other similar aquatic or terrestrial sites on this label.

#### Aquatic Sites

**Rodeo may be applied to emerged weeds in all bodies of fresh and brackish water which may be flowing, nonflowing or transient. This includes lakes, rivers, streams, ponds, estuaries, rice levees, seeps, irrigation and drainage ditches, canals, reservoirs, wastewater treatment facilities, wildlife habitat restoration and management areas, and similar sites.**

**If aquatic sites are present in the noncrop area and are part of the intended treatment, read and observe the following directions:**

- Rodeo does not control plants which are completely submerged or have a majority of their foliage under water.
- There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.
- Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.



- **NOTE:** Do not apply this product directly to water within 1/2 mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after the application. The water intake may be turned on prior to 48 hours if the glyphosate level in the intake water is below 0.7 parts per million as determined by laboratory analysis. These aquatic applications may be made **only** in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.
- For treatments after drawdown of water or in dry ditches, allow 7 or more days after treatment before reintroduction of water to achieve maximum weed control. Apply this product within 1 day after drawdown to ensure application to actively growing weeds.
- Floating mats of vegetation may require retreatment. Avoid wash-off of sprayed foliage by spray boat or recreational boat backwash or by rainfall within 6 hours of application. Do not re-treat within 24 hours following the initial treatment.
- Applications made to moving bodies of water must be made while traveling upstream to prevent concentration of this herbicide in water. When making any bankside applications, do not overlap more than 1 foot into open water. Do not spray in bodies of water where weeds do not exist. The maximum application rate of 7 1/2 pints per acre must not be exceeded in any single broadcast application that is being made over water.
- When emerged infestations require treatment of the total surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in fish kill.

**Other Noncrop Sites**

Rodeo may be used to control the listed weeds in the following terrestrial noncrop sites and/or in aquatic sites within these areas:

- Habitat Restoration & Management Areas
- Highways & Roadsides
- Industrial Plant Sites
- Petroleum Tank Farms
- Pipeline, Power, Telephone & Utility Rights-of-Way
- Pumping Installations
- Railroads
- Similar Sites

**Cut Stump Application**

Woody vegetation may be controlled by treating freshly cut stumps of trees and resprouts with this product. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut vegetation close to the soil surface. **Apply a 50 to 100 percent solution of this product to freshly cut surface immediately after cutting.** Delay in applying this product may result in reduced performance. For best results, trees should be cut during periods of active growth and full leaf expansion.

When used according to directions for cut stump application, this product will **control, partially control or suppress** most woody brush and tree species, some of which are listed below:

Common Name	Scientific Name
Alder	<i>Alnus spp.</i>
Coyote brush †	<i>Baccharis consanguinea</i>
Dogwood †	<i>Cornus spp.</i>
Eucalyptus	<i>Eucalyptus spp.</i>
Hickory †	<i>Carya spp.</i>
Madrone	<i>Arbutus menziesii</i>
Maple †	<i>Acer spp.</i>
Oak	<i>Quercus spp.</i>
Poplar †	<i>Populus spp.</i>
Reed, giant	<i>Arundo donax</i>
Salt cedar	<i>Tamarix spp.</i>
Sweet gum †	<i>Liquidambar styraciflua</i>
Sycamore †	<i>Platanus occidentalis</i>
Tan oak	<i>Lithocarpus densiflorus</i>
Willow	<i>Salix spp.</i>

† Rodeo is not approved for this use on these species in the state of California.

**Wildlife Habitat Restoration and Management Areas**

Rodeo is recommended for the restoration and/or maintenance of native habitat and in wildlife management areas.

**Habitat Restoration and Maintenance:** When applied as directed, exotic and other undesirable vegetation may be controlled in habitat management areas. Applications may be made to allow recovery of native plant species, to open up water to attract waterfowl, and for similar broad-spectrum vegetation control requirements in habitat management areas. Spot treatments may be made to selectively remove unwanted plants for habitat enhancement. For spot treatments, care should be exercised to keep spray off of desirable plants.

**Wildlife Food Plots:** Rodeo may be used as a site preparation treatment prior to planting wildlife food plots. Apply as directed to control vegetation in the plot area. Any wildlife food species may be planted after applying this product, or native species may be allowed to reinfest the area. If tillage is needed to prepare a seedbed, wait 7 days after applying this product before tilling to allow for maximum effectiveness.

**Injection and Frill Applications**

Woody vegetation may be controlled by injection or frill application of this product. Apply this product using suitable equipment which must penetrate into living tissue. Apply the equivalent of 1 ml of this product per 2 to 3 inches of trunk diameter. This is best achieved by applying 25 to 100 percent concentration of this product either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying dilute material to a continuous frill or more closely spaced cuttings. Avoid application techniques that allow runoff to occur from frill or cut areas in species that exude sap freely after frills or cutting. In species such as these, make frill or cut at an oblique angle so as to produce a cupping effect and use undiluted material. For best results, applications should be made during periods of active growth and full leaf expansion.



**This treatment will control the following woody species:**

Common Name	Scientific Name
Oak	<i>Quercus spp.</i>
Poplar	<i>Populus spp.</i>
Sweet gum	<i>Liquidambar styraciflua</i>
Sycamore	<i>Platanus occidentalis</i>

**This treatment will suppress the following woody species:**

Common Name	Scientific Name
Black gum †	<i>Nyssa sylvatica</i>
Dogwood	<i>Cornus spp.</i>
Hickory	<i>Carya spp.</i>
Maple, red	<i>Acer rubrum</i>

† Rodeo is not approved for this use on this species in the state of California.

**Release of Bermudagrass or Bahiagrass on Noncrop Sites**

**Release Of Dormant Bermudagrass and Bahiagrass**

When applied as directed, this product will provide control or suppression of many winter annual weeds and tall fescue for effective release of dormant bermudagrass or bahiagrass. Make applications to dormant bermudagrass or bahiagrass.

For best results on winter annuals, treat when weeds are in an early growth stage (below 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is in or beyond the 4 to 6-leaf stage.

**Weeds Controlled**

Rate recommendations for control or suppression of winter annuals and tall fescue are listed below.

Apply the recommended rates of this product in 10 to 25 gallons of water per acre plus 2 quarts nonionic surfactant per 100 gallons of total spray volume.

**Weeds Controlled or Suppressed †**

Note: C = Controlled; S = Suppressed

Weed Species	Rate of Rodeo (Fluid Ounces Per Acre)					
	6	9	12	18	24	48
<b>Barley, little</b> <i>Hordeum pusillum</i>	S	C	C	C	C	C
<b>Bedstraw, catchweed</b> <i>Galium aparine</i>	S	C	C	C	C	C
<b>Bluegrass, annual</b> <i>Poa annua</i>	S	C	C	C	C	C
<b>Chervil</b> <i>Chaerophyllum tainturieri</i>	S	C	C	C	C	C
<b>Chickweed, common</b> <i>Stellaria media</i>	S	C	C	C	C	
<b>Clover, crimson</b> <i>Trifolium incarnatum</i>	•	S	S	C	C	C
<b>Clover, large hop</b> <i>Trifolium campestre</i>	•	S	S	C	C	C
<b>Speedwell, corn</b> <i>Veronica arvensis</i>	S	C	C	C	C	C
<b>Fescue, tall</b> <i>Festuca arundinacea</i>	•	•	•	•	S	S
<b>Geranium, Carolina</b> <i>Geranium carolinianum</i>	•	•	S	S	C	C
<b>Henbit</b> <i>Lamium amplexicaule</i>	•	S	C	C	C	C
<b>Ryegrass, Italian</b> <i>Lolium multiflorum</i>	•	•	S	C	C	C
<b>Vetch, common</b> <i>Vicia sativa</i>	•	•	S	C	C	C

† These rates apply only to sites where an established competitive turf is present.

**Release of Actively Growing Bermudagrass**

**NOTE: Use only on sites where bahiagrass or bermudagrass are desired for ground cover and some temporary injury or yellowing of the grasses can be tolerated.**

When applied as directed, this product will aid in the release of bermudagrass by providing control of annual species listed in the "Weeds Controlled" section in this label, and suppression or partial control of certain perennial weeds.

For control or suppression of those annual species listed in this label, use 3/4 to 2 1/4 pints of this product as a broadcast spray in 10 to 25 gallons of spray solution per acre, plus 2 quarts of a nonionic surfactant per 100 gallons of total spray volume. Use the lower rate when treating annual weeds below 6 inches in height (or length of runner in annual vines). Use the higher rate as size of plants increases or as they approach flower or seedhead formation.



Use the higher rate for partial control or longer-term suppression of the following perennial species. Use lower rates for shorter-term suppression of growth.

Bahiagrass	Johnsongrass <sup>†</sup>
Dallisgrass	Trumpet creeper <sup>††</sup>
Fescue (tall)	Vaseygrass

<sup>†</sup> Johnsongrass is controlled at the higher rate.  
<sup>††</sup> Suppression at the higher rate only.

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment but regrowth will occur under moist conditions. Repeat applications in the same season are not recommended, since severe injury may result.

### Bahiagrass Seedhead and Vegetative Suppression

When applied as directed in the "Noncrop Sites" section in this label, this product will provide significant inhibition of seedhead emergence and will suppress vegetative growth for a period of approximately 45 days with single applications and approximately 120 days with sequential applications.

Apply this product 1 to 2 weeks after full green-up of bahiagrass or after the bahiagrass has been mowed to a uniform height of 3 to 4 inches. Applications must be made prior to seedhead emergence. Apply 5 fluid ounces per acre of this product, plus 2 quarts of an approved nonionic surfactant per 100 gallons of total spray volume in 10 to 25 gallons of water per acre.

Sequential applications of this product plus nonionic surfactant may be made at approximately 45-day intervals to extend the period of seedhead and vegetative growth suppression. For continued vegetative growth suppression, sequential applications must be made prior to seedhead emergence.

Apply no more than 2 sequential applications per year. As a first sequential application, apply 3 fluid ounces of this product per acre plus nonionic surfactant. A second sequential application of 2 to 3 fluid ounces per acre plus nonionic surfactant may be made approximately 45 days after the last application.

### Annual Grass Growth Suppression

For growth suppression of some annual grasses, such as annual ryegrass, wild barley and wild oats growing in coarse turf on roadsides or other industrial areas, apply 3 to 4 ounces of this product in 10 to 40 gallons of spray solution per acre. Mix 2 quarts of a nonionic surfactant per 100 gallons of spray solution. Applications should be made when annual grasses are actively growing and before the seedheads are in the boot stage of development. Treatments made after seedhead emergence may cause injury to the desired grasses.

### Weeds Controlled

#### Annual Weeds

Apply to actively growing annual grasses and broadleaf weeds.

Allow at least 3 days after application before disturbing treated vegetation. After this period the weeds may be mowed, tilled or burned. See "Directions for Use," "General Information" and "Mixing

and Application Instructions" for labeled uses and specific application instructions.

**Broadcast Application Rates:** Use 1 1/2 pints of this product per acre plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution if weeds are less than 6 inches tall. If weeds are greater than 6 inches tall, use 2 1/2 pints of this product per acre plus 2 or more quarts of an approved nonionic surfactant per 100 gallons of spray solution.

**Hand-Held, High-Volume Application Rates:** Use a 3/4 percent solution of this product in water plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution and apply to foliage of vegetation to be controlled.

**When applied as directed, Rodeo plus nonionic surfactant will control the following annual weeds:**

Common Name	Scientific Name
Balsamapple <sup>†</sup>	<i>Momordica charantia</i>
Barley	<i>Hordeum vulgare</i>
Barnyardgrass	<i>Echinochloa crus-galli</i>
Bassia, fivehook	<i>Bassia hyssopifolia</i>
Bluegrass, annual	<i>Poa annua</i>
Bluegrass, bulbous	<i>Poa bulbosa</i>
Brome	<i>Bromus spp.</i>
Buttercup	<i>Ranunculus spp.</i>
Cheat	<i>Bromus secalinus</i>
Chickweed, mouseear	<i>Cerastium vulgatum</i>
Cocklebur	<i>Xanthium strumarium</i>
Corn, volunteer	<i>Zea mays</i>
Crabgrass	<i>Digitaria spp.</i>
Dwarf dandelion	<i>Krigia cespitosa</i>
Falseflax, smallseed	<i>Camelina microcarpa</i>
Fiddleneck	<i>Amsinckia spp.</i>
Flaxleaf fleabane	<i>Conyza bonariensis</i>
Fleabane	<i>Erigeron spp.</i>
Foxtail	<i>Setaria spp.</i>
Foxtail, Carolina	<i>Alopecurus carolinianus</i>
Groundsel, common	<i>Senecio vulgaris</i>
Horseweed/Marestail	<i>Conyza canadensis</i>
Kochia	<i>Kochia scoparia</i>
Lambsquarters, common	<i>Chenopodium album</i>
Lettuce, prickly	<i>Lactuca serriola</i>
Morningglory	<i>Ipomoea spp.</i>
Mustard, blue	<i>Chorispora tenella</i>
Mustard, tansy	<i>Descurainia pinnata</i>
Mustard, tumble	<i>Sisymbrium altissimum</i>
Mustard, wild	<i>Sinapis arvensis</i>
Oats, wild	<i>Avena fatua</i>
Panicum	<i>Panicum spp.</i>
Pennycress, field	<i>Thlaspi arvense</i>
Pigweed, redroot	<i>Amaranthus retroflexus</i>
Pigweed, smooth	<i>Amaranthus hybridus</i>
Ragweed, common	<i>Ambrosia artemisiifolia</i>
Ragweed, giant	<i>Ambrosia trifida</i>
Rocket, London	<i>Sisymbrium irio</i>
Rye	<i>Secale cereale</i>
Ryegrass, Italian <sup>††</sup>	<i>Lolium multiflorum</i>
Sandbur, field	<i>Cenchrus spp.</i>
Shattercane	<i>Sorghum bicolor</i>
Shepherd's-purse	<i>Capsella bursa-pastoris</i>
Signalgrass, broadleaf	<i>Brachiaria platyphylla</i>
Smartweed, Pennsylvania	<i>Polygonum pennsylvanicum</i>
Sowthistle, annual	<i>Sonchus oleraceus</i>



Spanishneedles <sup>††</sup>  
Stinkgrass  
Sunflower  
Thistle, Russian  
Spurry, umbrella  
Velvetleaf  
Wheat  
Witchgrass

*Bidens bipinnata*  
*Eragrostis ciliaris*  
*Helianthus annuus*  
*Salsola kali*  
*Holosteum umbellatum*  
*Abutilon theophrasti*  
*Triticum aestivum*  
*Panicum capillare*

Clover, red (31)  
Clover, white (31)  
Cogongrass (6)  
Cordgrass (7)  
Cutgrass, giant <sup>†</sup> (8)  
Dallisgrass (31)  
Dandelion (31)  
Dock, curly (31)  
Dogbane, hemp (9)  
Fescue (31)  
Fescue, tall (10)  
Guineagrass (11)  
Hemlock, poison (31)  
Horsenettle (31)  
Horseradish (9)  
Ice Plant (22)  
Johnsongrass (12)  
Kikuyugrass (21)  
Knapweed (9)  
Lantana (13)  
Lespedeza, common (31)  
Lespedeza, sericea (31)  
Loosestrife, purple (14)  
Lotus, American (15)  
Maidencane (16)  
Milkweed (17)  
Muhly, wirestem (21)  
Mullein, common (31)  
Napiergrass (31)  
Nightshade, silverleaf (3)  
Nutsedge, purple (18)  
Nutsedge, yellow (18)  
Orchardgrass (12)  
Pampasgrass (19)  
Paragrass (16)  
Phragmites <sup>††</sup> (20)  
Quackgrass (21)  
Reed, giant (22)  
Ryegrass, perennial (12)  
Smartweed, swamp (31)  
Spatterdock (23)  
Starthistle, yellow (31)  
Sweet potato, wild <sup>†</sup> (24)  
Thistle, artichoke (25)  
Thistle, Canada (25)  
Timothy (12)  
Torpedograss <sup>†</sup> (26)  
Tules, common (27)  
Vaseygrass (31)  
Velvetgrass (31)  
Waterhyacinth (28)  
Waterlettuce (29)  
Waterprimrose (30)  
Wheatgrass, western (12)

