FINAL

INVASIVE PLANT SPECIES CONTROL AND MANAGEMENT PLAN FOR THE ARCADE CREEK STREAM CORRIDOR, SACRAMENTO COUNTY, CALIFORNIA

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Acronyms and Abbreviations

BMPs	best management practices
City	City of Sacramento
CNDDB	California Natural Diversity Database
CVFPB	Central Valley Flood Protection Board
DFG	Department of Fish and Game
ICF	ICF International
MBTA	Migratory Bird Treaty Act
Project	Arcade Creek Watershed Management Project
QAL	Qualified Applicator's License
USFWS	U.S. Fish and Wildlife Service
VELB	Valley elderberry longhorn beetle

Chapter 1
Introduction

1.1 Project Background

Arcade Creek is approximately 16 miles long and is fed by multiple tributaries, the largest being Cripple Creek (Figure 1-1). Located in the cities of Citrus Heights and Sacramento and unincorporated areas of Sacramento County, the Arcade Creek Watershed is a 38-square-mile area of land that is subject to negative effects from increasing urban development. One contributing factor to the decline of the health of the watershed is the occurrence of nonnative invasive plants that compete with native vegetation for water, soil nutrients, and sunlight.

On May 30, 2006, the City of Sacramento (City) retained ICF International (ICF) to provide a variety of services in support of the Arcade Creek Watershed Management Project (Project), a project funded by a grant from the CALFED Watershed Program and administered by the State Water Resources Control Board. The Project seeks to improve the health and management of the Arcade Creek stream corridor through the phased implementation of public education and outreach, watershed restoration, and nonnative invasive plant species control and management efforts, all as prescribed by the CALFED Watershed Program grant.

To date, a variety of nonnative invasive plant species control and management efforts have been undertaken. Phase I (2007) nonnative invasive plant control and management efforts for the Arcade Creek stream corridor included the following:

- Conducting a full census of the stream corridor to map nonnative invasive plant species and identify related restoration opportunities (including developing nonnative invasive plant species maps).
- Developing a priority system to identify high-priority nonnative invasive plant species removal sites.
- Coordinating with Sacramento Weed Warriors (a project of the California Native Plant Society—Sacramento Valley Chapter) on giant reed removal efforts along the lower portion of the Arcade Creek stream corridor.

Phase II nonnative invasive plant control and management efforts were proposed to start in fall 2008 and include the following:

- Developing an invasive plant species control and management plan.
- Planning for nonnative invasive plant removal efforts (e.g., securing environmental permits from the Department of Fish and Game [DFG] and Central Valley Flood Protection Board [CVFPB]; reporting to Arcade Creek Watershed Group members on Phase II control efforts).

- Implementing work plans for nonnative invasive plant control.
- Reporting on the status of nonnative invasive plant control and management efforts.

Only a portion of the Phase II nonnative invasive plant control and management efforts listed above were completed because of the State of California's financial crisis, which resulted in suspension of many programs funded by bond money. This invasive plant species control and management plan was developed and planning for nonnative invasive plant removal efforts (e.g., securing environmental permits from the DFG and the CVFPB; reporting to Arcade Creek Watershed Group members on Phase II control efforts) was completed before the Project was put on hold in December 2008.

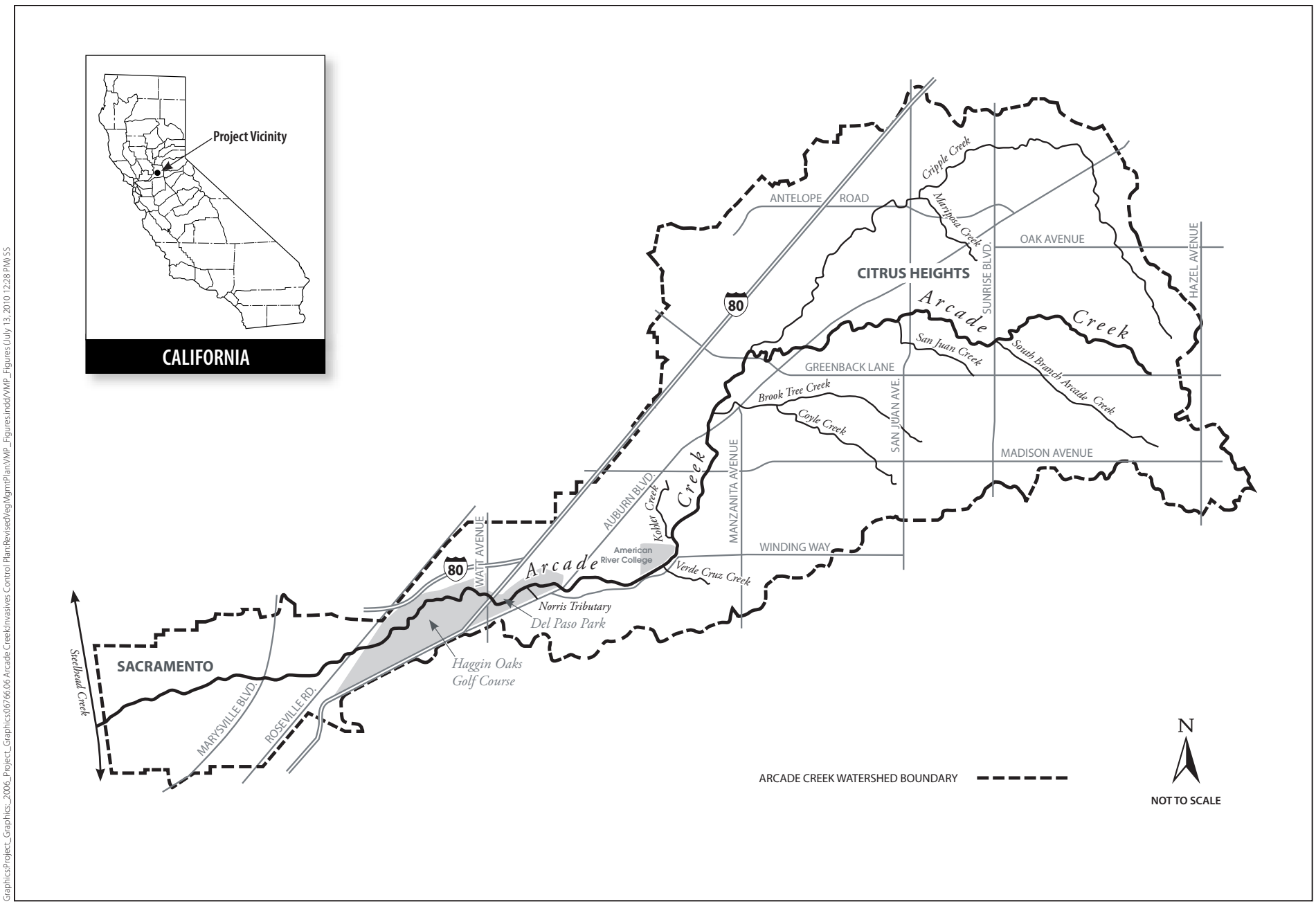
The control and management of nonnative invasive plant species in the Arcade Creek stream corridor relies on a multi-year phased approach that acknowledges the long period of viability of most nonnative invasive plant seed banks. The Arcade Creek Watershed Management Project covers Phases I and II control efforts. The grant funding for the Project expires on December 31, 2010. Additional phases of control and management of nonnative invasive plants will depend on the City's annual budget and procuring additional pertinent grants.

1.2 Effects of Nonnative Invasive Plants on Stream Corridor Health

Nonnative invasive plants are invading the Arcade Creek stream corridor at a rapid rate. This invasion is primarily the result of the development of lands adjacent to the stream corridor, especially those lands closest to the actual stream channel. Once introduced into the stream corridor, nonnative invasive plants spread exponentially, threatening native habitat and wildlife species dependent on this habitat. Some nonnative invasive plants have become so prominent in areas of the Arcade Creek stream corridor that the composition of the riparian woodland along the banks of the creek has changed from native to nonnative, with native species such as cottonwood and willow replaced by nonnative invasive species such as giant reed, red sesbania, tree-of-heaven, black locust, English ivy, vinca, cultivated fruit and nut trees, and other nonnative invasive species.

Nonnative invasive plants affect native habitats in many ways. Nonnative invasive species can compete with and displace native plants, interbreed with native plants, and introduce pathogens or parasites that can weaken or kill native plants. In this way, invasive plants can change the species composition of the environments they inhabit. As the species composition of native plant communities changes, the amount, quality, and type of food and shelter that are available to support dependent plant and wildlife species (e.g., native birds, wildlife, and insects) can be severely reduced or eliminated. As a result, as native plants and natural communities are displaced, so are dependent wildlife and bird species. Invasive plants are thought to have contributed to the decline of as many as 35 to 46 percent of the imperiled native plant species in the United States (Burmester pers. comm.). In addition, many invasive plants are known to be poisonous, toxic, or inedible to birds and wildlife species. For example, red sesbania is toxic to wildlife and can kill songbirds that ingest the plant's seeds.

Invasive plants also can affect the normal function of ecosystems, including watersheds and stream corridors, by altering fire regimes, hydrology, nutrient cycling, and productivity. With respect to fire regimes, displacement of less flammable native vegetation by more flammable invasive plants (e.g.,



Graphics:Project_Graphics:_2006_Project_Graphics:06766.06 Arcade Creek:Invasives Control Plan:RevisedVegMgmtPlan:VMP_Figures.indd:VMP_Figures (July 13, 2010 12:28 PM) SS

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Figure 1-1
Project

Scotch broom) increases the risk of fire in the infestation area. With respect to hydrology, displacement of sparse native riparian woodland and wetland vegetation by dense invasive plants increases vegetation biomass and decreases stream flow capacity in the stream corridor, which can lead to localized flooding, bank erosion, and poor water quality. These examples illustrate the subtle ways in which nonnative invasive plants degrade natural habitat function.