*Trifolium pratense*  
*Trifolium repens*  
*Imperata cylindrica*  
*Spartina* spp.  
*Zizaniopsis miliacea*  
*Paspalum dilatatum*  
*Taraxacum officinale*  
*Rumex crispus*  
*Apocynum cannabinum*  
*Festuca* spp.  
*Festuca arundinacea*  
*Panicum maximum*  
*Conium maculatum*  
*Solanum carolinense*  
*Armoracia rusticana*  
*Mesembryanthemum crystallinum*  
*Sorghum halepense*  
*Pennisetum clandestinum*  
*Centaurea repens*  
*Lantana camara*  
*Lespedeza striata*  
*Lespedeza cuneata*  
*Lythrum salicaria*  
*Nelumbo lutea*  
*Panicum hematoma*  
*Asclepias* spp.  
*Muhlenbergia frondosa*  
*Verbascum thapsus*  
*Pennisetum purpureum*  
*Solanum elaeagnifolium*  
*Cyperus rotundus*  
*Cyperus esculentus*  
*Dactylis glomerata*  
*Cortaderia jubata*  
*Brachiaria mutica*  
*Phragmites* spp.  
*Agropyron repens*  
*Arundo donax*  
*Lolium perenne*  
*Polygonum coccineum*  
*Nuphar luteum*  
*Centaurea solstitialis*  
*Ipomoea pandurata*  
*Cynara cardunculus*  
*Cirsium arvense*  
*Phleum pratense*  
*Panicum repens*  
*Scirpus acutus*  
*Paspalum urvillei*  
*Holcus* spp.  
*Eichornia crassipes*  
*Pistia stratiotes*  
*Ludwigia* spp.  
*Agropyron smithii*

<sup>†</sup>Apply with hand-held equipment only.  
<sup>††</sup>Apply 3 pints of this product per acre.

Annual weeds will generally continue to germinate from seed throughout the growing season. Repeat treatments will be necessary to control later germinating weeds.

### Perennial Weeds

Apply Rodeo to control most vigorously growing perennial weeds. Unless otherwise directed, apply when target plants are actively growing and most have reached early head or early bud stage of growth. Unless otherwise directed, allow at least 7 days after application before disturbing vegetation.

**NOTE:** If weeds have been mowed or tilled, do not treat until regrowth has reached the recommended stages. Fall treatments must be applied before a killing frost.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed.

**Specific Weed Control Recommendations:** For perennial weeds, apply the recommended rate plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution. See the "General Information", "Directions for Use" and "Mixing and Application" sections in this label for specific uses and application instructions.

**When applied as directed, Rodeo plus nonionic surfactant will control the following perennial weeds:** (Numbers in parentheses "(-)" following common name of a listed weed species refer to "Specific Perennial Weed Control Recommendations" for that weed which follow the species listing.)

**Common Name**  
Alfalfa (31)  
Alligatorweed <sup>†</sup> (1)  
Anise/Fennel (31)  
Artichoke, Jerusalem (31)  
Bahagrass (31)  
Bermudagrass (2)  
Bindweed, field (3)  
Bluegrass, Kentucky (12)  
Blueweed, Texas (3)  
Brackenfern (4)  
Bromegrass, smooth (12)  
Canarygrass, reed (12)  
Cattail (5)

**Scientific Name**  
*Medicago sativa*  
*Alternanthera philoxeroides*  
*Foeniculum vulgare*  
*Helianthus tuberosus*  
*Paspalum notatum*  
*Cynodon dactylon*  
*Convolvulus arvensis*  
*Poa pratensis*  
*Helianthus ciliaris*  
*Pteridium* spp.  
*Bromus inermis*  
*Phalaris arundinacea*  
*Typha* spp.

<sup>†</sup>Partial control.  
<sup>††</sup>Partial control in southeastern states. See "Specific Weed Control Recommendations" below.



**Specific Perennial Weed Control Recommendations:**

1. **Alligatorweed:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/4 percent solution with hand-held equipment to provide partial control of alligatorweed. Apply when most of the target plants are in bloom. Repeat applications will be required to maintain such control.
2. **Bermudagrass:** Apply 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and when seedheads appear.
3. **Bindweed, field / Silverleaf Nightshade / Texas Blueweed:** Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray west of the Mississippi River and 4 1/2 to 6 pints of this product per acre east of the Mississippi River. With hand-held equipment, use a 1 1/2 percent solution. Apply when target plants are actively growing and are at or beyond full bloom. For silverleaf nightshade, best results can be obtained when application is made after berries are formed. Do not treat when weeds are under drought stress. New leaf development indicates active growth. For best results apply in late summer or fall.
4. **Brackenfern:** Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 to 1 percent solution with hand-held equipment. Apply to fully expanded fronds which are at least 18 inches long.
5. **Cattail:** Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and are at or beyond the early-to-full bloom stage of growth. Best results are achieved when application is made during the summer or fall months.
6. **Cogongrass:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray. Apply when cogongrass is at least 18 inches tall and actively growing in late summer or fall. Allow 7 or more days after application before tillage or mowing. Due to uneven stages of growth and the dense nature of vegetation preventing good spray coverage, repeat treatments may be necessary to maintain control.
7. **Cordgrass:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 2 percent solution with hand-held equipment. Schedule applications in order to allow 6 hours before treated plants are covered by tidewater. The presence of debris and silt on the cordgrass plants will reduce performance. It may be necessary to wash targeted plants prior to application to improve uptake of this product into the plant.
8. **Cutgrass, giant:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment to provide partial control of giant cutgrass. Repeat applications will be required to maintain such control, especially where vegetation is partially submerged in water. Allow for substantial regrowth to the 7 to 10-leaf stage prior to retreatment.
9. **Dogbane, hemp / Knapweed / Horseradish:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth. For best results, apply in late summer or fall.
10. **Fescue, tall:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained.
11. **Guineagrass:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and when most have reached at least the 7-leaf stage of growth.
12. **Johnsongrass / Bluegrass, Kentucky / Bromegrass, smooth / Canarygrass, reed / Orchardgrass / Ryegrass, perennial / Timothy / Wheatgrass, western:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained. In the fall, apply before plants have turned brown.
13. **Lantana:** Apply this product as a 3/4 to 1 percent solution with hand-held equipment. Apply to actively growing lantana at or beyond the bloom stage of growth. Use the higher application rate for plants that have reached the woody stage of growth.
14. **Loosestrife, purple:** Apply 4 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution using hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost.
15. **Lotus, American:** Apply 4 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost. Repeat treatment may be necessary to control regrowth from underground parts and seeds.
16. **Maidencane / Paragrass:** Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Repeat treatments will be required, especially to vegetation partially submerged in water. Under these conditions, allow for regrowth to the 7 to 10-leaf stage prior to retreatment.
17. **Milkweed, common:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth.
18. **Nutsedge, purple, yellow:** Apply 4 1/2 pints of this product per acre as a broadcast spray, or as a 3/4 percent solution with hand-held equipment to control existing nutsedge plants and immature nutlets attached to treated plants. Apply when target plants are in flower or when new nutlets can be found at rhizome tips. Nutlets which have not germinated will not be controlled and may germinate following treatment. Repeat treatments will be required for long-term control.
19. **Pampasgrass:** Apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing.
20. **Phragmites:** For partial control of phragmites in Florida and the counties of other states bordering the Gulf of Mexico, apply 7 1/2 pints per acre as a broadcast spray or apply a 1 1/2 percent solution with hand-held equipment. In other areas of the U.S., apply 4 to 6 pints per acre as a broadcast spray or apply a 3/4 percent solution with hand-held equipment for partial control. For best results, treat during late summer or fall months when plants are actively growing and in full bloom. Due to the dense nature of the vegetation, which may prevent good spray coverage and uneven stages of growth, repeat treatments may be necessary to maintain control. Visual control symptoms will be slow to develop.
21. **Quackgrass / Kikuyugrass / Muhly, wirestem:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment when most quackgrass or wirestem muhly is at least 8 inches in height (3 to 4-leaf stage of growth) and actively growing. Allow 3 or more days after application before tillage.
22. **Reed, giant / ice plant:** For control of giant reed and ice plant, apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing. For giant reed, best results are obtained when applications are made in late summer to fall.



23. **Spatterdock:** Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when most plants are in full bloom. For best results, apply during the summer or fall months.
24. **Sweet potato, wild:** Apply this product as a 1 1/2 percent solution using hand-held equipment. Apply to actively growing weeds that are at or beyond the bloom stage of growth. Repeat applications will be required. Allow the plant to reach the recommended stage of growth before retreatment.
25. **Thistle, Canada / artichoke:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment for Canada thistle. To control artichoke thistle, apply a 2 percent solution as a spray-to-wet application. Apply when target plants are actively growing and are at or beyond the bud stage of growth.
26. **Torpedograss:** Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment to provide partial control of torpedograss. Use the lower rates under terrestrial conditions, and the higher rates under partially submerged or a floating mat condition. Repeat treatments will be required to maintain such control.
27. **Tules, common:** Apply this product as a 1 1/2 percent solution with hand-held equipment. Apply to actively growing plants at or beyond the seedhead stage of growth. After application, visual symptoms will be slow to appear and may not occur for 3 or more weeks.
28. **Waterhyacinth:** Apply 5 to 6 pints of this product per acre as a broadcast spray or apply a 3/4 to 1 percent solution with hand-held equipment. Apply when target plants are actively growing and at or beyond the early bloom stage of growth. After application, visual symptoms may require 3 or more weeks to appear with complete necrosis and decomposition usually occurring within 60 to 90 days. Use the higher rates when more rapid visual effects are desired.
29. **Waterlettuce:** For control, apply a 3/4 to 1 percent solution of this product with hand-held equipment to actively growing plants. Use higher rates where infestations are heavy. Best results are obtained from mid-summer through winter applications. Spring applications may require retreatment.
30. **Waterprimrose:** Apply this product as a 3/4 percent solution using hand-held equipment. Apply to plants that are actively growing at or beyond the bloom stage of growth, but before fall color changes occur. Thorough coverage is necessary for best control.
31. **Other perennial weeds listed above:** Apply 4 1/2 to 7 1/2 pints of Rodeo per acre as a broadcast spray or apply as a 3/4 to 1 1/2 percent solution with hand-held equipment.

### Woody Brush and Trees

**NOTE:** If brush has been mowed or tilled or trees have been cut, do not treat until regrowth has reached the recommended stage of growth.

#### Application Rates and Timing

When applied as a 5 to 8 percent solution as a directed application as described in the "Hand-Held and High-Volume Equipment" section, this product will control or partially control all wood brush and tree species listed in this section of this label. Use the higher rate of application for dense stands and larger woody brush and trees.

**Specific Brush or Tree Control Recommendations:** Numbers in parentheses "(-)" following the common name of a listed brush or tree species refer to "Specific Brush or Tree Control Recommendations" which follow the species listing. See this section for specific application rates and timing for listed species.

For woody brush and trees, apply the recommended rate plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution when plants are actively growing and, unless otherwise directed, after full-leaf expansion. Use the higher rate for larger plants and/or dense areas of growth. On vines, use the higher rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation.

In arid areas, best results are obtained when application is made in the spring or early summer when brush species are at high moisture content and are flowering. Ensure thorough coverage when using hand-held equipment. Symptoms may not appear prior to frost or senescence with fall treatments.

Allow 7 or more days after application before tillage, mowing or removal. Repeat treatments may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

See the "Directions for Use" and "Mixing and Application Instructions" sections in this label for labeled use and specific application instructions. **When applied as directed, Rodeo plus nonionic surfactant will control the following woody brush plants and trees:** (Numbers in parentheses "(-)" following common name of a listed brush or tree species refer to "Specific Brush or Tree Control Recommendations" for that species which follow the species listing.)

Common Name	Scientific Name
Alder (1)	<i>Alnus spp.</i>
Ash <sup>†</sup> (20)	<i>Fraxinus spp.</i>
Aspen, quaking (2)	<i>Populus tremuloides</i>
Bearclover, Bearmat (20)	<i>Chamaebatia foliolosa</i>
Birch (3)	<i>Betula spp.</i>
Blackberry (1)	<i>Rubus spp.</i>
Broom, French (4)	<i>Cytisus monspessulanus</i>
Broom, Scotch (4)	<i>Cytisus scoparius</i>
Buckwheat, California <sup>†</sup> (5)	<i>Eriogonum fasciculatum</i>
Cascara <sup>†</sup> (20)	<i>Rhamnus purshiana</i>
Catsclaw <sup>†</sup> (6)	<i>Acacia greggi</i>
Ceanothus (20)	<i>Ceanothus spp.</i>
Chamise (17)	<i>Adenostoma fasciculatum</i>
Cherry, bitter (7)	<i>Prunus emarginata</i>
Cherry, black (7)	<i>Prunus serotina</i>
Cherry, pin (7)	<i>Prunus pennsylvanica</i>
Coyote brush (8)	<i>Baccharis consanguinea</i>
Creeper, Virginia <sup>†</sup> (20)	<i>Parthenocissus quinquefolia</i>
Dewberry (1)	<i>Rubus trivialis</i>
Dogwood (9)	<i>Cornus spp.</i>
Elderberry (3)	<i>Sambucus spp.</i>
Elm <sup>†</sup> (20)	<i>Ulmus spp.</i>
Eucalyptus, bluegum (10)	<i>Eucalyptus globulus</i>
Hasardia <sup>†</sup> (5)	<i>Haplopappus squamosus</i>
Hawthorn (2)	<i>Crataegus spp.</i>
Hazel (3)	<i>Corylus spp.</i>
Hickory (9)	<i>Carya spp.</i>
Holly, Florida (11)	<i>Schinus terebinthifolius</i>
(Brazilian peppertree)	
Honeysuckle (1)	<i>Lonicera spp.</i>
Hornbeam, American (20)	<i>Carpinus caroliniana</i>
Kudzu (12)	<i>Pueraria lobata</i>
Locust, black <sup>†</sup> (20)	<i>Robinia pseudoacacia</i>
Manzanita (20)	<i>Arctostaphylos spp.</i>



Maple, red <sup>1</sup> (13)  
 Maple, sugar (14)  
 Maple, vine <sup>1</sup> (20)  
 Monkey flower <sup>1</sup> (5)  
 Oak, black <sup>1</sup> (20)  
 Oak, northern pin (14)  
 Oak, post (1)  
 Oak, red (14)  
 Oak, southern red (7)  
 Oak, white <sup>1</sup> (20)  
 Persimmon <sup>1</sup> (20)  
 Poison-ivy (15)  
 Poison-oak (15)  
 Poplar, yellow <sup>1</sup> (20)  
 Prunus (7)  
 Raspberry (1)  
 Redbud, eastern (20)  
 Rose, multiflora (16)  
 Russian-olive (20)  
 Sage: black (17), white  
 Sagebrush, California (17)  
 Salmonberry (3)  
 Salt cedar <sup>1</sup> (9)  
 Saltbush, sea myrtle (18)  
 Sassafras (20)  
 Sourwood <sup>1</sup> (20)  
 Sumac, poison <sup>1</sup> (20)  
 Sumac, smooth <sup>1</sup> (20)  
 Sumac, winged <sup>1</sup> (20)  
 Sweetgum (7)  
 Swordfern <sup>1</sup> (20)  
 Tallowtree, Chinese (17)  
 Thimbleberry (3)  
 Tobacco, tree <sup>1</sup> (5)  
 Trumpet creeper (2)  
 Waxmyrtle, southern <sup>1</sup> (11)  
 Willow (19)