Invasive plants also can degrade or change recreational use patterns. For example, red sesbania, giant reed, and Himalayan blackberry grow so densely along much of the shorelines of local rivers (e.g., American and Mokelumne rivers) that recreationists can no longer access the stream channel through sections of the shoreline.

As noted above, there are many benefits to controlling nonnative invasive plants in the Arcade Creek stream corridor. Healthy, functioning native plant communities require minimal active management. In contrast, nonnative invasive plant infestations typically require ongoing management to maintain ecosystem functions, preserve wildlife habitat values, reduce fuel build-up and minimize wild fires, and preserve scenic and recreational attributes of open space areas, among other management considerations. The effects of nonnative invasive plants on Arcade Creek's stream corridor health are likely to increase through time as existing populations expand, even if new introductions are halted. Controlling nonnative invasive plants while infestations are small and manageable reduces the cost of managing larger infestations over time.

1.3 Approach to Nonnative Invasive Plant Control and Management

The invasive plant control and management program described in this document uses the multiple parameter management approach. The program focuses on management of the Arcade Creek stream corridor as a whole through selective treatment and removal of nonnative invasive plants that occur in especially problematic areas. Initially, key removal sites for Phase II were identified adjacent to the Haggin Oaks Golf Course Complex and in Del Paso Regional Park where stakeholders have noted compromised safety of park users and poor habitat and other sites where nonnative invasive plant species clog the creek channel and create localized flooding issues. Two aggressively invasive plants that occur throughout the stream corridor and are especially damaging to riverine ecosystems as the plants mature and establish were also identified for control throughout the stream corridor as part of Phase II removal efforts: red sesbania and giant reed. Because of the suspension of the Project in December 2008, Phase II efforts have been reassessed and nonnative invasive plant control efforts will now focus on Del Paso Regional Park. Controlling red sesbania and giant reed throughout the stream corridor will continue as part of Phase II efforts.

1.4 Organization and Use of this Document

The purpose of this document is to serve as a blueprint for the implementation of nonnative invasive plant control and management efforts in the Arcade Creek stream corridor. The document is intended for use by a variety of audiences, including the City, contractors who will perform the work, granting agencies, and other stakeholders.

The document is organized into the following chapters:

- **Chapter 1—Introduction** describes the project background, reasons for controlling nonnative invasive plants, and the organization of the document.
- **Chapter 2—Environmental Baseline Conditions** summarizes the baseline site conditions that were the basis for identifying nonnative invasive plant management actions and Phase II projects considered in this document.
- **Chapter 3—Nonnative Invasive Plant Species Control and Management Goals and Objectives** describes the overall goals and objectives and identifies performance standards for the nonnative invasive plant species control and management program.
- **Chapter 4—Nonnative Invasive Plant Species Management Approach and Techniques** is a resource for selecting the most effective and least harmful methods for control and management projects that will be undertaken as part of this program.
- **Chapter 5—Phase II Proposed Work Plans** presents site-specific work plans for each site identified for implementation under Phase II of the nonnative invasive plant species control and management program. More specific than Chapter 4, which presents general control and management approaches and techniques, Chapter 5 presents detailed, technical work plans designed to guide the work of contractors at each Phase II site.
- **Chapter 6—Proposed Work Plans For Future Phases of Work** presents site-specific work plans for nonnative invasive plant species control that would be covered under future phases as additional Project funding becomes available. Chapter 6, like Chapter 5, presents detailed, technical work plans designed to guide the work of contractors under future phases.
- **Chapter 7—Long-Term Nonnative Invasive Plant Species Control Maintenance Needs** describes long-term maintenance that will be necessary for the City to undertake at sites where control efforts have been implemented.
- **Chapter 8—References Cited** lists printed references and personal communications cited in the document.
- **Appendix A—Common and Scientific Species Names** lists the common and scientific names of plant and wildlife species used in this document.

Please note that common species names are used for plant and wildlife species discussed in this document. The corresponding scientific plant and wildlife species names are provided in Appendix A, Table A-1, Common and Scientific Names of Plant Species Referenced in this Document, and Table A-2, Common and Scientific Names of Wildlife Species Referenced in this Document.

Chapter 2
Environmental Baseline Conditions

This chapter tiers off of the *Final Existing Conditions and Assessment Report and Stream Corridor Management Plan for the Arcade Creek Watershed, Sacramento County, California* (ICF Jones & Stokes 2008) to describe baseline site conditions within the Arcade Creek stream corridor and to provide necessary background information for proposed nonnative invasive plant species control and management actions described in this document.

2.1 Nonnative Invasive Plants in the Arcade Creek Stream Corridor

This section summarizes nonnative invasive plants that occur in the Arcade Creek stream corridor. Table 2-1 provides a summary of these species by reach. Although some nonnative invasive plants are dominant in an individual reach, many nonnative invasive plants have been observed in all of the reaches.

Many of the nonnative invasive plants in the Arcade Creek stream corridor are ornamental landscape tree, shrub, and vine species. These nonnative invasive plants are common to many urban streams. The original source for most of the nonnative invasive plants in the Arcade Creek stream corridor is unknown, but is probably from residential or commercial landscapes. Many of the nonnative invasive plants in the stream corridor are now self-sustaining and support the further expansion of nonnative invasive plants.

Nonnative invasive plants in the Arcade Creek stream corridor have been grouped as follows to facilitate discussion: vines and groundcovers; giant reed and pampas grass; red sesbania; cultivated fruit and nut trees; and other species.

2.2 Vines and Groundcovers

Nonnative invasive vines and groundcovers occur throughout the Arcade Creek stream corridor, including species that form monocultures along creek banks or in the understory of adjacent woodlands. Nonnative invasive vines and groundcovers typically grow so dense that they shade and out-compete native understory species. The most common of these species in the Arcade Creek stream corridor are English ivy, vinca, and Himalayan blackberry (Table 2-1). English ivy and vinca spread vegetatively and typically are found in the riparian woodland understory adjacent to residential landscaped areas. English ivy may also occur in the riparian tree canopy. Himalayan

blackberry spreads vegetatively and by seed dispersal, and it forms stands of interwoven vines that are impenetrable once established.

Effective control of nonnative invasive vines and groundcovers may require a combination of physical removal and herbicide treatment. In some cases, habitat restoration may be necessary to facilitate site conversion from a monoculture of nonnative invasive plant infestations to a native riparian woodland understory.

2.3 Giant Reed and Pampas Grass

Giant reed and pampas grass typically occur in isolated, dense stands throughout the Arcade Creek stream corridor (Table 2-1). Giant reed spreads vegetatively and may establish through the dispersal of root segments dislodged by high-flow events, bank erosion, or control activities. Pampas grass spreads mainly by seed dispersal but can resprout from root fragments.

In 2007, Sacramento Weed Warriors conducted giant reed control activities along a portion of the Arcade Creek stream corridor from Marysville Boulevard to Madison Avenue as part of Phase I nonnative invasive control efforts. Additional effort is necessary to achieve control of giant reed throughout the corridor.

Giant reed and pampas grass are controlled using a multi-stage process where stalks are cut close to ground level and removed from the site; the plant is then allowed to resprout so it can be treated with herbicide when the new sprouts are 2 to 3 feet high. This approach reduces the overall amount of herbicide necessary for treatment because it concentrates the herbicide onto actively growing plant matter that can transport the herbicide rapidly into the root system of the entire plant. In most cases, the plant is effectively killed with two to three treatments. Because of its rate of spread and ability to infest the riparian ecosystem, giant reed is considered a high priority for control in the Arcade Creek stream corridor.

2.4 Red Sesbania

Red sesbania is an extremely invasive plant species that occurs in isolated locations throughout the Arcade Creek stream corridor (Table 2-1). Seedlings and small trees typically occur along the lower portion of the bank next to the water's edge or on exposed sandbars. This plant most often is observed where there is no overhead riparian vegetation cover or where there are openings within the canopy. This plant is a prolific seed producer and establishes quickly in disturbed areas along stream corridors. Its rate of spread and ability to infest the riparian ecosystem make red sesbania a high-priority plant to control in the Arcade Creek stream corridor.

The preferred method for control of small plants up to 3 inches in diameter is to manually remove the entire plant, including the root ball. Large plants (those more than 3 inches in diameter) should be cut close to ground level and the remaining cut stump treated with herbicide.

Table 2-1. Nonnative Invasive Plant Species Observed in the Arcade Creek Stream Corridor, by Reach, During 2007 Field Surveys

Reach	Acacia	Ash	Black locust	Catalpa	Chinese pistache	Elm	English ivy	Eucalyptus	Fig	Giant reed	Himalayan blackberry	Japanese privet	Liquidambar	Maple	Mulberry	Oleander	Plum/fruit trees	Red sesbania	Redwood/pine	Silk tree	Tree-of-heaven	Vinca	Washington palm	Other
Arcade Creek																								
1		X				X												X			X			
2		X	X	X		X								X	X						X			
3			X	X		X				X								X			X			
4		X		X					X	X	X				X	X	X	X			X			English walnut, Wisteria
5	X	X		X		X	X		X	X	X				X			X					X	White alder
6		X		X		X		X		X	X	X			X		X	X					X	Beefwood
7		X	X	X		X				X	X										X			
8	X			X		X			X		X	X		X				X			X	X	X	Almond
9	X		X	X		X	X			X	X			X	X		X				X	X		English walnut, Buckthorn
10	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	Olive
11	X	X	X	X					X			X			X		X	X				X		Pampas grass, Camphor
12	X		X	X			X	X	X	X	X	X	X		X		X	X			X	X	X	
13	X		X	X							X	X		X	X		X	X			X			Pampas grass, Redbud
14	X		X				X		X	X		X		X	X		X					X		
15	X		X	X			X		X		X			X	X		X				X	X		
16	X	X	X	X						X	X				X		X				X	X		
17	X	X	X	X			X		X	X	X	X			X		X					X	X	Olive
18	X			X	X		X			X	X	X	X	X	X		X				X			Camphor
19	X						X		X	X	X	X			X		X						X	Pampas grass
20	X						X		X		X	X					X							
21	X								X		X	X		X			X				X		X	Weeping willow