*Acer rubrum*  
*Acer saccharum*  
*Acer circinatum*  
*Mimulus guttatus*  
*Quercus velutina*  
*Quercus palustris*  
*Quercus stellata*  
*Quercus rubra*  
*Quercus falcata*  
*Quercus alba*  
*Diospyros spp.*  
*Rhus radicans*  
*Rhus toxicodendron*  
*Liriodendron tulipifera*  
*Prunus spp.*  
*Rubus spp.*  
*Cercis canadensis*  
*Rosa multiflora*  
*Elaeagnus angustifolia*  
*Salvia spp.*  
*Artemisia californica*  
*Rubus spectabilis*  
*Tamarix spp.*  
*Baccharis halimifolia*  
*Sassafras aibidum*  
*Oxydendrum arboreum*  
*Rhus vernix*  
*Rhus glabra*  
*Rhus copallina*  
*Liquidambar styraciflua*  
*Polystichum munitum*  
*Sapium sebiferum*  
*Rubus parviflorus*  
*Nicotiana glauca*  
*Campsis radicans*  
*Myrica cerifera*  
*Salix spp.*

7. **Cherry, bitter / Cherry, black / Cherry, pin / Oak, southern red / Sweetgum / Prunus:** For control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution with hand-held equipment.
8. **Coyote brush:** For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
9. **Dogwood / Hickory / Salt cedar:** For partial control, apply a 1 to 2 percent solution of this product with hand-held equipment or 6 to 7 1/2 pints per acre as a broadcast spray.
10. **Eucalyptus, bluegum:** For control of eucalyptus resprouts, apply a 1/2 percent solution of this product with hand-held equipment when resprouts are 6 to 12-feet tall. Ensure complete coverage. Apply when plants are actively growing. Avoid application to drought-stressed plants.
11. **Holly, Florida / Waxmyrtle, southern:** For partial control, apply this product as a 1 1/2 percent solution with hand-held equipment.
12. **Kudzu:** For control, apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications will be required to maintain control.
13. **Maple, red:** For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when leaves are fully developed. For partial control, apply 2 to 7 1/2 pints of this product per acre as a broadcast spray.
14. **Maple, sugar / Oak: northern pin / Oak, red:** For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
15. **Poison-ivy / Poison-oak:** For control, apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications may be required to maintain control. Fall treatments must be applied before leaves lose green color.
16. **Rose, multiflora:** For control, apply 3 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treatments should be made prior to leaf deterioration by leaf-feeding insects.
17. **Sage, black / Sagebrush, California / Chamise / Tallowtree, Chinese:** For control of these species, apply a 3/4 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.
18. **Saltbush, sea myrtle:** For control, apply this product as a 1 percent solution with hand-held equipment.
19. **Willow:** For control, apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment.
20. **Other woody brush and trees listed above:** For partial control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment.

<sup>1</sup> Partial control (See below for control or partial control instructions.)

**Specific Brush or Tree Control Recommendations:**

1. **Alder / Blackberry / Dewberry / Honeysuckle / Oak, Post / Raspberry:** For control, apply 4 1/2 to 6 pints per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.
2. **Aspen, Quaking / Hawthorn / Trumpet creeper:** For control, apply 3 to 4 1/4 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.
3. **Birch / Elderberry / Hazel / Salmonberry / Thimbleberry:** For control, apply 3 pints per acre of this product as a broadcast spray or as a 3/4 percent solution with hand-held equipment.
4. **Broom, French / Broom, Scotch:** For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment.
5. **Buckwheat, California / Hasardia / Monkey flower / Tobacco, tree:** For partial control of these species, apply a 3/4 to 1 1/2 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.
6. **Catsclaw:** For partial control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.



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### Warranty Disclaimer

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Dow AgroSciences warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. Dow AgroSciences MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

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### Inherent Risks of Use

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It is impossible to eliminate all risks associated with use of this product. Crop injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. All such risks shall be assumed by buyer.

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### Limitation of Remedies

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The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

- (1) Refund of purchase price paid by buyer or user for product bought, or
- (2) Replacement of amount of product used.

Dow AgroSciences shall not be liable for losses or damages resulting from handling or use of this product unless Dow AgroSciences is promptly notified of such loss or damage in writing. In no case shall Dow AgroSciences be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer above and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Dow AgroSciences or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.

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**Dow AgroSciences LLC • Indianapolis, IN 46268 U.S.A.**

Label Code: D02-148-002  
Replaces Label: D02-148-001

EPA-accepted 05/15/2002

#### Revisions:

1. Update of specific uses allowed in the state of California.



# STALKER<sup>®</sup>

herbicide

SPECIMEN

<b>ACTIVE INGREDIENT:</b> Isopropylamine salt of Imazapyr (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid)*	27.6%
<b>INERT INGREDIENTS</b>	72.4%
<b>TOTAL</b>	100.0%

\*Equivalent to 22.6% (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid) or 2 pounds acid per gallon.

EPA Reg. No. 241-398

U.S. Patent No. 4,798,619

## KEEP OUT OF REACH OF CHILDREN CAUTION/PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.  
(If you do not understand this label, find someone to explain it to you in detail.)

### STATEMENT OF PRACTICAL TREATMENT

**IF ON SKIN:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

**IF IN EYES:** Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Call a poison control center or doctor for treatment advice.

**IF INHALED:** Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a poison control center or doctor or going for treatment.

In case of an emergency endangering life or property involving  
this product, call day or night 800-832-HELP.

See Next Page for Additional Precautionary Statements.

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10/00

BASF Corporation  
26 Davis Drive  
Research Triangle Park, NC 27709

# BASF

**PRECAUTIONARY STATEMENTS**

**HAZARDS TO HUMANS**

**CAUTION!**

Harmful if inhaled or absorbed through skin. Avoid breathing spray mist. Avoid contact with skin, eyes or clothing. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

**Personal Protective Equipment (PPE):**

Applicators and other handlers must wear:

- long-sleeved shirt and long pants
- waterproof gloves
- shoes plus socks

Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

**USER SAFETY RECOMMENDATIONS**

Users should:

1. Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
2. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

**PHYSICAL AND CHEMICAL HAZARDS**

Spray solutions of STALKER should be mixed, stored, and applied only in stainless steel, fiberglass, plastic, and plastic-lined steel containers.

DO NOT mix, store, or apply STALKER or spray solutions of STALKER in unlined steel (except stainless steel) containers or spray tanks.

**ENVIRONMENTAL HAZARDS**

DO NOT apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. DO NOT contaminate water when disposing of equipment washwaters. This herbicide is phytotoxic at extremely low concentrations. Non-target plants may be adversely affected from drift.

**DIRECTIONS FOR USE**

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application.

For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

**AGRICULTURAL USE REQUIREMENTS**

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- coveralls
- waterproof gloves
- shoes plus socks

**NON-AGRICULTURAL USE REQUIREMENTS**

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Noncrop weed control is not within the scope of the Worker Protection Standard. See the GENERAL INFORMATION section of this label for a description of noncrop sites.

Do not enter treated areas without protective clothing until sprays have dried.

STALKER herbicide should be used only in accordance with recommendations in this leaflet label. Keep containers closed to avoid spills and contamination.

**STORAGE AND DISPOSAL**

**PROHIBITIONS:** DO NOT store below 10°F. DO NOT contaminate water, food, or feed by storage or disposal.

**PESTICIDE DISPOSAL:** Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

**CONTAINER DISPOSAL:** Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in an approved sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

**IMPORTANT**

**DO NOT** use on food or feed crops. **DO NOT** apply to the inside of ditches used to transport irrigation water. **DO NOT** apply where runoff water may flow onto agricultural land as injury to crops may result. Keep from contact with fertilizers, insecticides, fungicides, and seeds. **DO NOT** drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots.

Thoroughly clean application equipment after use. Flush tank, pump, hoses, and boom with several changes of water after removing nozzle tips and screens (clean these parts separately).

**GENERAL INFORMATION**

STALKER herbicide is an emulsifiable concentrate mixable with water, diesel oil, or recommended seed oils and penetrating oils. STALKER is to be mixed with water or a penetrating oil and applied as a spray to cut stumps and frilling cuts for the control of brush. STALKER should be mixed with a penetrating oil for application to the basal area of brush and trees. Adequate agitation should be maintained with all STALKER emulsion mixtures to prevent phase separation. Prior to actual tank mixing with other products, herbicides and carrier oils, compatibility testing in small containers is recommended!

An application of STALKER is recommended for control of brush in noncropland areas such as railroad, utility, highway, and pipeline rights-of-way, utility plant sites, petroleum tank farms, pumping installations, fence rows, storage areas, non-irrigation ditchbanks and other similar areas. STALKER herbicide is also recommended for use with asphalt and asphalt slurries to control weeds on road shoulders, under pavement, in roadside cracks and crevices, and to prevent weed encroachment on highways and paved surfaces.

STALKER herbicide is also recommended for control of undesirable vegetation along forest roads, non-irrigation ditchbanks, and the establishment and maintenance of wildlife openings.

**SYMPTOMOLOGY:**

STALKER herbicide is readily absorbed through foliage, bark and roots and is translocated rapidly throughout the plant, with accumulation in meristematic regions. Treated plants stop growing soon after herbicide application. Chlorosis first appears in the youngest leaf tissue. In perennials, the herbicide is translocated into the roots, thus preventing resprouting. Chlorosis and tissue necrosis may not be apparent in some species for several weeks after application. Woody plants, brush, and trees may not display the full extent of herbicide control until several months following application.



### PRECAUTIONS FOR AVOIDING INJURY TO NON-TARGET PLANTS

Untreated trees can occasionally be affected by root uptake of STALKER herbicide through movement into the top soil. Injury or loss of desirable trees or other plants may result if STALKER herbicide is applied on or near desirable trees or other plants, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots.

### CUT STUMP TREATMENTS

Mix 8.0-16.0 fluid ounces of STALKER in one gallon of water\*, diesel oil, or a penetrating oil. STALKER herbicide may be tank-mixed with Garlon<sup>1</sup> 3A, Garlon 4, Tordon<sup>1</sup> K, Brush Killer<sup>2</sup> 800, Escort<sup>3</sup> or Roundup<sup>4</sup> to control labeled species. Spray or brush the STALKER solution onto the cambium area of the freshly cut stump surface. Insure that the STALKER solution thoroughly wets the cambium area (the wood next to the bark) of the stump. The use of a surfactant or penetrating agent may improve uptake through partially callused cambiums. Applications can be made anytime during the year except during periods of heavy sap flow in the spring. **DO NOT** over apply causing puddling.

### TREE INJECTION TREATMENTS

No Worker Protection Standard worker entry restrictions or worker notification requirements apply when this product is directly injected into agricultural plants.

Mix 8.0-12.0 fluid ounces of STALKER in one gallon of water\*. Using standard injection equipment, apply 1 ml. of STALKER solution at each injection site around the tree with no more than 1 inch intervals between cut edges. Insure that the injector completely penetrates the bark at each site.

### FRILL OR GIRDLE TREATMENTS

Mix 8.0-12.0 fluid ounces of STALKER in one gallon of water\*, diesel oil, or a penetrating oil.

Using a hatchet, machete, or similar tool, make cuts through the bark and completely around the tree with no more than 2 inch intervals between cut edges. Spray or brush the STALKER solution into each cut until thoroughly wet.

\*Note: Use water as a diluent only when temperatures are sufficient to prevent freezing or add antifreeze (ethylene glycol) according to label directions to prevent freezing.

### CUT STUBBLE

STALKER herbicide can be applied within 2 weeks following mechanical mowing or cutting of brush. Best results are obtained when some regrowth of brush has occurred. To suppress or control resprouting, uniformly apply a spray solution of 1 to 2 pints STALKER herbicide plus 2.5 gallons (5% v/v) basal oil, or similar penetrating agent plus enough water to make 50 gallons of spray solution to treat one acre. STALKER herbicide may be tank-mixed with 1 to 2 quarts of Garlon 4 or Tordon K and other labeled products to aid in control or suppression of brush. When tank-mixing, follow all precautions on the tank-mix product label and always follow the most restrictive label. Tank-mixes should include at least 5% (v/v) penetrating agent. The addition of at least 5% (v/v)

penetrating agent can aid in uptake through the bark or exposed roots. Cut stubble applications are made to the soil and cut brush stumps. This type of application may increase ground cover injury. However, vegetation will recover. Making applications of STALKER herbicide directly to the soil can increase potential root uptake causing injury or death of desirable trees.

### USE WITH ASPHALT AND PAVED SURFACES

STALKER herbicide may be applied at 3 quarts per acre in combination with MC 30, MC 70, RC 70, and SC 70 asphalts to control weeds which encroach on road shoulders under guardrails, or in cracks and crevices of paved surfaces. The addition of an emulsifier may be needed to allow proper mixing of STALKER with other asphalts. Add STALKER to the distribution tank just before application, allowing sufficient time for it to mix uniformly with the asphalt. Mixtures should not be heated above 150°F. Do not allow mixture to stand; apply as soon as thoroughly mixed.

### THINLINE BASAL AND STEM APPLICATIONS

STALKER herbicide may be applied as a thinline application to susceptible species such as big leaf maple (*Acer macrophyllum*), willow (*Salix* spp.) and Eucalyptus (*Eucalyptus* spp.) with a stem ground line diameter of 3 inches or less. Mix 24 to 48 ounces of STALKER in one gallon of diesel oil or penetrating oil. Maintain uniform mixtures with frequent agitation. Direct a thin line of the spray solution to the stems beginning a few feet from the ground and descending toward the base of the tree making a zig-zag motion. Do not over apply causing puddling.

### LOW VOLUME BASAL BARK TREATMENTS

Mix 8.0-12.0 fluid ounces of STALKER in one gallon of diesel oil or a penetrating oil. To control mixed brush species with up to 4 inch stem diameter at breast height, spray to wet the lower 12-18 inches of the stem with the STALKER oil mixture (include the root collar area). **DO NOT** over apply causing dripping or puddling. Maintain uniform mixtures with frequent agitation. Avoid application on sites that have been mowed prior to application resulting in a high density of stump resprouts containing multiple, small (1/2 inch diameter or less) stems. Application sites containing high stem densities and multiple, small (1/2 inch diameter or less) stems should be foliar treated with low volume backpack or fixed boom applications. See BRUSH CONTROL/GROUND APPLICATIONS/Low Volume Section of ARSENAL<sup>®</sup> herbicide label (EPA Reg. No. 241-346). STALKER may be tank-mixed with Garlon 4, Brush Killer 800 and other basal products to broaden the spectrum of control. Consult the herbicide labels for rates and susceptible brush species. When tank-mixing, follow all precautions on the tank-mix product label and always follow the most restrictive label. Use a tank mix of 3 to 5% STALKER herbicide plus 15 to 20% Garlon 4 in basal oil to control black locust, honey locust, hackberry, elms and other species listed on manufacturer's labels. Use the higher rate of STALKER herbicide (5%) in areas containing sassafras, oak, hickory, cherry, and maples or in the southern 2/3's of the U.S. A tank-mix of 3% STALKER herbicide + Garlon 4 is effective in the North-eastern U.S.