Table 2-1. Continued

Reach	Acacia	Ash	Black locust	Catalpa	Chinese pistache	Elm	English ivy	Eucalyptus	Fig	Giant reed	Himalayan blackberry	Japanese privet	Liquidambar	Maple	Mulberry	Oleander	Plum/fruit trees	Red sesbania	Redwood/pine	Silk tree	Tree-of-heaven	Vinca	Washington palm	Other
Cripple Creek																								
22		X	X	X			X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	
23	X	X		X			X				X	X			X		X	X		X	X	X		
24		X		X			X			X	X	X					X				X	X		Bamboo
25		X					X	X	X	X	X	X		X		X	X	X	X		X			
26				X	X		X		X	X	X			X			X	X		X		X	X	
27		X	X	X	X	X	X		X	X	X	X		X	X	X	X	X				X		
28		X		X					X	X	X	X		X	X						X	X		
29	X		X	X	X		X				X	X	X	X	X			X			X	X		
30		X	X	X			X	X	X		X	X			X	X	X	X		X		X	X	Beefwood
31				X			X				X				X									

2.5 Cultivated Fruit and Nut Trees

Common horticultural fruit and nut trees in the Arcade Creek stream corridor form dense stands in the understory of oak and riparian woodlands in several reaches. Common species include plum, apple, fig, almond, and English walnut (Table 2-1). These species typically spread by seed dispersal, with the seed source probably being adjacent to residential landscapes or gardens. Most of these species are controllable by herbicide treatment that may be followed by replacement planting with native riparian plant species.

2.6 Other Species

Other nonnative invasive plants occur throughout the Arcade Creek stream corridor, including non-cultivated fruit and seed-bearing trees, fruit and seed-bearing shrubs, and other tree and shrub species (Table 2-1). Some of the more common nonnative invasive plant species in the stream corridor are listed below:

- yellow star-thistle,
- Japanese privet,
- Mexican fan palm,
- mulberry,
- Chinese pistache,
- acacia,
- black locust,
- catalpa,
- tree-of-heaven, and
- elm.

Many of these species (including Japanese privet, black locust, and catalpa) are prolific seed producers and have quickly expanded their range in the stream corridor. For example, black locust has become well established along the Haggin Oaks Golf Course Complex/stream corridor interface and will require extensive control to remove existing large mature trees and control resprouting roots and seedlings.

2.7 Sensitive Biological Resources

The Arcade Creek stream corridor is likely to support sensitive plant and wildlife biological resources, based on a search of the California Natural Diversity Database (CNDDB) and reconnaissance-level, habitat-based field surveys (Jones & Stokes 2005; ICF Jones & Stokes 2008). These sensitive biological resources need to be considered as part of nonnative invasive plant control and management planning efforts. Sensitive biological resources along the Arcade Creek corridor are described below, as well as the safeguards that will be included as part of nonnative invasive plant removal efforts to ensure that the resources are protected.

Please note with respect to sensitive fish species that Chinook salmon and steelhead historically have been present in Arcade Creek, but these native fish species have not been observed there for more than 20 years (Healey pers. comm.). This is probably attributable to the lack of suitable rearing and spawning habitat, summer low flows, and poor water quality in the creek (Healey pers. comm.). However, Chinook salmon and steelhead do occur in the Sacramento River, and both have been documented in recent years in Miners Ravine and Secret Ravine, tributaries to Dry Creek. While the Dry Creek watershed is not as heavily urbanized as the Arcade Creek watershed, the potential exists for these species to return to Arcade Creek if aquatic habitat conditions improve (Healey pers. comm.).

2.7.1 Plants

The CNDDB lists six special-status plant species that have been recorded within the Arcade Creek stream corridor: Sanford's arrowhead, dwarf downingia, legenere, Boggs Lake hedge-hyssop, Sacramento Orcutt grass, and Ahart's dwarf rush. With the exception of Sanford's arrowhead, these species occur in vernal pools, but no vernal pool habitat was identified in the stream corridor during habitat-based field assessments. This habitat type may be present outside the stream corridor.

Sanford's arrowhead was not identified during reconnaissance-level surveys at the Phase II work sites identified in Chapter 5 or the proposed future work phase sites identified in Chapter 6. If Sanford's arrowhead is found at any of the sites or near red sesbania and giant reed targeted for removal in Phase II, the plants will be flagged and avoided during efforts to remove nonnative invasive plants.

2.7.2 Wildlife

The CNDDB lists 14 special-status wildlife species that have been recorded in the project region: Valley elderberry longhorn beetle (VELB), California linderiella, vernal pool fairy shrimp, vernal pool tadpole shrimp, giant garter snake, western pond turtle, Swainson's hawk, white-tailed kite, tricolored blackbird, burrowing owl, purple martin, great egret, great blue heron, and bank swallow.

Based on reconnaissance-level surveys and a review of existing information on species distribution and habitat requirements, 7 of the 14 special-status wildlife species have the potential to occur in the Arcade Creek stream corridor: VELB, western pond turtle, Swainson's hawk, white-tailed kite, tricolored blackbird, great egret, and great blue heron. In addition, Cooper's hawk, loggerhead shrike, pallid bat, Yuma myotis, and Townsend's big-eared bat are sensitive species that could occur in the stream corridor.

Prior to nonnative invasive plant removal efforts, sites will be surveyed as applicable for the presence of the seven special-status wildlife species and five sensitive wildlife species listed above. Although the presence of VELB has not been confirmed in the Arcade Creek stream corridor as part of project efforts, elderberry plants are found throughout the Arcade Creek Stream corridor, most often in elevated areas away from the low-flow channel and active floodplain of the creek. In most cases, the nonnative invasive plants recommended for control in the Arcade Creek stream corridor are located in the active floodplain of the creek, so there is no overlap with elderberry plant occurrences. However, in some instances, elderberry plants can co-occur with target nonnative invasive plants (such as giant reed), and consideration must be given to protecting the elderberry plants to eliminate potential effects on VELB from nonnative invasive plant removal. Several nonnative invasive plant removal projects on the American River Parkway, Dry Creek, and other

local rivers have been successfully completed without affecting VELB by using simple avoidance techniques (e.g., flagging elderberry plants, limiting herbicide application within 25 feet of the elderberry plants), including the giant reed removal work done by Sacramento Weed Warriors in the Arcade Creek stream corridor in 2007.

Numerous riparian-associated bird species (including tree swallow, oak titmouse, spotted towhee, house wren, Nuttall's woodpecker, and red-shouldered hawk) have been observed along the stream corridor (Jones & Stokes 2005; ICF Jones & Stokes 2008). Although most of these bird species are not considered special-status wildlife species, their occupied nests and eggs are protected by California Fish and Game Code Sections 3503 and 3503.5 and the federal Migratory Bird Treaty Act (MBTA) (50 CFR 10 and 21).

If invasive plant removal efforts are scheduled during the nesting season for raptors and migratory birds (February 15 to September 1) protected under the MBTA, a focused survey for active nests will be conducted within 15 days before beginning nonnative invasive plant removal efforts. The survey will be conducted for active raptor nests within a ¼-mile radius from the site and submitted to DFG. If active nests are found, the City will consult with DFG and U.S. Fish and Wildlife Service (USFWS) regarding appropriate action under the California Fish and Game Code and MBTA (California Department of Fish and Game 2007).

2.8 Restoration Opportunities

Table 2-2 summarizes restoration opportunities related to nonnative invasive plant removal as identified in the *Final Existing Conditions and Assessment Report and Stream Corridor Management Plan for the Arcade Creek Watershed, Sacramento County, California* (ICF Jones & Stokes 2008).

Table 2-2. Restoration Opportunities Related to Nonnative Invasive Plant Species Removal in Arcade Creek Stream Corridor, by Reach

Reach	Identification Number	Type of Restoration Activity	Jurisdiction	Priority Level[a]	Invasive Nonnative Plants/Notes
Arcade Creek—Lower Segment					
Reach 1	R1-Rest-001	Remove invasive nonnative vegetation	City of Sacramento	Low	Tree-of-heaven, red sesbania, elm
	R1-Rest-002	Remove invasive nonnative vegetation	City of Sacramento	Low	Tree-of-heaven, red sesbania, elm
Reach 2	R2-Rest-001	Remove invasive nonnative vegetation	City of Sacramento	Low	Tree-of-heaven, mulberry, elm, catalpa, maple
	R2-Rest-002	Remove invasive nonnative vegetation	City of Sacramento	Low	Elm, ash, black locust, maple, red sesbania, catalpa
	R2-Rest-003	Remove invasive nonnative vegetation	City of Sacramento	Low	Elm, ash, maple, black locust, tree-of-heaven, catalpa
	R2-Rest-005	Remove invasive nonnative vegetation	City of Sacramento	Low	Elm, ash, maple, black locust, tree-of-Heaven, catalpa
	R2-Rest-006	Remove invasive nonnative vegetation	City of Sacramento	Low	Elm, ash, maple, black locust, tree-of-heaven, catalpa
Reach 3	R3-Rest-001	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Maple, catalpa, red sesbania, elm, giant reed[t], tree-of-heaven
	R3-Rest-004	Remove invasive nonnative vegetation	City of Sacramento	High[4]	Giant reed[t]
	R3-Rest-005	Remove invasive nonnative vegetation	City of Sacramento	High[4]	Giant reed[t]
Arcade Creek—Middle Segment					
Reach 4	R4-Rest-002	Remove invasive nonnative vegetation	City of Sacramento	High[4]	Giant reed[t/nt] (one of two stands treated)
	R4-Rest-003	Stabilize banks and remove invasive nonnative vegetation	City of Sacramento	High[1]	Eminent property damage on right bank; Giant reed[t]
	R4-Rest-004	Remove invasive nonnative vegetation	City of Sacramento	High[1]	Giant reed[t], tree-of-heaven; adjacent to R4-Rest-003
	R4-Rest-006	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Himalayan blackberry
	R4-Rest-007	Remove invasive nonnative vegetation	City of Sacramento	High[4]	Japanese privet, acacia, Himalayan blackberry, English ivy, catalpa, fig, red sesbania
	R4-Rest-008	Remove invasive nonnative vegetation	City of Sacramento	Moderate	English ivy
	R4-Rest-009	Remove invasive nonnative vegetation	City of Sacramento	High[4]	English ivy, Japanese privet
	R4-Rest-010	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Giant reed[t]
	R4-Rest-011	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Giant reed[t/nt] (one of two stands treated)
	R4-Rest-012	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Giant reed[t]