**WEEDS CONTROLLED**

STALKER herbicide will provide control of the following target vegetation species. Degree of control is both species and rate dependent.

**WOODY BRUSH AND TREES**

The species of woody brush and trees controlled by STALKER herbicide include the following:

Alder ( <i>Alnus</i> spp.)	Elm ( <i>Ulmus</i> spp.) <sup>1</sup>	Privet ( <i>Ligustrum vulgare</i> )
American beech ( <i>Fagus grandifolia</i> )	Eucalyptus ( <i>Eucalyptus</i> spp.)	Red alder ( <i>Alnus rubra</i> )
Ash ( <i>Fraxinus</i> spp.)	Hawthorn ( <i>Crataegus</i> spp.)	Red maple ( <i>Acer rubrum</i> )
Aspen ( <i>Populus</i> spp.)	Hazel ( <i>Corylus cornuta</i> ) <sup>1</sup>	Russian olive ( <i>Eleagnus angustifolia</i> )
Australian pine ( <i>Casuarina equisetifolia</i> ) <sup>1</sup>	Hickory ( <i>Carya</i> spp.)	Saltcedar ( <i>Tamarix pentandra</i> )
Autumn olive ( <i>Elaeagnus umbellata</i> )	Holly ( <i>Ilex</i> spp.)	Sassafras ( <i>Sassafras albidum</i> )
Bald cypress ( <i>Taxodium distichum</i> )	Including: Gallberry ( <i>Ilex glabra</i> ) <sup>1</sup>	Scotch broom ( <i>Cytisus scoparius</i> ) <sup>1</sup>
Bigleaf maple ( <i>Acer macrophyllum</i> )	Tall gallberry ( <i>Ilex coriacea</i> )	Sourwood ( <i>Oxydendrum arboreum</i> )
Birch ( <i>Betula</i> spp.) <sup>1</sup>	Yaupon ( <i>Ilex vomitoria</i> )	Sumac ( <i>Rhus</i> spp.)
Black locust ( <i>Robinia pseudoacacia</i> ) <sup>1</sup>	Honey locust ( <i>Gleditsia triacanthos</i> ) <sup>1</sup>	Sweetbay magnolia ( <i>Magnolia virginiana</i> ) <sup>1</sup>
Black oak ( <i>Quercus kelloggii</i> )	Huckleberry ( <i>Gaylussacia</i> spp.)	Sweetgum ( <i>Liquidambar styraciflua</i> )
Blackgum ( <i>Nyssa sylvatica</i> )	<i>Lyonia</i> spp.	Sycamore ( <i>Platanus occidentalis</i> )
Boxelder ( <i>Acer negundo</i> )	Including: Fetterbush ( <i>Lyonia lucida</i> )	Tanoak ( <i>Lithocarpus densiflorus</i> ) <sup>1</sup>
Brazilian peppertree ( <i>Schinus terebinthifolius</i> )	Staggerbush ( <i>Lyonia mariana</i> )	TiTi ( <i>Cyrtilla racemiflora</i> )
Ceanothis ( <i>Ceanothus</i> spp.)	Madrone ( <i>Arbutus menziesii</i> )	Tree of heaven ( <i>Ailanthus altissima</i> ) <sup>1</sup>
Cherry ( <i>Prunus</i> spp.)	Maple ( <i>Acer</i> spp.)	<i>Vaccinium</i> spp.
Chinaberry ( <i>Melia azedarach</i> )	Melaleuca ( <i>Melaleuca quinquenervia</i> )	Including: Blueberry ( <i>Vaccinium</i> spp.)
Chinese tallow-tree ( <i>Sapium sebiferum</i> )	Mulberry ( <i>Morus</i> spp.)	Sparkleberry ( <i>Vaccium arboreum</i> )
Chinquapin ( <i>Castanopsis chrysophylla</i> ) <sup>1</sup>	Oak ( <i>Quercus</i> spp.)	Waxmyrtle ( <i>Myrica californica</i> ) <sup>1</sup>
Cottonwood ( <i>Populus</i> spp.)	Persimmon ( <i>Diospyros virginiana</i> )	( <i>Myrica cerifera</i> ) <sup>1</sup>
Cypress ( <i>Taxodium</i> spp.)	Poison oak ( <i>Rhus diversiloba</i> )	Willow ( <i>Salix</i> spp.)
Dogwood ( <i>Cornus</i> spp.)	Poplar ( <i>Populus</i> spp.)	Yellow-poplar ( <i>Liriodendron tulipifera</i> )
Elderberry ( <i>Sambucus</i> spp.) <sup>1</sup>		

<sup>1</sup>Tankmix with Garlon 4 as a basal or cut stump treatment.

**DISCLAIMER**

The label instructions for the use of this product reflect the opinion of experts based on field use and tests. The directions are believed to be reliable and should be followed carefully. However, it is impossible to eliminate all risks inherently associated with use of this product. Ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the use or application of the product contrary to label instructions, all of which are beyond the control of BASF Corporation. All such risks shall be assumed by the user. BASF warrants only that the material contained herein conforms to the chemical description on the label and is reasonably fit for the use therein described when used in accordance with the directions of use, subject to the risks referred to above.

Any damages arising from a breach of this warranty shall be limited to direct damages and shall not include consequential commercial damages such as loss of profits or values of any other special or indirect damages.

BASF makes no other express or implied warranty, including other express or implied warranty of FITNESS or of MERCHANTABILITY.

<sup>1</sup>Trademark of Dow AgroSciences Company

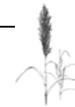
<sup>2</sup>Trademark of PBI Gordon Company

<sup>3</sup>Trademark of E.I. Dupont de Nemours and Company

<sup>4</sup>Trademark of Monsanto Company

9344

**BASF Corporation**  
 26 Davis Drive  
 Research Triangle Park, NC 27709



**Agridex**

**Agridex<sup>®</sup>**

**NON-IONIC SURFACTANT**

**Active Constituents:** 730 g/L PARAFFIN BASE PETROLEUM OIL  
149 g/L POLYOL FATTY ACID ESTERS AND  
POLYETHOXYLATED POLYOL FATTY ACID  
ESTER EMULSIFIER

**For addition to various pesticides as recommended on their labels**

**GENERAL INSTRUCTIONS**

**Mixing**

Mix the required quantity of Folicur, Bayfidan or other pesticide with water in the spray tank, then add the required amount of Agridex and stir or agitate thoroughly.

**PROTECTION OF WILDLIFE, FISH, CRUSTACEANS AND ENVIRONMENT**

DO NOT contaminate streams, rivers or waterways with the chemical or used containers.

**STORAGE AND DISPOSAL**

Keep out of reach of children. Store in the closed, original container in a cool, well ventilated area. Do not store for prolonged periods in direct sunlight. Triple or preferably pressure rinse container before disposal. Add rinsings to spray tank. Do not dispose of undiluted chemicals on site. If recycling, replace cap and return clean containers to recycler or designated collection point. If not recycling, break, crush or puncture and bury empty containers in a local authority landfill. If no landfill is available, bury the containers below 500 mm in a disposal pit specifically marked and set up for this purpose clear of waterways, desirable vegetation and tree roots. Empty containers and product should not be burnt.

**MATERIAL SAFETY DATA SHEET**

Additional information is listed in the Material Safety Data Sheet, which can be obtained from [www.bayercropscience.com.au](http://www.bayercropscience.com.au).

**EXCLUSION OF LIABILITY**

This product must be used strictly as directed, and in accordance with all instructions appearing on the label and in other reference material. So far as it is lawfully able to do so, Bayer CropScience Pty Ltd accepts no liability or responsibility for loss or damage arising from failure to follow such directions and instructions.

Agridex<sup>®</sup>, Bayfidan<sup>®</sup> and Folicur<sup>®</sup> are Trademarks of Bayer

NRA Approval Number 41165/0103

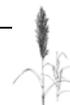
FOR 24 HOUR SPECIALIST ADVICE  
IN EMERGENCY ONLY  
PHONE 1800 033 111

**DIRECTIONS FOR USE**

Agridex is a blend of a surfactant and a superior type of agricultural spray oil which enhances the activity of Folicur<sup>®</sup> 430 SC Fungicide, Bayfidan<sup>®</sup> 250 EC Fungicide and some other pesticides. Before using Agridex, read the other pesticide label.

For use with	Crop	Rate of Agridex
Folicur 430	Peanuts	1 L/ha
Bayfidan 250	Brassica vegetables	200 mL/ha
Other pesticides - see manufacturer's label		

**NOT TO BE USED FOR ANY PURPOSE, OR IN ANY MANNER, CONTRARY TO THIS LABEL UNLESS AUTHORISED UNDER APPROPRIATE LEGISLATION**



## MATERIAL SAFETY DATA SHEET



Date of Issue: December 14, 2004

### 1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

**Product name** Agridex® Non-Ionic Surfactant  
**Other names** None  
**Product codes and pack sizes** 4950223 (20 L)  
**Chemical group** Paraffins, esters  
**Recommended use** Surfactant / adjuvant for use with various pesticides  
**Formulation** Emulsifiable concentrate  
**Supplier** Bayer CropScience Pty Ltd ABN 87 000 226 022  
**Address** 391 - 393 Tooronga Road, East Hawthorn, Victoria 3123, Australia  
**Telephone** (03) 9248 6888  
**Facsimile** (03) 9248 6800  
**Website** [www.bayercropscience.com.au](http://www.bayercropscience.com.au)  
**Contact** Development Manager (03) 9248 6888  
**Emergency Telephone Number** 1800 033 111 – Orica SH&E Shared Services

### 2. HAZARDS IDENTIFICATION

#### EMERGENCY OVERVIEW NON-HAZARDOUS SUBSTANCE – NON DANGEROUS GOOD

**Hazard classification** Not Hazardous (National Occupational Health and Safety Commission - NOHSC)  
**Risk phrases** None  
**Safety phrases** See Sections 4, 5, 6, 7, 8, 10, 12, 13  
**ADG classification** Not a "Dangerous good" for transport by road or rail according to the Australian Code for the Transport of Dangerous Goods by Road and Rail.  
**SUSDP classification** Exempt (Standard for the Uniform Scheduling of Drugs and Poisons)

### 3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredients	CAS Number	Concentration (g/L)
Paraffin base petroleum oil	[64742-56-9]	730
Polyol fatty acid esters and polyethoxylated polyol fatty acid ester emulsifier	-----	149

### 4. FIRST AID MEASURES

**If poisoning occurs, immediately contact a doctor or Poisons Information Centre (telephone 13 11 26), and follow the advice given. Show this Material Safety Data Sheet to the doctor.**

**Inhalation** If inhaled and symptoms occur, seek immediate medical assistance. If breathing has stopped, start artificial respiration. Call for prompt medical attention.



## MATERIAL SAFETY DATA SHEET



Date of Issue: December 14, 2004

### 4. FIRST AID MEASURES - continued

<b>Skin contact</b>	Carefully remove contaminated clothing. Wash affected areas with soap and water. Seek medical aid if at all worried.
<b>Eye contact</b>	Rinse eyes immediately with clean water for at least 15 minutes. If irritation persists obtain medical aid.
<b>Ingestion</b>	Seek immediate medical attention. Do NOT induce vomiting.
<b>First Aid Facilities</b>	Provide eyewash and safety shower facilities in the workplace.
<b>Medical attention</b>	Low viscosity liquid – if swallowed may enter the lungs and cause lung damage. Excessive exposure may result in eye, skin or respiratory irritation. If this product is aspirated into the lungs it may cause chemical pneumonitis.

### 5. FIRE FIGHTING MEASURES

<b>Extinguishing media</b>	Carbon dioxide, foam, dry chemical, water fog
<b>Hazards from combustion products</b>	Combustion products may include carbon monoxide, sulphur oxides, aldehydes.
<b>Precautions for fire fighters</b>	Water or foam may cause frothing. Fire fighters should wear full protective gear, including self-contained breathing apparatus (AS/NZS 1715/1716). If possible and without risk, remove intact containers from exposure to fire. Otherwise, spray unopened containers with water to keep cool. Avoid spraying directly into containers. Keep unnecessary people away. Bund area to prevent contamination of water sources. Dispose of fire control water and spillage safely later.
<b>Hazchem code</b>	Not applicable

### 6. ACCIDENTAL RELEASE MEASURES

Avoid contact with spilled material or contaminated surfaces. The spill may be slippery. Extinguish or remove possible sources of ignition. When dealing with spills do not eat, drink or smoke and wear protective clothing and equipment as described in Section 8 - PERSONAL PROTECTION. Prevent spilled material from entering drains or watercourses. Contain spill and absorb with earth, sand, clay, or other absorbent material. Collect and store in properly labelled, sealed drums for safe disposal. Deal with all spillages immediately. If contamination of drains, streams, watercourses, etc. is unavoidable, warn the local water authority.

### 7. HANDLING AND STORAGE

<b>Handling</b>	Keep out of reach of children. Avoid contact with eyes and skin. Do not inhale mists.
<b>Storage</b>	Store in the closed, original container in a cool, well ventilated area. Do not store for prolonged periods in direct sunlight. Keep container tightly closed and do not allow water to be introduced to the contents of the container.
<b>Flammability</b>	Class C2 combustible liquid – flashpoint over 150° C



## MATERIAL SAFETY DATA SHEET



Date of Issue: December 14, 2004

### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Exposure standards** NOHSC Occupational Exposure Limits for oil mist: TWA: 5 mg/m<sup>3</sup>

Definition:

*Exposure standard – Time Weighted Average (TWA)* means the average airborne concentration of a particular substance when calculated over a normal eight-hour working day, for a five-day working week.

**Biological limit values** None allocated

**Engineering controls** Control process conditions to avoid contact. Use local exhaust ventilation during manufacturing operations. Use in a well-ventilated area only, especially if mists are generated.

**Personal Protective Equipment**

- Safety goggles if exposure is likely
- Suitable work clothing to prevent skin contact
- Elbow-length PVC gloves
- If inhalation exposure is likely to exceed the exposure level above or ventilation is inadequate, an AS/NZS 1715/1716 approved respirator suitable for organic vapours should be worn.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance:** Light yellow liquid  
**Odour:** Mild, bland petroleum  
**pH:** Not available  
**Vapour pressure:** Low  
**Vapour density:** > 2.0  
**Boiling point:** > 316 ° C  
**Freezing/melting point:** Not available  
**Solubility:** Emulsifies in water  
**Density:** Approximately 0.88 g/mL at 20° C  
**Flash Point:** Approximately 183° C – Cleveland open cup  
**Flammability (explosive) limits:** Not established  
**Auto-ignition temperature:** > 260° C  
**Partition coefficient (octanol/water):** Not available

### 10. STABILITY AND REACTIVITY

**Chemical stability** Stable under normal conditions of use.

**Conditions to avoid** Extreme heat and high energy sources of ignition

**Incompatible materials** Incompatible with strong acids and oxidising agents.



## MATERIAL SAFETY DATA SHEET



Date of Issue: December 14, 2004

### 10. STABILITY AND REACTIVITY - continued

**Hazardous decomposition products** Carbon monoxide, sulphur oxides, aldehydes on combustion.

**Hazardous reactions** None known

### 11. TOXICOLOGICAL INFORMATION

#### POTENTIAL HEALTH EFFECTS

**Inhalation** Excessive exposure may result in respiratory irritation.

**Skin contact** Prolonged contact may remove natural fats and oils from the skin. Excessive exposure may result in skin irritation.

**Eye contact** Excessive exposure may result in eye irritation.

**Ingestion** If swallowed, the material may enter the lungs and cause lung damage.

#### ANIMAL TOXICITY DATA – SIMILAR PRODUCTS

**Acute:**

**Oral toxicity** LD<sub>50</sub> rat: > 2000 mg/kg

**Dermal toxicity** LD<sub>50</sub> rat: > 2000 mg/kg

**Inhalation toxicity** Not available. Similar products showed low inhalation toxicity.

**Skin irritation** Practically non-irritating (rabbit)

**Eye irritation** Practically non-irritating (rabbit)

**Sensitisation** Not expected to be sensitising based on results of tests with similar products.

#### **Chronic:**

Repeated or prolonged exposure to this product may cause irritation to the skin, eyes or respiratory tract. Overexposure to oil mist may result in oil droplet deposition and / or granuloma formation. The base oils in this product are not mutagenic or teratogenic. The main ingredient in this product is not listed as a carcinogen in the National Toxicology Program or the International Agency for Research on Cancer databases.

### 12. ECOLOGICAL INFORMATION

Agridex poses a low a hazard to the environment.  
DO NOT contaminate streams, rivers or waterways with Agridex or the used containers.

**Ecotoxicity** No data available

**Environmental fate, persistence and degradability, mobility** Adsorption to sediment and soil can be expected. This product is expected to be inherently biodegradable. Bioaccumulation is unlikely due to the low water solubility of the product.



## MATERIAL SAFETY DATA SHEET



Date of Issue: December 14, 2004

### 13. DISPOSAL CONSIDERATIONS

Triple or preferably pressure rinse containers before disposal. Add rinsings to spray tank. Do not dispose of undiluted chemicals on-site. If recycling, replace cap and return clean containers to recycler or designated collection point. If not recycling, break, crush or puncture and bury empty containers in a local authority landfill. If no landfill is available, bury the containers below 500 mm in a disposal pit specifically marked and set up for this purpose clear of waterways, desirable vegetation and tree roots. Empty containers or product should not be burnt. Dispose of waste material via a reputable waste disposal contractor.

### 14. TRANSPORT INFORMATION

UN number	Not applicable
Proper shipping name	Not applicable
Class and Subsidiary Risk	Not applicable
Packing Group	Not applicable
EPG	Not applicable
Hazchem code	Not applicable
Marine Pollutant	No

### 15. REGULATORY INFORMATION

Registered according to the Agricultural and Veterinary Chemicals Act 1988.  
Australian Pesticides and Veterinary Medicines Authority approval number: 41165  
See also Section 2.

### 16. OTHER INFORMATION

**Trademark information** Agridex® is a Registered Trademark of Bayer.

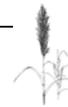
**Preparation information** Replaces August 1, 2002 MSDS.  
Reasons for revision: 16 heading format, Ingredients, Physical and Chemical properties, Exposure Standards, Toxicological and Ecological information.

This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including in conjunction with other products.

If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact this company.

Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

END OF MSDS



# Blazon®

SPRAY PATTERN INDICATOR

## General Product Description

Blazon® Spray Pattern Indicator is a non-staining blue liquid colorant designed to be used with pesticide, fertilizer and/or plant growth regulator tank mixes. Blazon® provides visual assurance that these solutions are uniformly applied, with minimum overlap and no missed areas. Blazon® helps to alert the operator to improper equipment operation - the blue color immediately indicates line and/or connection leaks and clogged nozzles. Blazon® is an excellent safety tool - the blue color provides real time feedback in the event of operator exposure to the solution.

**Blazon®:**

- is a blue liquid, containing 100% non-ionic polymeric colorant
- is patented, non-staining colorant technology
- is non-hazardous
- is **not** a dye, and will not permanently stain skin

## Package Availability

PRODUCT NAME	CONTAINER	NET CONTENTS
Blazon® Blue	2 x 2.5 gal. cont./cs.	40 lbs/case
Blazon® Blue	55 gal. drum	440 lbs/drum
Blazon® Green	4 x 1 gal. cont./cs.	4 gals./case

## Product Characteristics

- pH: 7.0
- Freeze/Thaw Stability: Excellent
- Shelf Stability: Excellent
- Solubility in Water: Complete

## Recommended Application Guidelines and Rates

Experience will be the best determinant of the rates required for your application, but the following rates are typically used:

**BLAZON BLUE APPLICATION RATE**

EQUIPMENT	APPLICATION	RATE
<b>Boom</b>	Dormant turf, greens, short cut fairways	8 - 14 oz./acre
	Longer cut fairways, roughs	16 - 24 oz./acre
<b>Hand Gun</b>	High volume applications (>2 gal. /1000 sq. ft.)	24 - 32 oz./acre
	Low volume applications (1-2 gal. /1000 sq. ft.)	18 - 24 oz./acre
<b>Back Pack</b>	Spot spraying or	One oz./gallon
	small area coverage w/ mini boom	of solution

**BLAZON® GREEN APPLICATION RATE**

Boom or	Dormant turf, greens, fairways, roughs	32 - 43 oz./acre
Hand Gun		

*Your rates may vary based on conditions in your area. Therefore, it is recommended that you begin at the higher rates and reduce with each successive tank to a color that is just visible to the applicator. Fill tank halfway, then add the color. Minimal agitation is required. Avoid contact or spills with the concentrate as it is a highly colored solution.*



**Milliken Chemical, Division of Milliken & Company, M-402**  
 P. O. Box 1927, Spartanburg, SC 29304  
 800-845-8502 or 864-503-6171, Fax: 864-503-6186  
 www.millikenturf.com



# Blazon®

SPRAY PATTERN INDICATOR

## Unique Features

- **Colorant** - Blazon® is a water soluble polymeric colorant, not a dye – it is *NON-STAINING* to skin, clothing and equipment.
- **Inert** - Pesticides are active at very low rates, and even a small amount of interference from a dye could affect the entire application. Blazon® is an inert product at all pH's and has been university tested to prove compatibility.
- **No heavy metals** - Blazon®'s unique manufacturing process does not require the use of heavy metals. None are used so there are none in the final product.
- **Highly visible** - The product is designed to be discreet but highly visible to the trained eye. Even on thick foliage or bare ground, the evidence of chemical application is provided by the bright colorant.

## Directions for Use

- Application rates will vary due to: turf or vegetation type, cut height, color & density; the color of other spray solution components; spray nozzle type, configuration & pressure; total volume of spray solution per acre (>85 gal./acre may require a higher application rate).
- Initial applications should be made at the highest rates. This allows the operator to become familiar with Blazon®'s appearance on the turf. In subsequent applications, the Blazon® rate should be adjusted to a level appropriate for the individual operator.
- Blazon® may be added anytime during the spray tank filling process. Minimum agitation is required. Blazon® may be applied from a separate container.

## General Use Precautions

- Individual operators perceive color differently - adjustments to the above rates may be necessary.
- Use caution before a general application of Blazon® near porous surfaces (e.g. - concrete, rocks, stonework, bricks).
- Decolorization may be obtained by applying a bleach solution (1 part bleach/2 parts water).
- Always use the appropriate protective equipment when handling chemicals.
- **Not intended for application to edible crops.**

## Health Safety & First Aid Information

Effects of overexposure may cause slight eye and skin irritation. In case of contact, flush with water. For additional information, see MSDS.

## Transportation, Storage and Disposal

- **Transportation** - Blazon® is a non-hazardous chemical. Not regulated by the U.S. Department of Transportation.
- **Storage** - Store in original container only and keep sealed. Store in secured storage areas. Use caution when moving, opening, closing or pouring.
- **Product Disposal** - Wastes resulting from use of this product should be disposed of through on-site spray application or at an approved waste disposal facility.
- **Container Disposal** - Triple rinse, then offer for recycling or reconditioning, dispose of in a sanitary landfill, or follow other procedures approved by federal, state and local authorities. Re-use of this container is not recommended.

*According to the Office of Pesticides and Toxic Substances of the U.S. E.P.A., no clearance is required under 40 CFR 180.1001 for use on non-crop vegetation. Not approved for edible crop use. The information contained herein is provided for the purpose of disclosing product application and does not constitute product specifications regarding which, if any, warranties are expressed or implied.*



**Milliken Chemical, Division of Milliken & Company, M-402**  
P. O. Box 1927, Spartanburg, SC 29304  
800-845-8502 or 864-503-6171, Fax: 864-503-6186  
www.millikenturf.com

rev. 07/02 #190-03



Blazon® Blue Spray Pattern Indicator  
MSDS Number: 710190

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February 26, 2003

## MATERIAL SAFETY DATA SHEET



### 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

#### Product Identification

Product Name: Blazon® Blue Spray Pattern Indicator  
Chemical Family: Polymeric Colorant  
CAS Number: Proprietary

#### Company Identification

Milliken Chemical  
P.O. Box 817  
1440 Campton Road  
Inman, SC 29349 USA  
1-864-472-9041 (For questions and emergencies)  
1-800-424-9300 or 1-703-527-3887 (CHEMTREC)



**PRODUCT USE:**  
Colorant.

### 2. COMPOSITION/INFORMATION ON INGREDIENTS

#### COMPONENT LISTING:

Chemical Name	Amount	CAS Number
PROPRIETARY COLORANT	100.0 %	Proprietary

(See Section 8 for exposure guidelines)

(See Section 15 for regulatory information)

### 3. HAZARDS IDENTIFICATION

#### EMERGENCY OVERVIEW:

The health hazards of this product should be low under normal industrial and commercial uses. May cause skin or eye irritation after repeated or prolonged contact. This material is a concentrated colorant.

#### HMIS Rating:

Health - 0  
Flammability - 0  
Reactivity - 0  
Personal Protection Index - B

#### NFPA Rating:

Health - 0  
Flammability - 0  
Reactivity - 0  
Special Hazard - None

#### POTENTIAL HEALTH EFFECTS

UNCONTROLLED DOCUMENT



Blazon® Blue Spray Pattern Indicator  
MSDS Number: 710190

Page 2 of 5  
February 26, 2003

**EYE:**

Not an eye irritant. No hazards expected in normal industrial use at room temperature.

**SKIN:**

Prolonged or repeated skin contact may cause irritation. No hazards expected in normal industrial use at room temperature.

**INHALATION:**

No information regarding inhalation available. No known hazards in normal industrial use.

**INGESTION:**

Essentially non-toxic. No hazards expected in normal industrial use.

#### 4. FIRST AID MEASURES

**EYE CONTACT FIRST AID:**

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.

**SKIN CONTACT FIRST AID:**

Wash affected area with large amounts of soap and water. Get medical attention if irritation develops or persists.

**INHALATION FIRST AID:**

Although this product is not known to cause respiratory problems, if breathing is difficult, remove to fresh air and provide oxygen. Get medical attention if cough or other symptoms develop.

**INGESTION FIRST AID:**

If swallowed, immediately give 2 glasses of water. Never give anything by mouth to an unconscious person. Contact a physician.

#### 5. FIRE FIGHTING MEASURES

**FLAMMABLE PROPERTIES**

COC Flash Point: > 260.0 C (> 500.0 F)

Autoignition Temperature: N/A

**FLAMMABLE LIMITS IN AIR**

LEL: N/A

UEL: N/A

**EXTINGUISHING MEDIA:**

Water, carbon dioxide, foam or dry powder.

**FIRE & EXPLOSION HAZARDS:**

No known unusual hazards in a fire/explosion situation.

**FIRE FIGHTING INSTRUCTIONS:**

As in any fire, wear self-contained breathing apparatus pressure-demand MSHA/NIOSH (approved or equivalent) and full protective gear. Avoid breathing smoke, fumes, and decomposition products. Contain runoff water. Contaminated extinguishing water must be disposed of in accordance with applicable regulations.

#### 6. ACCIDENTAL RELEASE MEASURES

**SPILL PROCEDURE:**

This material is a concentrated colorant. Water will increase the amount of colorant contamination. Do not allow material to enter

UNCONTROLLED DOCUMENT



Blazon® Blue Spray Pattern Indicator  
MSDS Number: 710190

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February 26, 2003

soil or surface water. Clean up area by absorbent material. Take up and place in secure closed containers. All waste materials should be packaged, labeled, and transported in accordance with all national, state/provincial, and local requirements.

**INITIAL CONTAINMENT:**

Do not allow material to enter soil or surface water.

## 7. HANDLING AND STORAGE

**HANDLING (PERSONNEL):**

Wash hands thoroughly after handling. Wash contaminated clothing before reuse.

**HANDLING (PHYSICAL ASPECTS):**

Avoid extreme temperatures. Keep container closed to avoid contamination.

**STORAGE PRECAUTIONS:**

Protect containers from physical damage. Do not stack drums more than three pallets high.

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**ENGINEERING CONTROLS:**

Good general ventilation should be sufficient to control airborne levels.

**EYE / FACE PROTECTION REQUIREMENTS:**

Wear safety glasses. Where contact with this material is likely, chemical goggles are recommended.

**SKIN PROTECTION REQUIREMENTS:**

Wear protective gloves to minimize skin contamination. For brief contact, normal work attire should be sufficient. When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material.

**RESPIRATORY PROTECTION REQUIREMENTS:**

Under normal use conditions, with adequate ventilation, no special respiratory protective equipment is required.

**EXPOSURE GUIDELINES:**

No Information Available.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

FORM:	Liquid
COLOR:	Dark Blue
ODOR:	Slight, sweet odor
BOILING POINT:	215 F
VAPOR PRESSURE:	N/A mm Hg
VAPOR DENSITY:	N/A (Air = 1)
SOLUBILITY IN WATER:	Complete
SPECIFIC GRAVITY:	1.07 (Water = 1)
MELTING/FREEZING POINT:	< 32 F
PH:	Mildly acidic
% VOLATILES:	70 (approx)%

## 10. STABILITY AND REACTIVITY

UNCONTROLLED DOCUMENT



Blazon® Blue Spray Pattern Indicator  
MSDS Number: 710190

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**STABILITY:**

This compound is stable at ambient conditions.

**POLYMERIZATION:**

Hazardous polymerization will not occur.

**INCOMPATIBILITY WITH OTHER MATERIALS:**

Avoid contact with strong oxidizing agents.

**DECOMPOSITION:**

Decomposition will not occur if handled and stored properly.

## 11. TOXICOLOGICAL INFORMATION

**Blazon® Blue Spray Pattern Indicator**

Test Code: Acute Oral Toxicity Study

Species: Rat

Results: The product tested has an oral LD50 > 5000 mg/kg

Test Code: Primary Dermal Irritation

Species: Rabbit

Results: The product tested is minimally irritating

Test Code: Primary Ocular Irritation and Reversibility

Species: Rabbit

Results: The product tested is not a primary eye irritant

Test Code: Ames Assay

Species: Salmonella

Results: The product tested is considered non-mutagenic under the test conditions

## 12. ECOLOGICAL INFORMATION

No information available.

## 13. DISPOSAL CONSIDERATIONS

**WASTE DISPOSAL:**

Uncleaned empty containers should be disposed of in the same manner as the contents. Due to the highly concentrated color, avoid washing material into sewer systems without proper treatment and authorization by the treatment facility management. All waste materials should be packaged, labeled and transported in accordance with all national, state/provincial, and local requirements.

## 14. TRANSPORTATION INFORMATION

PRODUCT LABEL: Blazon® Blue Spray Pattern Indicator

D.O.T. HAZARD CLASS: Non-Hazardous

## 15. REGULATORY INFORMATION

**CHEMICAL INVENTORY INFORMATION:**

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Blazon® Blue Spray Pattern Indicator  
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This material or all of its components are listed on the Inventory of Existing Chemical Substances under the Toxic Substance Control Act (TSCA). This material or all of its components are listed on the Canadian Domestic Substances List (DSL). This material or all of its components are listed (or considered as having been notified) on the European Inventory of Existing Chemical Substances (EINECS).