Table 2-2. Continued

Reach	Identification Number	Type of Restoration Activity	Jurisdiction	Priority Level[a]	Invasive Nonnative Plants/Notes
	R4-Rest-013	Remove invasive nonnative vegetation	City of Sacramento	Low	Tree-of-heaven, black locust, English ivy, English walnut, Himalayan blackberry
	R4-Rest-014	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Himalayan blackberry, red sesbania
Reach 5	R5-Rest-001	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Giant reed[t], Himalayan blackberry
	R5-Rest-002	Remove invasive nonnative vegetation	City of Sacramento	High[2]	Red sesbania, giant reed[t], Spanish broom; large number of these species are present at this location
	R5-Rest-005	Remove invasive nonnative vegetation	City of Sacramento	High[4]	Giant reed[t]
	R5-Rest-007	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Giant reed[t], red sesbania
	R5-Rest-008	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Giant reed[t], red sesbania
Reach 6	R6-Rest-002	Remove invasive nonnative vegetation	City of Sacramento	Low	Fruit trees, black locust, beefwood
	R6-Rest-003	Remove invasive nonnative vegetation	City of Sacramento	Low	Fruit trees
	R6-Rest-008	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Fruit trees, elm, fruit trees, mulberry, Himalayan blackberry, Japanese privet, acacia, tree-of-heaven, red sesbania
Reach 7	R7-Rest-003	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Black locust
	R7-Rest-005	Remove invasive nonnative vegetation	City of Sacramento	High[2]	Black locust, red sesbania; located along golf course; seed source for downstream area ; spreading into mature riparian forest
	R7-Rest-008	Remove invasive nonnative vegetation	City of Sacramento	High[2]	Black locust, red sesbania; located along golf course; seed source for downstream area; spreading into mature riparian forest
Reach 8	R8-Rest-003	Remove invasive nonnative vegetation	City of Sacramento	High[1]	Himalayan blackberry, tree-of-heaven, fig, catalpa, acacia, Japanese privet, vinca, maple, fruit trees, red sesbania[t]; cull nonnatives to improve visibility and safety around Discovery Museum
	R8-Rest-009	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Giant reed[t]
	R8-Rest-011	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Black locust; seed source for downstream areas
	R8-Rest-015	Remove invasive nonnative vegetation	City of Sacramento	Low	Giant reed[t]

Reach	Identification Number	Type of Restoration Activity	Jurisdiction	Priority Level[a]	Invasive Nonnative Plants/Notes
	R8-Rest-018	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Giant reed[t]
	R8-Rest-022	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Black locust
	R8-Rest-026	Remove invasive nonnative vegetation	City of Sacramento	Moderate	Yellow star-thistle; red sesbania, vinca, nonnative trees
Reach 9	R9-Rest-003	Remove invasive nonnative vegetation	City of Sacramento	High[4]	Giant reed[t]
	R9-Rest-005	Remove invasive nonnative vegetation	City of Sacramento/ County of Sacramento (Arden-Arcade)	Low	Himalayan blackberry, black locust, vinca, fruit trees, red sesbania, giant reed[t]
	R9-Rest-008	Remove invasive nonnative vegetation	County of Sacramento (Arden-Arcade)	High[4]	Giant reed[t]
Reach 10	R10-Rest-002	Remove invasive nonnative vegetation	County of Sacramento (North Highlands)	High[4]	Giant reed[nt]
	R10-Rest-003	Remove invasive nonnative vegetation	County of Sacramento (Arden-Arcade)	Low	Bamboo
	R10-Rest-006	Remove invasive nonnative vegetation	County of Sacramento (Arden-Arcade/ North Highlands)	High[2]	English ivy, vinca, red sesbania, acacia, Japanese privet, giant reed[nt], fruit trees, Himalayan blackberry, tree-of-heaven. Upper story is oaks and understory is invasives that prevent oaks from recruiting.
	R10-Rest-009	Remove invasive nonnative vegetation	County of Sacramento (Arden-Arcade/ North Highlands)	Moderate	Black locust, Himalayan blackberry, vinca, tamarisk, red sesbania
	R10-Rest-028	Remove invasive nonnative vegetation	County of Sacramento (Carmichael)	Moderate	Japanese privet, fruit trees, black locust, red sesbania, mulberry, tree-of-heaven, catalpa, maple
Reach 11	R11-Rest-003	Remove invasive nonnative vegetation	County of Sacramento (Carmichael)	High[1]	Black locust, privet, fruit trees, Himalayan blackberry, vinca; cull nonnatives to improve visibility and safety
	R11-Rest-008	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Japanese privet, mulberry, English ivy, catalpa, red sesbania
	R11-Rest-011	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Japanese privet, fruit trees, English ivy, vinca, Himalayan blackberry

Reach	Identification Number	Type of Restoration Activity	Jurisdiction	Priority Level[a]	Invasive Nonnative Plants/Notes
	R11-Rest-013	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Japanese privet, fruit trees, English ivy, vinca, Himalayan blackberry, giant reed[t/nt] (three of four stands treated), pyracantha; cull nonnatives to improve visibility and safety
Reach 12	R12-Rest-004	Remove invasive nonnative vegetation	City of Citrus Heights	High[4]	Fruit trees, privet, fig, giant reed[nt], Himalayan blackberry
	R12-Rest-005	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Fruit trees, privet, fig, giant reed[nt], Himalayan blackberry, red sesbania; large area
	R12-Rest-009	Remove invasive nonnative vegetation	City of Citrus Heights	High[4]	Giant reed[nt]
	R12-Rest-014	Remove invasive nonnative vegetation	City of Citrus Heights	Low	English ivy, vinca, fig, Japanese privet
Arcade Creek—Upper Segment					
Reach 13	R13-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Fruit trees, Japanese privet, eucalyptus, black locust, tree-of-heaven, catalpa, vinca, Himalayan blackberry, pampas grass, mulberry; large area of invasives
Reach 14	R14-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Fruit trees, Japanese privet, eucalyptus, black locust, tree-of-heaven, catalpa, vinca, Himalayan blackberry, pampas grass, mulberry; large area of invasives
	R14-Rest-014	Remove invasive nonnative vegetation	City of Citrus Heights	High[4]	Giant reed[nt], Japanese privet, English ivy, mulberry; adjacent maintained office park
	R14-Rest-015	Remove invasive nonnative vegetation	City of Citrus Heights	High[4]	English ivy, purple leaf plum, black locust, Japanese privet, giant reed[nt]; adjacent maintained office park
	R14-Rest-021	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Fruit trees
	R14-Rest-022	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Fruit trees, fig, catalpa
	R14-Rest-025	Remove invasive nonnative vegetation	City of Citrus Heights	Low	English ivy, fig
Reach 15	R15-Rest-002	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Fruit trees, Russian olive, vinca, Himalayan blackberry, catalpa, acacia
	R15-Rest-013	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Sweet gum, catalpa, fruit trees, vinca, Himalayan blackberry, privet, weeping willow, fig, mulberry

Reach	Identification Number	Type of Restoration Activity	Jurisdiction	Priority Level[a]	Invasive Nonnative Plants/Notes
Reach 16	R16-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Catalpa, fruit trees, Himalayan blackberry
	R16-Rest-005	Remove invasive nonnative vegetation	City of Citrus Heights	High[4]	Scotch broom, Russian olive, Himalayan blackberry; invasives removal should be undertaken when other restoration activities are done in the future (i.e., improving floodplain function and stabilizing banks)
	R16-Rest-006	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry, vinca, catalpa, mulberry
Reach 17	R17-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry, vinca, English ivy, catalpa
	R17-Rest-002	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Privet, mulberry, Russian olive, acacia, catalpa, vinca, fruit trees, Himalayan blackberry
	R17-Rest-009	Remove invasive nonnative vegetation	City of Citrus Heights	High[4]	Privet, fruit trees, Himalayan blackberry, vinca, English ivy; invasives removal should be undertaken when other restoration activities are done in the future (i.e., reconfigure channel)
	R17-Rest-013	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Catalpa, palm, mulberry, acacia, maple, Japanese privet, vinca, Himalayan blackberry; large area of invasives
	R17-Rest-025	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Catalpa, fruit trees, mulberry, Japanese privet, vinca, Himalayan blackberry, eucalyptus; large area of invasives
	R17-Rest-031	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Eucalyptus
Reach 18	R18-Rest-004	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry, Japanese privet
	R18-Rest-005	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Japanese privet, Himalayan blackberry, English ivy
	R18-Rest-010	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Himalayan blackberry, fruit trees, Japanese privet
Reach 21	R21-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, Japanese privet
	R21-Rest-002	Remove invasive nonnative vegetation	County of Sacramento (Orangevale)	Moderate	Himalayan blackberry, Japanese privet
Cripple Creek—Upper Segment					
Reach 22	R22-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Vinca, English ivy, Himalayan blackberry
	R22-Rest-006	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Vinca, English ivy, Himalayan blackberry
	R22-Rest-009	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Vinca