## 16. OTHER INFORMATION

PREPARED BY: John Bruhnke  
APPROVED BY: Jim Stavrakas  
TITLE: Development Associate  
APPROVAL DATE: June 7, 2002  
SUPERCEDES DATE: June 7, 2002  
MSDS NUMBER: 710190

\*\*\*\*\*  
The information contained in this Material Safety Data Sheet is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Milliken Chemical. The data on this sheet are related only to the specific material designated herein. Milliken Chemical assumes no legal responsibility for use or reliance upon these data.  
\*\*\*\*\*

\*\*\*\*\*  
**END OF MSDS**  
\*\*\*\*\*

UNCONTROLLED DOCUMENT



**11.0 REGULATORY PERMIT APPLICATIONS / FORMS**

**11.1 ACOE Permit Application**

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT <i>(33 CFR 325)</i>	OMB APPROVAL NO. 0710-0003 Expires December 31, 2004
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The public reporting burden for this collection of information is estimated to average 10 hours per response, although the majority of applications should require 5 hours or less. This includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

**PRIVACY ACT STATEMENT**

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies. Submission of requested information is voluntary, however, if information is not provided, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

**(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)**

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETED
--------------------	----------------------	------------------	-------------------------------

**(ITEMS BELOW TO BE FILLED BY APPLICANT)**

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE <i>(an agent is not required)</i>
6. APPLICANT'S ADDRESS	9. AGENT'S ADDRESS
7. APPLICANT'S PHONE NUMBERS WITH AREA CODE a. Residence b. Business	10. AGENT'S PHONE NUMBERS WITH AREA CODE a. Residence b. Business

**11. STATEMENT OF AUTHORIZATION**

I hereby authorize \_\_\_\_\_ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

APPLICANT'S SIGNATURE	DATE
-----------------------	------

**NAME, LOCATION AND DESCRIPTION OF PROJECT OR ACTIVITY**

12. PROJECT NAME OR TITLE <i>(see instructions)</i>	
13. NAME OF WATERBODY, IF KNOWN <i>(if applicable)</i>	14. PROJECT STREET ADDRESS <i>(if applicable)</i>
15. LOCATION OF PROJECT  _____ COUNTY                      _____ STATE	
16. OTHER LOCATION DESCRIPTIONS, IF KNOWN <i>(see instructions)</i>	

17. DIRECTIONS TO THE SITE



18. Nature of Activity *(Description of project, include all features)*

19. Project Purpose *(Describe the reason or purpose of the project, see instructions)*

**USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED**

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards

22. Surface Area in Acres of Wetlands or Other Waters Filled *(see instructions)*

23. Is Any Portion of the Work Already Complete? Yes \_\_\_\_\_ No \_\_\_\_\_ IF YES, DESCRIBE THE COMPLETED WORK

24. Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

25. List of Other Certifications or Approvals/Denials Received from other Federal, State, or Local Agencies for Work Described in This Application

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

\*Would include but is not restricted to zoning, building and flood plain permits

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

\_\_\_\_\_  
SIGNATURE OF APPLICANT

\_\_\_\_\_  
DATE

\_\_\_\_\_  
SIGNATURE OF AGENT

\_\_\_\_\_  
DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States, knowingly and willfully falsifies, conceals, or covers up any trick scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than \$10,000 or imprisoned not more than five years or both.



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Instructions for Preparing a  
**Department of the Army Permit Application**

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**Blocks 1 through 4.** To be completed by Corps of Engineers.

**Block 5. Applicant's Name.** Enter the name of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the responsible officer and title. If more than one party is associated with the application, please attach a sheet with the necessary information marked Block 5.

**Block 6. Address of Applicant.** Please provide the full address of the party or parties responsible for the application. If more space is needed, attach an extra sheet of paper marked Block 6.

**Block 7. Applicant Telephone Number(s).** Please provide the number where you can usually be reached during normal business hours.

**Blocks 8 through 11.** To be completed, if you choose to have an agent.

**Block 8. Authorized Agent's Name and Title.** Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, or any other person or organization. Note: An agent is not required.

**Blocks 9 and 10. Agent's Address and Telephone Number.** Please provide the complete mailing address of the agent, along with the telephone number where he / she can be reached during normal business hours.

**Block 11. Statement of Authorization.** To be completed by applicant, if an agent is to be employed.

**Block 12. Proposed Project Name or Title.** Please provide name identifying the proposed project, *e.g.*, Landmark Plaza, Burned Hills Subdivision, or Edsall Commercial Center.

**Block 13. Name of Waterbody.** Please provide the name of any stream, lake, marsh, or other waterway to be directly impacted by the activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

**Block 14. Proposed Project Street Address.** If the proposed project is located at a site having a street address (not a box number), please enter it here.

**Block 15. Location of Proposed Project.** Enter the county and state where the proposed project is located. If more space is required, please attach a sheet with the necessary information marked Block 15.

**Block 16. Other Location Descriptions.** If available, provide the Section, Township, and Range of the site and / or the latitude and longitude. You may also provide description of the proposed project location, such as lot numbers, tract numbers, or you may choose to locate the proposed project site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed project site if known.

**Block 17. Directions to the Site.** Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site.

**Block 18. Nature of Activity.** Describe the overall activity or project. Give appropriate dimensions of structures such as wingwalls, dikes (identify the materials to be used in construction, as well as the methods by which the work is to be done), or excavations (length, width, and height). Indicate whether discharge of dredged or fill material is involved. Also, identify any structure to be constructed on a fill, piles, or float-supported platforms.

The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 18.



**Block 19. Proposed Project Purpose.** Describe the purpose and need for the proposed project. What will it be used for and why? Also include a brief description of any related activities to be developed as the result of the proposed project. Give the approximate dates you plan to both begin and complete all work.

**Block 20. Reasons for Discharge.** If the activity involves the discharge of dredged and/or fill material into a wetland or other waterbody, including the temporary placement of material, explain the specific purpose of the placement of the material (such as erosion control).

**Block 21. Types of Material Being Discharged and the Amount of Each Type in Cubic Yards.** Describe the material to be discharged and amount of each material to be discharged within Corps jurisdiction. Please be sure this description will agree with your illustrations. Discharge material includes: rock, sand, clay, concrete, etc.

**Block 22. Surface Areas of Wetlands or Other Waters Filled.** Describe the area to be filled at each location. Specifically identify the surface areas, or part thereof, to be filled. Also include the means by which the discharge is to be done (backhoe, dragline, etc.). If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into a waterbody. If more space is needed, attach an extra sheet of paper marked Block 22.

**Block 23. Is Any Portion of the Work Already Complete?** Provide any background on any part of the proposed project already completed. Describe the area already developed, structures completed, any dredged or fill material already discharged, the type of material, volume in cubic yards, acres filled, if a wetland or other waterbody (in acres or square feet). If the work was done under an existing Corps permit, identify the authorization, if possible.

**Block 24. Names and Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Project Site.** List complete names and full mailing addresses of the adjacent property owners (public and private) lessees, etc., whose property adjoins the waterbody or aquatic site where the work is being proposed so that they may be notified of the proposed activity (usually by public notice). If more space is needed, attach an extra sheet of paper marked Block 24.

**Information regarding adjacent landowners is usually available through the office of the tax assessor in the county or counties where the project is to be developed.**

**Block 25. Information about Approvals or Denials by Other Agencies.** You may need the approval of other federal, state, or local agencies for your project. Identify any applications you have submitted and the status, if any (approved or denied) of each application. You need not have obtained all other permits before applying for a Corps permit.

**Block 26. Signature of Applicant or Agent.** The application must be signed by the owner or other authorized party (agent). This signature shall be an affirmation that the party applying for the permit possesses the requisite property rights to undertake the activity applied for (including compliance with special conditions, mitigation, etc.).

## DRAWINGS AND ILLUSTRATIONS

### General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross-Section Map. Identify each illustration with a figure or attachment number.

Please submit one original, or good quality copy, of all drawings on 8½ x 11 inch plain white paper (tracing paper or film may be substituted). Use the fewest number of sheets necessary for your drawings or illustrations.

Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross-section). **While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.**



## 11.2 Caltrans Standard Encroachment Permit Application

Page 1

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION  
**STANDARD ENCROACHMENT PERMIT APPLICATION**  
 TR-0100 (REV. 02/2004)

Permission is requested to encroach on the State highway right-of-way as follows:  
 (Complete all **BOXES** [write N/A if not applicable])  
 This application is not complete until all requirements have been approved.

1. COUNTY		2. ROUTE	3. POSTMILE		<b>FOR CALTRANS USE</b> PERMIT NO. _____ DIST/CO/RTE/PM _____ SIMPLEX STAMP _____ DATE OF SIMPLEX STAMP _____		
4. ADDRESS OR STREET NAME				5. CITY			
6. CROSS STREET (Distance and direction from site)			7. PORTION OF RIGHT-OF-WAY				
8. WORK TO BE PERFORMED BY <input type="checkbox"/> OWN FORCES <input type="checkbox"/> CONTRACTOR			9. EST. START DATE				10. EST. COMPLETION DATE
11. EXCAVATION	MAX. DEPTH	AVG. DEPTH	AVG. WIDTH	LENGTH	SURFACE TYPE	12. EST. COST IN STATE RW	
13. PIPES	PRODUCT TYPE		DIAMETER	VOLTAGE / PSIG	14. CALTRANS PROJECT E.A. NUMBER		

15.  Double Permit    Parent Permit Number \_\_\_\_\_  
 Applicant's Reference Number / Utility Work Order Number \_\_\_\_\_

16. Have your plans been reviewed by another Caltrans branch? NO  YES  (If "YES" Who? \_\_\_\_\_)

17. Completely describe work to be done within STATE highway right-of-way :  
 Attach 6 complete sets of **FOLDED** plans (folded 8.5" x 11" [216 mm x 280 mm]), and any applicable specifications, calculations, maps, etc.  
 All dimensions shall be in dual units (English and metric), OR exclusively in metric units.

---

18. Is a city, county, or other agency involved in the approval of this project?  
 YES (If "YES", check type of project and attach environmental documentation and conditions of approval.)  
 COMMERCIAL DEVELOPMENT     BUILDING     GRADING     OTHER \_\_\_\_\_  
 CATEGORICALLY EXEMPT     NEGATIVE DECLARATION     ENVIRONMENTAL IMPACT REPORT     OTHER \_\_\_\_\_

NO (If "NO", please check the category below which best describes the project, and complete page 4 of this application.)  
 DRIVEWAY OR ROAD APPROACH, RECONSTRUCTION, MAINTENANCE, OR RESURFACING     FENCE  
 PUBLIC UTILITY MODIFICATIONS, EXTENSIONS, HOOKUPS     MAILBOX  
 FLAGS, SIGNS, BANNERS, DECORATIONS, PARADES AND CELEBRATIONS     EROSION CONTROL  
 OTHER \_\_\_\_\_     LANDSCAPING

---

19. Will this project cause a substantial change in the significance of a historical resource (45 years or older), or cultural resource?  YES  NO  
 (If "YES", provide a description)

---

20. Is this project on an existing highway or street where the activity involves removal of a scenic resource including a significant tree or stand of trees, a rock outcropping or a historic building?  YES  NO (If "YES", provide a description)

---

21. Is work being done on applicant's property?  YES  NO (If "YES", attach site and grading plans.)

**ADA NOTICE:** For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write to Records and Forms Management, 1120 N Street, MS-89, Sacramento, CA 95814



STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION  
**STANDARD ENCROACHMENT PERMIT APPLICATION**  
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22. Will this proposed project require the disturbance of soil within highway right-of-way?  YES  NO  
 If "YES", estimate the area in square feet **AND** acres: \_\_\_\_\_ (ft<sup>2</sup>)  
 \_\_\_\_\_ (acres)

23. Will this proposed project require dewatering?  YES  NO  
 If "YES", estimate daily volume in gallons per day: \_\_\_\_\_ (gpd)

24. How will any storm water or ground water be disposed of from within or near the limits of this proposed project?  
 Storm Drain System  Combined Sewer / Storm System  Storm Water Retention Basin  
 Other (explain): \_\_\_\_\_

PLEASE READ THE FOLLOWING CLAUSES PRIOR TO SIGNING THIS ENCROACHMENT PERMIT APPLICATION.

*The applicant, understands and herein agrees to that an encroachment permit can be denied, and/or a bond required for non-payment of prior or present encroachment permit fees. Encroachment Permit fees may still be due when an application is withdrawn or denied, and that a denial may be appealed, in accordance with the California Streets and Highways Code, Section 671.5. All work shall be done in accordance with Caltrans rules and regulations subject to inspection and approval.*

*The applicant, understands and herein agrees to the general provisions, special provisions and conditions of the encroachment permit, and to indemnify and hold harmless the State, its officers, directors, agents, employees and each of them (Indemnitees) from and against any and all claims, demands, causes of action, damages, costs, expenses, actual attorneys' fees, judgments, losses and liabilities of every kind and nature whatsoever (Claims) arising out of or in connection with the issuance and/or use of this encroachment permit for: 1) bodily injury and/or death to persons including but not limited to the Applicant, the State and its officers, directors, agents and employees, the Indemnitees, and the public; and 2) damage to property of anyone. Except as provided by law, the indemnification provisions stated above shall apply regardless of the existence or degree of fault of Indemnitees. The Applicant, however, shall not be obligated to indemnify Indemnitees for Claims arising from conduct delineated in Civil Code Section 2782.*

**DISCHARGES OF STORM WATER AND NON-STORM WATER:** Work within State highway right-of-way shall be conducted in compliance with all applicable requirements of the National Pollutant Discharge Elimination System (NPDES) permit issued to the Department of Transportation (Department), to govern the discharge of storm water and non-storm water from its properties. Work shall also be in compliance with all other applicable Federal, State and Local laws and regulations, and with the Department's Encroachment Permits Manual and encroachment permit. Compliance with the Departments NPDES permit requires amongst other things, the preparation and submission of a Storm Water Pollution Protection Plan (SWPPP), or a Water Pollution Control Program (WPCP), and the approval of same by the appropriate reviewing authority prior to the start of any work. Information on the requirements may also be reviewed on the Department's Construction Website at:

<http://www.dot.ca.gov/hq/construc/stormwater1.htm>

25. NAME of APPLICANT or ORGANIZATION (Print or Type)		E-MAIL ADDRESS	
ADDRESS of APPLICANT or ORGANIZATION WHERE PERMIT IS TO BE MAILED (Include City and Zip Code)			
PHONE NUMBER		FAX NUMBER	
26. NAME of AUTHORIZED AGENT / ENGINEER (Print or Type)		IS LETTER OF AUTHORIZATION ATTACHED? <input type="checkbox"/> YES <input type="checkbox"/> NO	E-MAIL ADDRESS
ADDRESS of AUTHORIZED AGENT / ENGINEER (Include City and Zip Code)			
PHONE NUMBER		FAX NUMBER	
27. SIGNATURE of APPLICANT or ORGANIZATION	28. PRINT OR TYPE NAME	29. TITLE	30. DATE



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PERMIT NUMBER

**FEE CALCULATION -- FOR CALTRANS USE**

<input type="checkbox"/> CASH <input type="checkbox"/> CREDITCARD    NAME ON CARD _____    PHONE NUMBER _____					
<input type="checkbox"/> CHECK    NUMBER _____    NAME ON CHECK _____    PHONE NUMBER _____					
<input type="checkbox"/> EXEMPT <input type="checkbox"/> PROJECT EA _____ <input type="checkbox"/> DEFERRED BILLING (Utility)					
CALCULATED BY	(1)		(2)		
<b>REVIEW</b>	1. FEE / DEPOSIT	DATE	2. FEE / DEPOSIT	DATE	TOTAL FEE / DEPOSIT
1. _____ HOURS @ \$ _____ *	\$ _____		\$ _____		\$ _____
2. _____ HOURS @ \$ _____ *			\$ _____		\$ _____
<b>INSPECTION</b>	1. FEE / DEPOSIT	DATE	2. FEE / DEPOSIT	DATE	TOTAL FEE / DEPOSIT
1. _____ HOURS @ \$ _____ *	\$ _____		\$ _____		\$ _____
2. _____ HOURS @ \$ _____ *			\$ _____		\$ _____
<b>FIELDWORK</b>					
_____ HOURS @ \$ _____ *	\$ _____		\$ _____		\$ _____
<b>EQUIPMENT &amp; MATERIALS</b>	DEPOSIT	DATE	DEPOSIT	DATE	DEPOSIT
	\$ _____		\$ _____		\$ _____
<b>CASH DEPOSIT IN LIEU OF BOND</b>	\$ _____		\$ _____		\$ _____
<b>TOTAL COLLECTED</b>	\$ _____		\$ _____		
<b>CASHIER'S INITIALS</b>	_____		_____		\$ _____
<i>* The current hourly rate is set annually by Headquarters Accounting. District Office staff do not have authority to modify this rate.</i>					
<b>PERFORMANCE BOND</b>	<input type="checkbox"/>	DATE			AMOUNT \$ _____
<b>PAYMENT BOND</b>	<input type="checkbox"/>	DATE			AMOUNT \$ _____
<b>LIABILITY INSURANCE REQUIRED?</b>		<input type="checkbox"/> YES <input type="checkbox"/> NO			AMOUNT \$ _____



**STANDARD ENCROACHMENT PERMIT APPLICATION**

TR-0100 (REV. 02/2004)

**INSTRUCTIONS**  
for completing page 4

This page needs to be completed when the proposed project **DOES NOT** involve a City, County or other public agency.

Your answers to these questions will assist departmental staff in identifying any physical, biological, social or economic resources that may be affected by your proposed project within the State highway right-of-way. And, to determine which type of environmental studies may be required to approve your application for an encroachment permit.

It is the applicant's responsibility for the production of all required environmental documentation and supporting studies, in some cases this may be costly and time-consuming. If possible, attach photographs of the location of the proposed project.

Please answer these questions to the best of your ability. Provide a description of any "YES" answers (type, name, number, etc.)

1. Will any existing vegetation and/or landscaping within the highway right-of-way be disturbed?
2. Will the proposed project involve any soil disturbance within highway right-of-way (trenching or excavation)?
3. Are there waterways (river, creek, pond, natural pool or dry streambed) adjacent to or within the limits of the project or highway right-of-way?
4. Is the proposed project located within five miles of the coast line?
5. Will the proposed project generate construction noise levels greater than 86 dBA (i.e. jack-hammering, pile driving)?
6. Will the proposed project incorporate land from a public park, recreation area or wildlife refuge open to the public?
7. Are there any recreational trails or paths within the limits of the proposed project or highway right-of-way?
8. Will the proposed project impact any structures, buildings, rail lines, or bridges within highway right-of-way?
9. Will the proposed project impact access to any businesses or residences?
10. Will the proposed project impact any existing public utilities or public services?
11. Will the proposed project impact existing pedestrian facilities, such as sidewalks, crosswalks, or overcrossings?
12. Will new lighting be constructed within or adjacent to highway right-of-way?



11.3 CDFG SAA Application

For Department Use Only				
Notification Number:		Date Received		Date Completed
Fee Enclosed?	<input type="checkbox"/> Yes \$ _____ <input type="checkbox"/> No _____			
Action Taken/Notes				

STATE OF CALIFORNIA  
 THE RESOURCES AGENCY  
 DEPARTMENT OF FISH AND GAME

**NOTIFICATION OF LAKE OR STREAMBED ALTERATION**

All fields must be completed unless otherwise indicated.  
 (See enclosures for instructions.)

Notification Type	
<input type="checkbox"/> Timber Harvesting Plan (No. _____)	<input type="checkbox"/> Water Application (No. _____)
<input type="checkbox"/> Commercial Gravel Extraction (No. _____)	<input type="checkbox"/> Other

Application Information			
	Name	Address	Telephone/FAX
<b>Applicant:</b>			Business: Fax:
<b>Operator:</b>			Business: Fax:
<b>Contractor: (if known)</b>			Business: Fax:
<b>Contact Person: (if not applicant)</b>			Business: Fax:
<b>Property Owner:</b>			Business: Fax:

Project Location					
<b>Location Description:</b>					
County			Assessor's Parcel Number		
USGS Map		Township	Range	Section	Latitude/Longitude
Name of River, Stream, or Lake:					
Tributary To?					



**NOTIFICATION OF LAKE OR STREAMBED ALTERATION**  
 (Continued)

Name of Applicant: \_\_\_\_\_

Project Description						
<b>Project Name:</b>						
<b>Start Date:</b>		<b>Completion Date:</b>		<b>Project Cost:</b>	\$	<b>Number of Stream Encroachments: (Timber Harvesting Plans Only)</b>
<b>Describe project below:</b> (Attach separate pages if necessary)						
<input type="checkbox"/> Continued on separate page (s)						

Attachments/Enclosures		
<b>Attach or enclose the required documents listed below and check the corresponding boxes.</b>		
<input type="checkbox"/> Project Description	<input type="checkbox"/> Map showing project location, including distances and/or directions from nearest city or town	<input type="checkbox"/> Construction plans and drawings pertaining to the project
<b>Completed CEQA documents:</b>	<input type="checkbox"/> Notice of Exemption <input type="checkbox"/> Negative Declaration	<input type="checkbox"/> Mitigated Negative Declaration
	<input type="checkbox"/> Draft or Final Environmental Impact Report	<input type="checkbox"/> Notice of Determination
<b>Copies of applicable local, State, or federal permits, agreements, or other authorizations:</b>	<input type="checkbox"/> Local. Describe:	
	<input type="checkbox"/> State. Describe:	
	<input type="checkbox"/> Federal. Describe:	

I hereby certify that all information contained in this notification is true and correct and that I am authorized to sign this document. I understand that in the event this information is found to be untrue or incorrect, I may be subject to civil or criminal prosecution and the Department may consider this notification to be incomplete and/or cancel any Lake or Streambed Alteration Agreement issued pursuant to this notification. I understand that this notification is valid only for the project described herein and that I may be subject to civil or criminal prosecution for undertaking a project that differs from the one described herein, unless I have notified the Department of that project in accordance with Fish and Game Code Section 1602.

I understand that a Department representative may need to inspect the property where the project described herein will take place before issuing a Lake or Streambed Alteration Agreement pursuant to this notification. In the event the Department determines that a site inspection is necessary, I hereby authorize the Department to enter the property where the project described herein will take place to inspect the property at any reasonable time and certify that I am authorized to grant the Department permission to access the property.

I request the Department to first contact me at (insert telephone number) \_\_\_\_\_ to schedule a date and time to enter the property where the project described herein will take place and understand that this may delay the Department's evaluation of the project described herein.

Operator or Operator's Representative

Date



11.4 CDFG SAA Project Questionnaire

Arnold Schwarzenegger, Governor

STATE OF CALIFORNIA-THE RESOURCES AGENCY  
**DEPARTMENT OF FISH AND GAME**



**Lake and Streambed Alteration Program  
 Project Questionnaire**

Complete the following questionnaire and submit it with your notification package. Please attach or enclose any additional information or documents that support or relate to your response.

	Yes	Maybe/ Uncertain	No	Please explain if you responded "yes" or "maybe/uncertain"
1. Will the project or activity involve work on the bank of a river, stream, or lake?				
2. If you answered "yes" to #1, will the project or activity involve any of the following:				
a. Removal of any vegetation?				
b. Excavation of the bank?				
c. Placement of piers?				
d. Placement of bank protection or stabilization structures or materials (e.g., gabions, rip-rap, concrete slurry/sacks)?				
3. Will the project or activity take place in, adjacent to, or near a river that has been designated as "wild and scenic" under state or federal law?				
4. Will the project or activity involve work in the bed or channel of a river, stream, or lake?				
5. Will the project or activity involve the placement of any permanent or temporary structure in a river, stream, or lake?				



	Yes	Maybe/ Uncertain	No	Please explain if you responded "yes" or "maybe/uncertain"
6. Will the project involve the use of material from a streambed?				
7. Will the project or activity result in the disposal or deposition of debris, waste, or other material in a river, stream, or lake?				
a. If you answered "yes" to #7, describe the material that will be disposed of or deposited in the river stream, or lake:				
8. Will any type of equipment be used in a river, stream, or lake?				
a. If you answered "yes" to #8, describe the type of equipment that will be used:				
9. Does the project or activity area flood or periodically become inundated with water?				
10. Will water need to be diverted from a river, stream, or lake for the project or activity?				
11. If you answered "yes" to #10, please answer the following:				
a. Will this be a temporary diversion?				
b. Will water quality be affected by the deposition of silt, an increase in water temperature, a change in the pH level, or in some other way?				
c. Will the water be diverted by means of a dam, reservoir, or other water impoundment structure?				
12. Will the project or activity be done pursuant to a water right application or permit?				
13. a. Has a wildlife assessment or study been completed for the area where or near where the project or activity will take place? (If "yes", attach or enclose a copy of the assessment or study.)				

(Effective January 12, 2004)



	Yes	Maybe/ Uncertain	No	Please explain if you responded "yes" or "maybe/uncertain"
14. Will the project or activity affect fish, amphibians, insects, or other aquatic resources?				
15. Will the project or activity affect terrestrial wildlife?				
16. Are any endangered or rare plant species thought or known to occur in the area where the proposed project or activity will take place?				
17. Are any endangered or threatened fish, bird, or animal species thought or known to occur in the area where the proposed project or activity will take place?				
18. Have you contacted any other local, State, or federal agency regarding the project or activity?				
a. If you answered "yes" to #18, please list the names of the agencies you have contacted:				
19. Have you applied for or obtained any permit, agreement, or other authorization for your project or activity from any government agency?				
a. If you answered "yes" to #19, please list the names or describe the permit, agreement, or authorization you have applied for or obtained:				
20. Have any environmental documents pertaining to your project or activity been prepared?				
a. If you answered "yes" to #20, please list the environmental documents that have been prepared:				

*I hereby certify that all information contained in this form is true and correct and that I am authorized to sign this document. I understand that in the event this information is found to be untrue or incorrect, I may be subject to civil or criminal prosecution and the Department may consider my notification to be incomplete and/or cancel any Lake or Streambed Alteration Agreement issued pursuant to my notification.*

Operator or Operator's Representative \_\_\_\_\_ Date \_\_\_\_\_



11.5 LADPW Encroachment Permit Application



**LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS  
 FOR LOS ANGELES COUNTY FLOOD CONTROL DISTRICT**  
 900 SOUTH FREMONT AVENUE  
 ALHAMBRA, CALIFORNIA 91803-1331  
**FLOOD PERMIT APPLICATION**

REQUEST NO. \_\_\_\_\_  
 DATE RECEIVED: \_\_\_\_\_

The applicant must show that the proposed work will not adversely affect the District's interests; i.e., (1) Hydraulic and Hydrology Design; (2) Structural integrity; (3) Maintenance standards; (4) District's property rights, etc.

A. TO BE FILLED OUT BY OWNER/AGENT

OWNER/ APPLICANT: \_\_\_\_\_ TELEPHONE:(\_\_\_\_\_) \_\_\_\_\_

ADDRESS: \_\_\_\_\_  
Street City Zip Code

AGENT/ CONTACT: \_\_\_\_\_ TELEPHONE:(\_\_\_\_\_) \_\_\_\_\_

ADDRESS: \_\_\_\_\_  
Street City Zip Code

E-MAIL \_\_\_\_\_

SITE ADDRESS: \_\_\_\_\_  
Street City Zip Code

NEAREST INTERSECTION: \_\_\_\_\_ THOMAS GUIDE: \_\_\_\_\_

PERSON/AGENCY RESPONSIBLE FOR THE MAINTENANCE OF THE PROPOSED FACILITY: \_\_\_\_\_ PHONE: (\_\_\_\_\_) \_\_\_\_\_

The undersigned certifies that the applicant for this permit is familiar with the requirements of the County Lobbyist Ordinance (Los Angeles County Code Chapter 2.160), and that all persons acting on behalf of the applicant have complied with and will continue to comply with this ordinance throughout the application process.

Print Name of Owner/Agent \_\_\_\_\_ Signature of Owner/Agent \_\_\_\_\_ Date \_\_\_\_\_

B. SCOPE OF WORK (USE SEPARATE SHEET IF REQUIRED) \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Please submit the following with your application:

- Four sets of final construction plans (seven if Army Corps Facility involved) with structural details and profiles of the existing and proposed facilities.
- Two sets of letter size structural and/or hydraulic and hydrology calculations. The plans and calculations must be stamped and signed by a registered civil/structural engineer licensed to practice in the State of California.
- Copy of the As-Built drawing of the DISTRICT's facility impacted by the proposed work.
- Fee will be charged according to current ordinance established by the Board of Supervisors.
- For storm drain connection complete **EXHIBIT "A"** when applicable.
- Certificate of Liability Insurance (\$1,000,000 min.cov) along with the additional insured endorsement naming the County of Los Angeles, the Los Angeles County Flood Control District, and (when applicable) the U.S. Army Corps of Engr. as co-insured.

**FOR DISTRICT USE ONLY**

**PAYMENT** RECEIVED BY: \_\_\_\_\_ ASSIGNED TO: \_\_\_\_\_  
 Fees Paid Yes No Waived ( , Reciprocate Services, , Qualified Inspectors Provided, Other \_\_\_\_\_ )  
 Plan Check PCA No. \_\_\_\_\_ Plan Check Fee \_\_\_\_\_ Revenue Source Code B07-\_\_\_\_\_  
 Inspection PCA No. \_\_\_\_\_ Inspection Fee \_\_\_\_\_ Revenue Source Code B07-\_\_\_\_\_  
 SP8-7700 (Deposit \_\_\_\_\_) Total Amount \_\_\_\_\_ Receipt No. \_\_\_\_\_  
 Deposit Amount \_\_\_\_\_ Receipt No. \_\_\_\_\_

**TYPE**  
 Storm Drain Connection Landscaping Over Build Access  
 Catch Basin Relocation Major Modifications Bridge LNO  
 Catch Basin Modification Minor Modifications Utility Crossing Other \_\_\_\_\_

**INFO**  
 Stream/Project \_\_\_\_\_ File Code \_\_\_\_\_ PO # \_\_\_\_\_

PD/MTD (To be Transferred) \_\_\_\_\_ Tract/P.M. No. \_\_\_\_\_

(Preliminary Check)

General

- Permit application completely filled out
- Plan Check and Inspection fees included
- Vicinity Map
- Affected facility (i.e. MTD, RDD, & etc.) has been transferred to the District for maintenance

General Engineering Requirements

- Two sets of calculations and/or reports stamped and signed by Civil/Structural/Geotechnical Engineer
- Four sets of plans (seven for Army Corp facilities) signed and stamped by Civil/Structural/Geotechnical Engineer
- Copy of District's facility "As-Built" drawings that are affected by proposed work
- Name of affected District facility shown on the plans for the proposed work
- Plan, Profiles, Elevations, Sections, and Details for the proposed work

Storm Drain Connections

- Existing hydraulic and hydrology data of the District's facility impacted by the proposed connection
- Revised Hydraulic calculations taking into account proposed connection
- Water quality agreement signed and notarized (Not always required)
- Stationing along LACFCD's storm drain centerline where proposed connection is located

Catch basin relocation

- Existing catch basin hydrology and design data included.
- Revised catch basin hydrology and design data included.
- Connector pipe hydraulics.
- Street Capacity calculations

Crossings over channels

- Water surface and pier loss calculations
- Structural calculations for the bridge/ utility crossing including surcharges on the District facility
- Plan and profile plans

Overbuilds

- Right-of-way letter of approval from the underlying fee owner
- Structural calculations for added surcharges on District facility
- Copy of right-of-way map

Utility Crossings

Under-crossing

- Plan and profile of proposed utility showing District storm drain
- Method of support and structural calculations
- Copy of right-of-way map and "as built"

Over-crossing

- Plan and profile of proposed utility showing District storm drain
- Copy of right-of-way map and "as built"
- Structural calculations for added surcharges on District facility

Temporary Use

Short Term (less than a year)

- Liability Insurance (\$1 million dollars) including LACDPW as additionally insured
- Plot plan with north arrow and limits of affected areas

Long Term Use (more than a year)

- Copy of Use Agreement, Recreation Agreement
- SDF Plot plan with north arrow and limits of affected areas

O:\Section\Permits\Flood\Master\Flood Permit Application.doc



11.6 RWQCB 401 Application



**State Water Resources Control Board**

Division of Water Quality, Water Quality Certification Unit

1001 I Street, 15<sup>th</sup> Floor, Sacramento, CA 95814



Arnold Schwarzenegger  
 Governor

**CLEAN WATER ACT §401 WATER QUALITY CERTIFICATION  
 APPLICATION FORM FOR MULTI-REGIONAL PROJECTS**

Use this form for multi-Regional projects only. For projects located entirely within one Regional Board, use that Region's application form, available on that Region's website. To access Regional Board websites, go to [www.waterboards.ca.gov](http://www.waterboards.ca.gov), and click on the appropriate Regional Board link on the left.