Reach	Identification Number	Type of Restoration Activity	Jurisdiction	Priority Level[a]	Invasive Nonnative Plants/Notes
	R22-Rest-012	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Vinca
	R22-Rest-014	Remove invasive nonnative vegetation	City of Citrus Heights	High[4]	Vinca, Himalayan blackberry
Reach 23	R23-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	English ivy, vinca, Japanese privet
	R23-Rest-002	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Red sesbania, tree-of -heaven, mulberry
	R23-Rest-003	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Red sesbania, tree-of-heaven, Japanese privet
	R23-Rest-004	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Fruit trees, privet, Himalayan blackberry, catalpa
Reach 24	R24-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry
	R24-Rest-002	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry, catalpa
	R24-Rest-003	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Giant reed[nt]
	R24-Rest-004	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Giant reed[nt]; mostly unvegetated banks, plant with native vegetation
	R24-Rest-005	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	English ivy, fruit trees, vinca, Himalayan blackberry
	R24-Rest-006	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Fruit trees, vinca
	R24-Rest-007	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Vinca, tree-of-heaven, Himalayan blackberry, catalpa
Reach 25	R25-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Tree-of-heaven, Himalayan blackberry, catalpa
	R25-Rest-003	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry, English ivy, giant reed[nt]
	R25-Rest-004	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	English ivy, Himalayan blackberry
	R25-Rest-005	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry, Japanese privet
	R25-Rest-006	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry, vinca
	R25-Rest-007	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Tree-of-heaven, Himalayan blackberry, English ivy, vinca
	R25-Rest-010	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Tree-of-heaven, Himalayan blackberry, English ivy, vinca
	R25-Rest-014	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	English ivy, Japanese privet, giant reed[nt], fruit trees
	R25-Rest-015	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry, Japanese privet
	R25-Rest-016	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry; near R25-Rest-015
	R25-Rest-017	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry; near R25-Rest-015

Reach	Identification Number	Type of Restoration Activity	Jurisdiction	Priority Level[a]	Invasive Nonnative Plants/Notes
	R25-Rest-020	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry
	R25-Rest-021	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, eucalyptus, fruit trees
	R25-Rest-023	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, eucalyptus, fruit trees
	R25-Rest-025	Remove invasive nonnative vegetation	City of Citrus Heights	High[4]	Giant reed[nt]; in residential backyard
	R25-Rest-026	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Blackberry
	R25-Rest-028	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Blackberry, vinca, ash
Reach 26	R26-Rest-004	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, English ivy, Japanese privet, catalpa
	R26-Rest-005	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry
	R26-Rest-007	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, vinca, fruit trees
	R26-Rest-012	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, English ivy, catalpa, vinca, Japanese privet
	R26-Rest-013	Remove invasive nonnative vegetation	City of Citrus Heights	High[4]	Giant reed[nt], blackberry, vinca, fig
	R26-Rest-016	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Vinca, catalpa, mulberry, Himalayan blackberry
Reach 27	R27-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Giant reed[nt], vinca, Himalayan blackberry
	R27-Rest-002	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Fig, mulberry, vinca, Himalayan blackberry, Japanese privet
	R27-Rest-003	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry, fig, Japanese privet, vinca
	R27-Rest-004	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Giant reed[nt], catalpa, Himalayan blackberry, mulberry, vinca
	R27-Rest-005	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry, catalpa, fig
	R27-Rest-006	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Fig, catalpa, mulberry, Himalayan blackberry, Chinese pistache
	R27-Rest-008	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry, catalpa, vinca, Chinese pistache
	R27-Rest-010	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, vinca
	R27-Rest-011	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Elm, Japanese privet, Himalayan blackberry, vinca
	R27-Rest-014	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry

Table 2-2. Continued

Reach	Identification Number	Type of Restoration Activity	Jurisdiction	Priority Level[a]	Invasive Nonnative Plants/Notes
	R27-Rest-015	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, Chinese pistache, mulberry
Reach 28	R28-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, catalpa, vinca
	R28-Rest-003	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry
	R28-Rest-006	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Tree-of-heaven, Himalayan blackberry
	R28-Rest-007	Remove invasive nonnative vegetation	City of Citrus Heights	High[2]	Giant reed[nt], Himalayan blackberry, mulberry, Japanese privet
	R28-Rest-009	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Vinca
	R28-Rest-010	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry, mulberry
	R28-Rest-011	Remove invasive nonnative vegetation	City of Citrus Heights	High[1]	Giant reed[nt], mulberry, Himalayan blackberry; giant reed stand occurs within the active creek channel and impedes flood flows
Reach 29	R29-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry
	R29-Rest-003	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry, tree-of-heaven
	R29-Rest-004	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, mulberry
	R29-Rest-005	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, tree-of-heaven, vinca
	R29-Rest-007	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry, tree-of-heaven, Japanese privet
	R29-Rest-008	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, mulberry, vinca
	R29-Rest-009	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry
	R29-Rest-010	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry
	R29-Rest-012	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry, tree-of-heaven
	R29-Rest-016	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Himalayan blackberry, English ivy
Reach 30	R30-Rest-001	Remove invasive nonnative vegetation	City of Citrus Heights	High[3]	Tree-of-heaven, Himalayan blackberry
	R30-Rest-003	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry
	R30-Rest-005	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, silk tree, English ivy
	R30-Rest-006	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Eucalyptus, Himalayan blackberry, Japanese privet, Chinese pistache

Reach	Identification Number	Type of Restoration Activity	Jurisdiction	Priority Level[a]	Invasive Nonnative Plants/Notes
	R30-Rest-007	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, Japanese privet, tree-of-heaven
	R30-Rest-009	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Beefwood, silk tree, Japanese privet, Himalayan blackberry
	R30-Rest-011	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry, silk tree, fig
	R30-Rest-013	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Himalayan blackberry, tree-of-heaven
	R30-Rest-016	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Himalayan blackberry
	R30-Rest-018	Remove invasive nonnative vegetation	City of Citrus Heights	Low	Japanese privet, Himalayan blackberry
	R30-Rest-021	Remove invasive nonnative vegetation	City of Citrus Heights	Moderate	Japanese privet, Himalayan blackberry
Reach 31	R31-Rest-001	Remove invasive nonnative vegetation	County of Sacramento (Orangevale)	Low	Pampas grass, Himalayan blackberry

Notes:

[a] High priority level sites are further subdivided into 4 priority categories, from high (1) to low (4)

[t] Giant reed treated (in 2007)

[nt] Giant reed not treated (in 2007)

Chapter 3

Nonnative Invasive Plant Species Control and Management Goals and Objectives

3.1 Project Goals

The primary goal of the nonnative invasive plant species control and management program described in this document is to control selected nonnative invasive plants at priority sites in the Arcade Creek stream corridor. Additional goals are listed below.

- Improve floodwater conveyance by removing invasive plant species from the low-flow stream channel.
- Aid the restoration of natural riparian and riverine processes by controlling suspected seed sources for several prolific invasive plant species.
- Contribute to regional invasive plant species control efforts for high-priority invasive plant species (i.e., red sesbania and giant reed).
- Share new technical information gained from nonnative invasive plant removal efforts in the Arcade Creek stream corridor with other land managers and vegetation management technicians.

3.2 Project Objectives

To meet the five nonnative invasive plant species control and management program goals, the following objectives have been identified.

3.2.1 Objective 1. Protect Sensitive Biological Resources

An objective of the nonnative invasive plant species control and management program is to avoid sensitive biological resources during removal efforts, using a variety of approaches that have worked successfully in watersheds with similar issues. Program implementation is expected to improve the function of the Arcade Creek stream corridor, including improving the quality and function of riparian habitat. Habitat improvements will benefit sensitive biological resources.

As described in Section 2.7, two categories of sensitive biological resources could constrain nonnative invasive plant species control and management efforts: plants and wildlife. Specifically, under the category of plants, Sanford's arrowhead has the potential to occur at removal sites and needs to be avoided. Under the category of wildlife, elderberry, the host plant for VELB, has the

potential to occur at removal sites and needs to be avoided. Other sensitive wildlife resources, including nesting raptors, migratory birds, and western pond turtles, will need to be avoided if they occur at removal sites. To ensure avoidance of these sensitive wildlife resources during nonnative invasive plant species control and management, best management practices (BMPs) will be implemented. The suggested BMPs in this document are based on similar control and management activities in nearby rivers, including the American River Parkway and Dry Creek, and have been proven effective for avoiding impacts on sensitive plants and wildlife. Chapter 4 describes BMPs in detail.

3.2.2 Objective 2. Conduct Initial Nonnative Invasive Plant Control

An objective of the nonnative invasive plant species control and management program is to control 95% of mature target nonnative invasive plants at removal sites. Some of the numerous nonnative invasive plants that occur in the Arcade Creek stream corridor have been targeted for high priority as part of the selection process for removal efforts. Because of the longevity of nonnative invasive plant seed banks, it is not realistic to expect that nonnative invasive plants treated as part of the project will be eradicated by the end of the project. Rather, given nonnative invasive plant lifecycles and characteristics, a realistic goal is to complete removal of 95% of mature target nonnative invasive plants at removal sites and to re-treat some nonnative invasive plant resprouts and seedlings. Chapters 4 – 6 provide details on the preferred treatment for target nonnative invasive plants in the Arcade Creek stream corridor.

3.2.3 Objective 3. Restore Riparian Habitat to Reduce Potential for Re-Infestation of Nonnative Invasive Plants

An objective of the nonnative invasive plant species control and management program is to implement focused habitat restoration (i.e., active site planting) at removal sites that are not expected to restore passively through natural site regeneration. Removal sites that could be actively restored include dense invasive tree forests (e.g., cultivated fruit and nut trees) that are planned for conversion to native riparian woodland, and areas infested with dense understory vines and groundcovers (e.g., English ivy, vinca) that are planned for conversion to native riparian woodland understory. Chapters 4 – 6 provide details on the preferred restoration approach, depending on the specific characteristics of the removal site.

3.3 Performance Standards

The nonnative invasive plant species control and management program will be evaluated using the following performance standards. The indicated schedule for applying performance standards is based on Phase II control efforts, which are proposed to resume in summer 2010 and be completed in fall 2010. For subsequent phases of control efforts, the schedule should be adjusted accordingly.

Phase II nonnative invasive plant species control and management will be considered successful when:

- 95% of the mature target nonnative invasive plants at removal sites have been treated (i.e., target nonnative invasive plants have been manually removed, machine treated, and/or herbicide treated). This standard is to be applied 1 month after initial treatment.
- Target nonnative invasive plant resprouts or seedlings have been retreated at least once, within 2 months after initial treatment, as necessary . This standard is to be applied 2 months after initial treatment.

As budget and resources are identified, nonnative invasive plant species control and management for future phases of work will be considered successful when:

- 95% of the mature target nonnative invasive plants at removal sites have been treated (i.e., target nonnative invasive plants have been manually removed, machine treated, and/or herbicide treated). This standard is to be applied 1 month after initial treatment.
- Target nonnative invasive plant resprouts or seedlings have been retreated at least once within 2 months after initial treatment, if necessary. This standard is to be applied in February of the first year following initial treatment.

Chapter 4

Nonnative Invasive Plant Species Management Approach Techniques

The *Final Existing Conditions and Assessment Report and Stream Corridor Management Plan for the Arcade Creek Watershed, Sacramento County, California* (ICF Jones & Stokes 2008) includes restoration opportunities related to nonnative invasive plant species removal. These restoration opportunities were evaluated to determine which opportunities would be undertaken as part of Phase II nonnative invasive plant removal efforts. This chapter describes the prioritization process used to identify high-priority removal sites, presents the results of the prioritization process, and describes nonnative invasive plant control and management techniques and approaches to be used in the Arcade Creek stream corridor.

4.1 Overview of Nonnative Invasive Plant Species Control Approach

The nonnative invasive plant species control and management program described in this document uses the multiple parameter management approach. The intent of this approach is to manage the stream corridor as a whole through selective treatment and removal of nonnative invasive plants that occur in especially problematic areas.

4.2 Prioritizing and Selecting Invasive Plant Removal Sites

To determine prioritization, restoration opportunities related to nonnative invasive plant removal were presented to the Arcade Creek watershed group in August 2007 and April 2008. The watershed group was asked to provide feedback on what they viewed as priorities for determining problematic areas or removal sites.

Based on feedback from the group, the following priorities were used to identify invasive plant restoration opportunities/removal sites:

- Reduction of localized flooding and, to a lesser degree, of stream corridor flooding.
- Reduction of safety-threat concerns, as related to Del Paso Regional Park and the Del Paso Park filtration and detention wetland (primarily in regard to illicit activity and health concerns, respectively).

- Improvement of habitat and open space areas.
- Compliance with stream corridor project goals.
- Optimization of efforts through combination of site-specific restoration opportunities to create a major effect at a cumulative level.
- Consideration of costs, because budget limitations from year to year partially guide the order in which restoration projects can be implemented.
- Minimization of threats to infrastructure or property.
- Consideration of access (i.e., in some locations in the stream corridor, it may be difficult to access the site with hand crews or machinery and then remove cleared debris from the site).

Based on the above priority list, a ranking of low, medium, or high priority was given to each removal site. This resulted in several high-priority removal sites. In order to determine which high-priority removal sites would be part of Phase II efforts, high-priority removal sites were further assessed based on the following criteria:

- target nonnative invasive plants that contribute significant parent material (e.g., seed source) and support the spread of the species in the stream corridor;
- choose removal sites that can be treated on a schedule consistent with the current CALFED Watershed Program grant timeline (expires December 31, 2010); and
- choose removal sites that can be treated using recommended methods for the current CALFED Watershed Program grant budget.

A field review of potential high-priority sites was conducted in August 2008 to determine which sites meet some or all of the prioritization criteria. As part of the field review, conceptual planning maps were developed that graphically represented the type and distribution of target nonnative invasive plants, the location of site boundaries, and other pertinent field-based planning information. The potential high-priority sites then were evaluated to determine whether removal efforts could be accomplished within the current CALFED Watershed Program grant timeline and budget. The potential high-priority sites were further ranked in order of importance using a scale of 1 to 4, with highest high priority sites ranked as 1. Table 2-2 shows the further prioritization of high priority sites.

Table 4-1 lists Phase II nonnative invasive plant removal sites identified through the prioritization process described above. In addition to the specific sites listed in Table 4-1, red sesbania and giant reed will be targeted from Madison Avenue to the headwaters of Arcade Creek and on Cripple Creek, a large tributary to Arcade Creek (see discussion below). Table 4-2 lists nonnative invasive plant removal sites for future phases of work identified through the prioritization process described above.

Table 4-1. Phase II High-Priority Nonnative Invasive Plant Removal Sites in the Arcade Creek Stream Corridor

Reach	Site Identification No.	Comments
8	R8-Rest-003	This site is located behind the Children's Discovery Museum. This site targets several high-priority invasive plants.
8	R8-Rest-026	This site includes part of the Del Paso Park Detention and Filtration Wetland Project and Norris Tributary. Target nonnative invasive plants include yellow star-thistle, red sesbania, and cultivated fruit and nut trees.

Table 4-2. High-Priority Nonnative Invasive Plant Removal Sites in the Arcade Creek Stream Corridor for Future Phases of Work

Reach	Site Identification No.	Comments
4	R4-Rest-003, -004, and -006	This site is proposed to decrease channel roughness in a flood-prone area and target high-priority invasives (i.e., red sesbania and giant reed).
5	R5-Rest-002	This site targets several high-priority invasives (i.e., red sesbania and giant reed).
7	R7-Rest-005 and -008	This site targets several high-priority invasives.

In keeping with the multiple parameter management approach for the nonnative invasive plant species control and management program, addressing high-priority invasive plant removal sites is one component of Phase II removal efforts. The second component of Phase II removal efforts builds on the work done in 2007 by Sacramento Weed Warriors to remove giant reed from the Arcade Creek stream corridor.

Sacramento Weed Warriors focused nonnative invasive plant removal efforts in 2007 on giant reed locations in the stream corridor from Marysville Boulevard to Madison Avenue. As part of Phase II removal efforts to start in summer 2010, Sacramento Weed Warriors will focus on removing giant reed and red sesbania from Madison Avenue to the headwaters of Arcade Creek and on Cripple Creek, a major tributary to Arcade Creek (Table 2-2).

Sacramento Weed Warriors will use removal methods described in this chapter for red sesbania (manual removal using a weed wrench) and giant reed (cut plant and spray resprouts with herbicide, as needed). Cut material will be removed from the stream corridor and disposed of at an approved green waste disposal facility. Approximately 28 clusters of giant reed and approximately 8 red sesbania plants have been previously identified in the Phase II treatment area. Most of these occurrences are on public property and can be accessed by crews as part of removal efforts.

4.3 Protection of Sensitive Biological Resources

As described in Chapter 2, the Arcade Creek stream corridor is likely to support sensitive plant and wildlife biological resources, based on a search of the CNDDB and reconnaissance-level, habitat-

based field surveys (Jones & Stokes 2005; ICF Jones & Stokes 2008). These sensitive biological resources need to be considered as part of nonnative invasive plant control and management planning efforts. Strategies to ensure protection of these resources are described below.

4.3.1 Valley Elderberry Longhorn Beetle Protection Strategy

The following protection strategy was developed during vegetation management projects on Dry Creek and the American River Parkway and has been proven effective for protecting elderberry plants during nonnative invasive plant removal efforts. Similar protection strategies were used successfully by Sacramento Weed Warriors during their 2007 giant reed removal efforts in the Arcade Creek stream corridor.

Protection of elderberry plants (and VELB) should involve the following procedures:

- Identify elderberry plants near work areas and demarcate plants with flagging material or staking.
- Establish a physical buffer zone around elderberry plants located near target nonnative invasive plants. The buffer zone will be determined based on site conditions and proposed control techniques, but will be a minimum of 5 feet for manual removal and 25 feet for herbicide application.
- When target nonnative invasive plant removal efforts are to occur near elderberry plants (or their buffer zone), a qualified biological monitor will oversee removal efforts. The biological monitor should have the contractual ability to stop work or relocate work crews if nonnative invasive plant removal efforts are determined to be harmful to elderberry plants. Work may resume after the biological monitor determines that doing so will not harm the elderberry plants. The biological monitor will notify the appropriate regulatory agencies (e.g., USFWS, DFG) if inadvertent impacts on elderberry plants occur.
- Herbicide application will occur outside the buffer zone using BMPs to ensure that herbicides do not affect elderberry plants (e.g., using marker paint, spraying downwind from the elderberry plant, using a Tyvek sheet to shield the elderberry plant from spray). Localized herbicide application methods (e.g., paint) will be selected rather than widespread foliar spraying to reduce potential for herbicide drift onto elderberry plants. Herbicide should be applied only on low wind (less than 10 miles per hour) days to prevent drift.
- Herbicides will be mixed and stored in upland locations that are more than 25 feet from the stream channel and elderberry plants. The licensed herbicide applicator will be required to prevent soil and water contamination from these chemicals and report any spills to the appropriate regulatory and local agencies.

4.3.2 Raptor, Songbird, and Other Migratory Birds Protection Strategy

To protect nesting birds, including migratory songbirds and raptors, nonnative invasive tree and shrub removal should be conducted outside of the bird nesting season (February 15 to September 1). If nonnative invasive plant removal efforts need to be undertaken during the bird nesting season, a focused survey for active nests will be conducted within 15 days before beginning nonnative invasive plant removal efforts. The survey will be conducted for active raptor nests within a ¼ -mile

radius from the site and submitted to DFG. If active nests are found, the City will consult with DFG and USFWS regarding appropriate action under the California Fish and Game Code and MBTA.

4.3.3 Other Sensitive Species Protection Strategy

Prior to nonnative invasive plant removal efforts, sites will be surveyed, as applicable, for the presence of special-status wildlife species and sensitive wildlife species. If found, these species will be fully avoided using BMPs (e.g., flagging habitat and/or plants, avoiding work in the area). If nonnative invasive plant removal is required in areas where these species are found, manual removal methods will be used.