**1. APPLICANT/AGENT INFORMATION**

a) Applicant:	b) Agent <sup>1</sup> :
Address:	Address:
Phone No.	Phone No.
Fax No.	Fax No.
E-mail Address:	E-mail Address:
Have you previously contacted the Regional Board staff regarding this project? <input type="checkbox"/> YES <input type="checkbox"/> NO If 'yes' provide information on date, person, and brief summary of subject matter.	

**STATEMENT OF AUTHORIZATION**

I hereby authorize \_\_\_\_\_ to act in my behalf as my agent in the processing of this application, and to furnish upon request, supplemental information in support of this permit application.

\_\_\_\_\_  
 Applicant's Signature \_\_\_\_\_  
 Date

<sup>1</sup>Complete only if applicable

**2. PROJECT DESCRIPTION**

a) Project Title:
b) Project Purpose:
c) Project Activities:
d) Proposed Schedule (start-up, duration, and completion dates):

**California Environmental Protection Agency**



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**3. FEDERAL LICENSES/PERMITS**

a) Federal Agency(ies)/File Number(s):  
 U.S. Army Corps of Engineers \_\_\_\_\_ Other \_\_\_\_\_  
 File No.(s) (if known) \_\_\_\_\_

b) Permit Type(s) (please provide permit number(s) if known):  
 Nationwide Permit No.(s) \_\_\_\_\_ Regional General Permit No.(s) \_\_\_\_\_  
 Individual Permit \_\_\_\_\_ Other \_\_\_\_\_

c) Does the project require any Federal Application(s), Notification(s) or Correspondence?  
 YES (attach copy[ies])  NO (attach detailed explanation)

d) Provide copies of the license/permit/application.

**4. OTHER LICENSES/PERMITS/AGREEMENTS**

a) Please list all other required, including local regulatory approvals (submit final or draft copy if available). Include information on any De-watering, NPDES, and Storm Water permits.

Agency	License/Permit/Agreement	Permit No.	Approval Date

b) Does the project require a Federal Energy Regulatory Commission (FERC) license or amendment to a FERC license?  
 NO  YES (application copy)

**5. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)**

Indicate CEQA Document (submit final or draft copy if available\*):

Type of CEQA Document	Date of filing of Notice of Exemption/ Preparation and Name of Lead Agency
Statutory Exemption/Class Title	
Categorical Exemption/Class Title	
Negative Declaration	
Mitigated Negative Declaration	
Environmental Impact Report	

Note: Ample time must be provided to the certifying agency to properly review a final copy of valid CEQA documentation before certification can occur.



**6. APPLICATION FEE**

Provide an initial deposit of \$500.00 for the application. Please write a check made out to the State Water Resources Control Board.  
 Is a check enclosed?  NO  YES Check Number \_\_\_\_\_ Amount \$ \_\_\_\_\_

**7. PROJECT SITE DESCRIPTION – GENERAL (Include areas outside of US waters)**

a) Project Location (attach map of suitable quality and detail):  
 City or Area \_\_\_\_\_ County \_\_\_\_\_  
 Longitude/Latitude \_\_\_\_\_

b) Total Project Size: \_\_\_\_\_ acres \_\_\_\_\_ linear feet (if appropriate)

c) Site description of the entire project area (including areas outside of jurisdictional water of the US):

**8. WATER BODY IMPACT**

a) **Water Body Name(s)**<sup>2</sup>:  
 Clearly indicate on a published map of suitable detail, quality, and scale (1:24K) to allow the certifying agency to easily identify the area(s) and water body(ies) receiving any discharge.

b) **Fill and Excavation:** Indicate in ACRES and/or LINEAR FEET the proposed waters to be impacted, and identify the impacts(s) as permanent and/or temporary for each water body type listed below:

Water Body Type	Permanent Impact		Temporary Impact	
	Acres	Linear Feet	Acres	Linear Feet
Wetland <sup>3</sup>				
Streambed				
Lake/Reservoir				
Ocean/Estuary/Bay				
Riparian				
Isolated Waters <sup>4</sup>				

Provide the name, title, and affiliation of person that carried out wetland delineation.

c) **Dredging:** Volume (cubic yards) of dredged material to be discharged in waters of the United States.

e) **SWANCC:** Is the water body “isolated” (SWANCC-related)?  YES  NO

d) Provide information on the Q<sub>2</sub>, Q<sub>10</sub>, Q<sub>100</sub> for pre- and post-project implementation.

e) Indicate type(s) of material proposed to be discharged in waters of the United States:

<sup>2</sup>Both US Army Corps of Engineer’s jurisdictional- and non-jurisdictional or isolated waters (SWANCC).

<sup>3</sup>Per US Army Corps of Engineer’s wetland delineation protocol.

<sup>4</sup>SWANCC-related (isolated) water body.

**9. COMPENSATORY MITIGATION (Please complete attached Mitigation Checklist)**

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a) Is compensatory mitigation proposed?  YES  NO

b) Indicate in ACRES and LINEAR FEET (where appropriate) the total quantity of **waters of the United States** proposed to be Created, Restored and/or Enhanced for purposes of providing Compensatory Mitigation:

Water Body Type	Created	Restored	Enhanced	Set Aside for Protection
Wetland				
Streambed				
Lake/Reservoir				
Ocean/Estuary/Bay				
Riparian				
Isolated Waters				

c) If contributing to a Mitigation Bank provide the following:

Mitigation Bank Name:
Name of Mitigation Bank Operator:
Office Address of Operator/Phone Number:
Mitigation Bank Location (Latitude/Longitude, County, and City):
Mitigation Bank Water Body Type(s):
Mitigation Area (acres or linear feet) and cost (dollar):

d) Provide/attach a map with suitable detail, quality, and scale (1:24K) that will easily provide information as to the location(s) and water body(ies) of the mitigation area.

**10. THREATENED/ENDANGERED SPECIES**

a) Does the project require coordination with the US Fish and Wildlife Service or National Marine Fisheries Service under the Federal Endangered Species Act?  
 YES (provide copies of Biological Report)  NO (provide basis of determination)

b) Does the project require coordination with the State of California Department of Fish and Game under the California Endangered Species Act?  
 YES (provide copies of Biological Report)  NO (provide basis of determination)

**11. OTHER ACTIONS/BEST MANAGEMENT PRACTICES (BMPs)**

Briefly describe other actions/BMPs to be implemented to Avoid and/or Minimize impacts to waters of the United States, including preservation of habitats, erosion control measures, project scheduling, flow diversions, etc.

**12. PAST/FUTURE PROPOSALS BY THE APPLICANT**

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Briefly list/describe any projects carried out in the last 5 years or planned for implementation in the next 5 years that are in any way related to the proposed activity or may impact the same receiving body of water. Include estimated adverse impacts.

\_\_\_\_\_  
Applicant's or Agent's Name (print)

\_\_\_\_\_  
Applicant's or Agent's Signature

\_\_\_\_\_  
Date

For further information please  
email: [LBierwirth@waterboards.ca.gov](mailto:LBierwirth@waterboards.ca.gov)

**California Environmental Protection Agency**



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## 12.0 COMMERCIAL USE POLICY

If removal project plans will potentially include any commercial entity that produces products from invasive species biomass, we strongly urge the project planners to undertake contract negotiations with the producing entity. Due to arundo's ability to aggressively invade riparian and wetland habitats, Team Arundo del Norte has established the following guidelines, which we recommend for inclusion in all contracts.

1. Propagation or cultivation of arundo in riparian, wetland, floodplain, or other natural or ecologically significant wetland habitats or any waterway or channel that leads to any such wetland habitat should be avoided without exception.
2. Propagation or cultivation of arundo must not pose a threat to or lead to the reintroduction of arundo into wetland habitats.
3. Harvesting of arundo for commercial purposes in riparian, wetland, floodplain, or other ecologically significant wetland habitats should be consistent with established eradication efforts, plans, and goals.
4. Propagation or harvesting for commercial purposes should not delay or interfere with invasive exotic species regulatory efforts, bio-control development, or arundo eradication efforts.
5. Plans to cultivate or harvest arundo should be approved by a local Weed Management Area, Cal IPC, CDFA, or some designated agency or organization charged with eradication or regulation of invasive exotic plant species.
6. Arundo distribution maps, property owner data, and any arundo-related information provided by eradication organizations such as Team Arundo del Norte should not be used by commercial interests to contact and influence landowners to grow arundo on properties included in eradication plans or other wetland habitats.
7. Commercial interests should not pay property owners to grow arundo or otherwise promote the propagation of arundo in wetland habitats.
8. Eradication equipment, machinery, and transports must not introduce or spread arundo in wetland habitats.

Additional points that should be taken into consideration when entering into contracts are listed as follows:

1. Know your removal needs and costs before negotiating your contracted selling price of the commercially harvested arundo.
2. Do not depend on harvest income for eradication costs.
3. Clearly state in the contract the agreed upon removal timeline, specific areas of removal, harvest methods, requirements for coordination with herbicide applicator, and other limitations.
4. Provide neighbors with written notification of scheduled work and your contact information for questions and complaints.
5. Require full public access to any maps and distribution data developed in cooperation with a commercial entity.
6. Include a six-month performance evaluation clause in the contract.
7. If performance is good, extend the contract to 2-3 years. If performance is poor, cancel the contract.



### 13.0 QAPP BASELINE WATER QUALITY MONITORING PLAN

As part of the SCARP, the VCRCO developed a Quality Assurance Program Plan (QAPP) designed to measure and monitor the potential effects of the proposed project's eradication efforts on water quality. The QAPP was submitted to the RWQCB and was certified as being an acceptable program for measuring potential water quality effects. Field measurements were taken at five locations along the Santa Clara River – beginning at the Ventura County line and ending near the headwaters in Acton. Samples were taken to provide baseline water quality conditions for the SCARP project area prior to implementation of individual removal activities. All of the samples were taken on 9 March 2005. Measurements of temperature, dissolved oxygen, conductivity, and pH were taken in the field and the remaining samples were submitted to a qualified laboratory for testing.

Sampling for the QAPP occurred in a single session and is therefore potentially subject to bias such as

sampling error or an uncharacteristic spike or drop in a certain constituent. Conclusions based on water quality monitoring (particularly when compared to water quality objectives in the RWQCB's 1994 Basin Plan) are typically based on averages from multiple samples taken over a 30-day period. Therefore, further water quality sampling would be necessary to provide a more accurate description of baseline conditions. However, the results of this single sampling event show that temperature, salinity, conductivity, TDS, and fecal coliform levels increased as the Santa Clara River moved upstream to downstream (Table 12-1). This is expected as more development and wastewater and stormwater inputs occur as water moves downstream in the watershed. The results also showed that glyphosate, the primary ingredient in the most common herbicides used in the watershed, was below the laboratory detectability limit (5µg/L) at all sampling locations. All other constituents were within the RWQCB's Basin Plan Water Quality Objectives for single sampling events.

**Table 12-1: Water Quality Sampling Results**

	Site 1B <sup>1</sup>	Site 2B	Site 3B	Site 4B	Site 5B
<b>Latitude</b>	34 ° 24.178 N	34 ° 25.653 N	34 ° 25.293 N	34 ° 26.349 N	34 ° 27.997 N
<b>Longitude</b>	118 ° 45.460 W	118 ° 29.653 W	118 ° 25.557 W	118 ° 16.700 W	118 ° 09.643 W
<b>Parameter</b>					
Water Temperature (°C)	23.1	23	19.5	17.5	13.4
Dissolved Oxygen (mg/L)	8.46	8.41	9.22	8.49	9.76
pH	8.66	8.98	9.15	8.41	8.36
Salinity (%)	0.04	0.03	0.03	0.02	0.02
Conductivity (µS/cm)	1.03	0.73	0.705	0.575	0.394
Glyphosate (µg/L)	>5	>5	>5	>5	>5
Ammonia as N (mg/L)	0.04	0.16	0.21	0.08	0.06
Biochemical Oxygen Demand (mg/L)	>5	>5	>5	>5	>5
Dissolved Organic Carbon (mg/L)	5.52	5.58	5.22	5.32	6.05
Nitrate as N (mg/L)	1.09	0.94	1.32	1.12	0.18
Dissolved Phosphorus (mg/L)	0.13	0.11	0.04	0.06	0.06
Total Phosphorus (mg/L)	0.64	3.77	0.3	0.25	0.06
Total Organic Carbon (mg/L)	5.69	5.74	5.52	5.42	6.4
Total Dissolved Solids (mg/L)	584	382	322	294	232
Total Suspended Solids (mg/L)	371	1960	105	93	5
Turbidity (NTU)	305	1520	43	28.7	6.1
Nitrite as N (mg/L)	0.108	0.636	0.1	0.1	0.1
Total Coliforms (MPN/100mL)	3000	700	800	23	900
Fecal Coliforms (MPN/100mL)	800	500	800	23	27

<sup>1</sup> Sample taken outside of project area boundary and in Ventura County due to lack of access point into the Santa Clara River within Los Angeles County near the county line.





## REFERENCES

- AMEC Earth & Environmental, Inc. 2004. *Santa Clara River Enhancement and Management Plan*. Prepared for: Friends of Santa Clara River, Newbury Park, CA.
- Boyd, S.D. 1987. "Habitat Parameters of *Mahonia nevinii* (Gray) Fedde (Berberidaceae)". Technical Report No. 3. Claremont, CA: Rancho Santa Ana Botanic Garden.
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- CDFG. 2001. California Natural Diversity Database. Wildlife & Habitat Data Analysis Branch. Department of Fish and Game. Electronic Database. January.
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- CDFG. 2005b. Personal communication with Mary Meyer, Rare Plant Botanist. 8 August.
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- California Native Plant Society (CNPS). 2001. *Inventory of Rare and Endangered Plants of California* (sixth edition). Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. California Native Plant Society. Sacramento, CA.
- Dudek and Associates. 2001. *Western Riverside Multiple Species Habitat Conservation Plan*.
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