4.4 Nonnative Invasive Plant Control and Management

The information provided in this section is intended to guide decisions about nonnative invasive plant control efforts. Chapter 5 provides site-specific nonnative invasive plant control treatments for Phase II removal sites. Chapter 6 provides site-specific nonnative invasive plant control treatments for future phases of work.

There is no single effective method to control nonnative invasive plants. Most land managers who have successfully implemented nonnative invasive plant control programs have used a variety of control techniques that are adjusted as necessary through an adaptive management process. One consistent element of unsuccessful nonnative invasive plant control programs is underestimating the time, staff, and funding resources that are necessary to control nonnative invasive plants.

The invasive plant species control and management program described in this document includes manual, machine, and chemical (i.e., herbicide) methods in combination with BMPs. BMPs should be used during control and management efforts to minimize soil disturbance and ensure that vegetation biomass is removed from the site.

Manual and machine methods will be discussed later in this chapter because these methods relate to target nonnative invasive plants. Herbicides are discussed below.

4.4.1 Herbicide Application

Herbicide application methods should follow Agricultural Commissioner's recommendations, U.S. Environmental Protection Agency guidelines, state and federal laws, and product labeling guidance. Herbicides should be prescribed and applied under the direction of a qualified herbicide applicator with a valid Qualified Applicator's License (QAL) and experience in applying herbicides in wildland settings.

Common herbicides used for nonnative invasive plant control and management are discussed below.

- **Glyphosate formulations.** Glyphosate formulations such as Roundup Pro™ (Rodeo™ or AquaMaster™ are similar to Roundup Pro™ but formulated for use in water and areas near water) are the most commonly used herbicides in wildland settings, especially in highly sensitive areas (i.e., sites that support sensitive plants and native communities and are near a

waterway). Glyphosate formulations have minimal effects on surrounding areas because of a short environmental lifespan. Glyphosate formulations work on actively growing plant tissue. Glyphosate formulations are most effective on grasses and forbs but can be used on woody species when applied in multiple applications or mixed with other herbicide formulations. Some common Glyphosate mixtures for hard-to-treat woody species (broom species) and grasses (e.g., giant reed, pampas grass) are Roundup Pro™ with Garlon 3A™ or Garlon 4™, and Roundup Pro™ with Stalker™.

- **Triclopyr formulations.** Triclopyr formulations such as Garlon 3A™, Garlon 4™, and Pathfinder™ are often used to control woody species in less sensitive areas. Garlon 4™ has less effect on surrounding grasses and forbs than the other triclopyr formulations. Triclopyr formulations can be mixed with other herbicide formulations to increase effectiveness.
- **Imazapyr formulations.** Imazapyr formulations such as Stalker™ and Habitat™ are effective on both broadleaf plants and grasses. Imazapyr formulations also can be mixed with other herbicide formulations to increase effectiveness. Imazapyr is a non-selective, broad-spectrum systemic herbicide therefore care should be taken during application to avoid negative effects to adjacent vegetation. This herbicide tends to have a longer environmental lifespan and is water soluble making it mobile in the soil. Imazapyr can be leached from the soil and could affect groundwater so it should be used with caution and applied to very small, nonsensitive areas.
- **Clopyralid formulations.** Clopyralid formulations such as Transline™ are plant-specific herbicides that are effective on members of the pea (*Fabacea*) and sunflower (*Asteraceae*) plant families (e.g., Scotch broom, Spanish broom, and yellow star-thistle). This herbicide tends to have a longer environmental lifespan and higher toxicity than other herbicides, so it should be used with caution and applied to very small, nonsensitive areas.

4.4.2 Nonnative Invasive Plant Species-Specific Control and Management

4.4.2.1 Black Locust, Tree-of-Heaven, and Other Nonnative Invasive Trees

Black locust is a tree in the pea family. It is native to the southeastern United States but has been widely planted and naturalized in temperate North America, Europe, and Asia. It grows up to 70 feet tall. Black locust reproduces primarily through roots that produce new trees from a central mature tree. It also can reproduce from seeds that are easily carried long distances by the wind. Black locust tends to form monotypic forests with little or no understory. Once introduced to an area, black locust expands readily into areas as the trees shade out sunlight-dependent plants. Black locust is considered toxic to livestock.

Tree-of-heaven is a tree in the tree-of-heaven family (*Simaroubaceae).* It most commonly is found in riparian areas and disturbed inland sites. It can grow to 30 to 65 feet tall. Tree-of-heaven reproduces through vegetative sprouts (from stumps and roots) and seeds. A single tree can produce an estimated 300,000 seeds annually. Seeds typically are wind-dispersed but also can be dispersed by water, birds, and vehicles/equipment. Tree-of-heaven tends to form dense monocultures as it shades out or poisons native understory vegetation through chemicals spread from its roots (allelopathy).

Other nonnative invasive trees that occur in the Arcade Creek stream corridor include:

- Japanese privet,
- Mexican fan palm,
- mulberry,
- Chinese pistache,
- acacia,
- catalpa, and
- elm.

Many of these nonnative invasive tree species, including Japanese privet and catalpa, are prolific seed producers and have quickly expanded their range in the stream corridor.

General guidance for nonnative invasive tree removal efforts is provided below. Chapter 5 includes work plans for Phase II site-specific control efforts, and Chapter 6 includes work plans for future phases of control efforts.

- Target trees should be removed in a manner that does not substantively disturb the surrounding soil surface, thereby minimizing erosion potential.
- Target trees should be removed outside of the bird nesting season (February 15 to September 1). If nonnative invasive plant removal efforts need to be undertaken during the bird nesting season, a focused survey for active nests will be conducted within 15 days prior to the beginning of nonnative invasive plant removal efforts. The survey will be conducted for active raptor nests within a ¼-mile radius from the site and submitted to the appropriate regulatory agencies.
- BMPs for target tree removal should be used, depending on site-specific conditions. BMPs for erosion control include use of certified seed-free rice straw, straw wattles, or other acceptable erosion control materials that decompose naturally over time and that will not introduce nonnative invasive plants into the Arcade Creek stream corridor.
- Cut stumps should be no more than 3 inches above ground level if herbicide is to be applied to the stump. For trees such as tree-of-heaven and black locust that sprout from cut stumps, the cut stumps should be stump-ground in place and/or cut and immediately painted with an appropriate herbicide to prevent resprouts. Cut stumps can also be treated using solarization techniques (use of materials such as heavy black plastic that block sunlight).
- Woody debris should be removed from the site and disposed of at an approved green waste disposal facility in accordance with invasive plant control procedures and regulatory requirements.
- Following target tree removal, site inspections should be conducted to detect and prevent secondary infestations.

4.4.2.2 Red Sesbania, Spanish Broom, and Himalayan Blackberry

Red sesbania is a small tree/large shrub in the pea family and native to South America. It grows up to 15 feet tall and can produce hundreds of four-sided seed pods that can float in water, transporting the seeds along river systems. Red sesbania is spreading rapidly along rivers and creeks in the Central Valley and is considered a high priority for control. The plant forms clusters that are often so dense that access to the shoreline is impossible. Red sesbania is displacing native plants that provide

essential food and shelter for a wide variety of wildlife species. Red sesbania contains saponin, a chemical that is poisonous to both humans and wildlife. Successful treatment requires one or more types of treatments over multiple years. For small infestations and newly established infestations, manual removal using a weed wrench is highly effective. For larger infestations, a combination of cutting and herbicide treatment is recommended.

Spanish broom is a perennial shrub in the pea family. It is native to the Mediterranean region in southern Europe, southwest Asia, and northwest Africa. Plants establish quickly and can flower in the first year following establishment. Individual plants typically produce large numbers of seeds that remain viable in the soil for decades. These shrubs usually resprout from underground roots. Spanish broom also may reproduce by stump sprouting. Successful treatment requires one or more types of treatments over multiple years. For small infestations and newly established infestations, manual removal using a weed wrench is highly effective. For larger infestations, a combination of mowing and herbicide treatment is recommended.

Himalayan blackberry is a perennial vine/shrub of the rose family (*Rosaceae*). Contrary to its name, Himalayan blackberry is native to western Europe and probably was introduced to North America as a cultivated crop. The plant first appears as individual canes that eventually can grow to 20 to 40 feet long. This plant frequently roots at the nodes or tips of the canes, spreading in an ever-larger area around the central plant. Himalayan blackberry is problematic because it displaces native riparian understory plants through the formation of a large and impenetrable mound of vegetation. Unlike some other nonnative invasive plants, Himalayan blackberry provides forage and shelter to a variety of common wildlife species. Control efforts require repeated cut-and-paint treatment of the canes until the entire plant dies.

4.4.2.3 English Ivy and Vinca

English ivy is in the aralia family (*Araliacea*). It is native to most of Europe, along the west coast of South America, southwest Asia, and Australia. English ivy is an evergreen plant that grows up to 100 feet in length, climbing into the canopies of trees and shrubs by means of short adhesive rootlets or growing as ground cover when no vertical surfaces are available for the plant to climb. The plant produces a small, black, berry fruit that is an important food for many birds. The plant is dispersed by birds, underground roots, and surface vines that also root. English ivy is relatively easy to control by cutting and rolling the groundcover vegetation, then treating the cut cane surfaces with herbicide. Climbing vines can be cut or "ringed" (the cambium layer is removed) and then treated with herbicides.

Vinca is in the dogbane family (*Apocynaceae*). It is native to Europe, northwest Africa, and southwest Asia. This plant has slender trailing stems that are typically 3 to 6 feet long. The stems frequently root where they touch the ground, allowing the plant to spread widely and create a dense mat of understory vegetation that shades out native understory plants. It grows well in shaded to semi-shaded areas such as riparian woodlands. Vinca typically is dormant in winter; therefore, treatment is most effective in spring or summer when the plant is actively growing. Treatment includes cutting the plant and then applying herbicides to the cut stems.

For best control results, both English ivy and vinca removal sites should be actively restored and/or solarized to kill remaining roots and vines and shade out the soil surface.

4.4.2.4 Giant Reed and Pampas Grass

Giant reed is a tall perennial grass in the grass family (*Poacea*). It is native to India. It can grow up to 30 feet tall. The species flowers and sets seed anywhere from March to September; however, the species does not produce much viable seed. It reproduces mostly from underground rhizomes that spread outward from the plant. Pieces of root as small as ¼ inch can produce new plants. It is important to kill or remove the entire plant, including root fragments. Control of this species is important because its rapid growth and uptake of water allows it to out-compete native plants. Stiff stalks and noxious alkaloids in its leaves discourage wildlife from feeding on it. It tends to form dense monotypic stands in sandy areas, riparian woodlands, disturbed areas, and wetlands. The dense stands of canes and leaves are highly flammable.

Pampas grass is a tall perennial in the grass family. It is native to southern South America and Patagonia. It forms dense clumps that can reach a height of 10 feet. The leaves have very sharp edges and require caution during removal. This grass can live for more than a decade and is a prolific seed producer. Each plant is able to produce an estimated 1 million or more seeds during its lifetime. It also spreads from root fragments, similar to giant reed.

Sacramento Weed Warriors treated giant reed in the Arcade Creek stream corridor in 2007. Additional treatments of seedlings and resprouts are required to achieve full control. Young seedlings of both giant reed and pampas grass species can be pulled by hand. Larger resprouts and mature grass clumps should be cut close to ground level, allowed to resprout to a height of 2 to 3 feet, and then sprayed with herbicides. This approach is recommended to enable the herbicide to move into the fibrous and widespread root system more quickly.

4.5 Focused Habitat Conversion

There are two general approaches to restoring a riparian woodland: active restoration (i.e., planting native riparian species back into the system) and passive restoration (i.e., allowing native plants to colonize a site naturally over time). Active restoration helps ensure that a site returns to a healthy ecosystem more quickly, but can be costly (e.g., growing material for installed plants should be collected locally to safeguard local native plant genes) and could fail (e.g., some or all planted material does not survive and reproduce over time). Passive restoration is a much slower process that could result in short-term site damage, such as soil erosion or re-infestation with nonnative invasive plants, while the native plants are reestablishing. The benefits of passive restoration over active restoration are reduced cost and protection of local native plant genes.

The invasive plant species control and management program for the Arcade Creek stream corridor recommends a combination of active and passive restoration. Active restoration will be used in areas where large areas will be disturbed (and soils exposed) as a result of nonnative invasive plant removal. This approach will be used in some groundcover removal areas in dense tree removal areas.

Passive restoration will be used in areas where widely scattered individual nonnative invasive plants are removed from an area of mostly native riparian vegetation. In this situation, the existing seed bank of native riparian plants is more likely to colonize the site without planting additional vegetation.

4.6 Site Maintenance and Monitoring

Restoration areas will require ongoing maintenance and inspection following completion of the restoration site work. This work can be conducted by a combination of volunteers, staff members, and independent contractors. Volunteer stewards can play an important role in performing a number of restoration actions within accessible areas.

Stewardship of restoration sites is recommended for 3 to 5 years (10 years for large and insipient nonnative invasive plant populations and forested areas) following initial restoration activities. Follow-up activities include site maintenance, performance monitoring, and annual reporting.

4.6.1 Site Maintenance

Routine maintenance will be required for the restoration areas. Maintenance activities associated with the restoration areas include weed control, plant watering, and plant replacement. Weed control would include removing weeds from the around the individual planting sites to reduce competition for resources. As-needed management of invasive plant species should also be provided. Plant watering during the maintenance period should be provided on an as-needed basis if the plantings appear to be stressed due to lack of water. Replacement plantings may be required based on the results of the annual vegetation monitoring surveys.

4.6.2 Performance Monitoring

Annual performance monitoring of restoration plantings will be required to ensure that the planted material becomes established. Monitoring should include recording plant survival, evaluating plant health and vigor, and identifying any remedial measures which may be necessary based on site conditions. The progress of the on-site mitigation site should also be documented photographically. Representative photographs should be taken during the performance monitoring events to document site conditions.

4.6.3 Reporting

Annual monitoring reports will provide the City, land managers, or independent contractors with information to determine whether the restoration areas are progressing toward project success. Reports will include a summary of the project location and description, a summary of monitoring methods, a summary and analysis of the monitoring results, management recommendations and photodocumentation.

Chapter 5
Phase II Proposed Work Plans

This chapter presents work plans for Phase II proposed nonnative invasive plant removal sites. Chapter 4 presents general guidelines for nonnative invasive plant control and management.

5.1 Work Plan for Site R8-Rest-003

5.1.1 Location

This work plan covers R8-Rest-003 (Figure 5-1).

5.1.2 Description

This work plan covers control of a variety of small clusters and scattered nonnative invasive plants located at R8-Rest-003. In addition to a focus on nonnative invasive plant removal for habitat improvement, removal efforts will focus on improving public safety and the scenic viewshed in the area behind the Sacramento Children's Discovery Museum property.

The site supports red sesbania, tree-of-heaven, Himalayan blackberry, vinca, and nonnative invasive trees (e.g., catalpa, acacia, Japanese privet, and cultivated fruit trees such as fig).

This work plan includes the following major tasks:

- remove red sesbania plants,
- remove mature and seedling tree-of-heaven,
- remove Himalayan blackberry and vinca infestations,
- remove nonnative invasive trees, and
- conduct follow-up field inspections and re-treatments targeting resprouts and new seedlings of target invasive plants at this site.

General control protocols are described below but may need to be field modified to fit the actual site conditions encountered (e.g., site access, site topography, and size of plant to be treated).

5.1.3 Control Protocols

Control protocols for red sesbania, tree-of-heaven, Himalayan blackberry, vinca, and nonnative invasive trees are provided below.

5.1.3.1 Red Sesbania

Red sesbania is a newly establishing plant at R8-Rest-003. The plants are relatively small and can be treated through a combination of manual removal using a weed wrench (for plants up to 3 inches in diameter) and herbicide application (for plants more than 3 inches in diameter). Control protocols for red sesbania are described below.

1. Collect and bag flowers, fruit, and seed pods in thick black plastic bags prior to control efforts.
2. Manually remove small seedlings up to 3 inches in diameter by pulling the entire plant from the ground.
3. Cut larger seedlings and small trees more than 3 inches in diameter close to ground level (i.e., no more than 6 inches above ground level). Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Treat larger and mature trees with a basal bark application of herbicide, and cut the remaining stump at ground level (i.e., no more than 2 inches above ground level).
4. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), glyphosate should be used. In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.
    b. Apply herbicide mixed with dye to facilitate identification of application areas. A wick application and/or low-pressure, high-flow nozzle is recommended.
    c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.
5. Collect woody debris, cut material, and duff; remove the material from the site and dispose of it at an approved green waste facility.
6. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 4c).

5.1.3.2 Tree-of-Heaven

Tree-of-heaven reproduces by seed and vegetatively from cut stumps and roots; therefore, control efforts should focus on tree removal and herbicide treatment and collection and disposal of woody debris, duff, and seed pods from the site. Control protocols for tree-of-heaven are described below.

1. Collect and bag flowers, fruit, and seed pods in thick black plastic bags prior to control efforts.

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Figure 5-1
Site R8-Rest-003 Work Plan

2. Manually remove small seedlings up to 3 inches in diameter by pulling the entire plant from the ground.
3. Cut larger seedlings and small trees more than 3 inches in diameter close to ground level (i.e., no more than 6 inches above ground level). Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Treat larger and mature trees with a basal bark application of herbicide, and cut the remaining stump at ground level (i.e., no more than 2 inches above ground level). Cut stumps can also be treated with solarization techniques.
4. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), the use of a triclopyr such as Garlon 3A™ or Garlon 4™ should be considered. Another possible herbicide application for locations away from water is triclopyr mixed with imazapyr (i.e., Chopper™ or Stalker™). In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.
    b. Apply herbicide mixed with dye to facilitate identification of application areas. Coat cut stumps with the herbicide and a dye in accordance with the selected application procedure.
    c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.
5. Collect woody debris, cut material, and duff; remove the material from the site and dispose of it at an approved green waste facility.
6. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 4c).

5.1.3.3 Himalayan Blackberry and Vinca

Himalayan blackberry and vinca are grouped together because they are removed using similar treatments. Himalayan blackberry is a vining perennial plant. Vinca is a groundcover that spreads primarily from stolons. Control protocols for Himalayan blackberry and vinca are described below.

1. Cut infestations close to ground level (i.e., no more than 6 inches above ground level) using a Pulaski, McLeod, fire rake, or machete, and then roll up the cut vegetation like a carpet. Once cut, the remaining stems should be broadcast sprayed with an herbicide.
2. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), a glyphosate such as Roundup Pro™ should be used. In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.

b. Apply herbicide mixed with dye to facilitate identification of application areas. A wick application and/or low-pressure, high-flow nozzle is recommended. Broadcast spray cut vegetation.

c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.

3. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 2c).

5.1.3.4 Nonnative Invasive Trees

The site supports scattered individual and small clusters of nonnative invasive trees (e.g., catalpa, acacia, Japanese privet, and cultivated fruit trees such as fig). Most of the nonnative trees are perennials that reproduce primarily by seed. It is likely that other target invasive nonnative trees will be encountered at this site, and these should be treated concurrently with the other nonnative invasive trees. Control protocols for nonnative invasive trees are described below.

1. Collect and bag flowers, fruit, and seed pods in thick black plastic bags prior to control efforts.
2. Manually remove small nonnative invasive trees by pulling the entire plant from the ground using a weed wrench.
3. For large nonnative invasive trees, cut close to ground level. Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Very large stumps should be painted using the "ringing" method: pull back bark in a complete circle around the stump. At least 1 to 5 inches of fresh cambium (outer layer of tree) should be exposed. Paint herbicide on cambium and top of stump. Cut stumps can also be treated with solarization techniques.
4. Collect woody debris and cut material; remove the material from the site and dispose of it at an approved green waste facility.
5. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), the use of a triclopyr such as Garlon 4™ or other woody vegetation-specific herbicide should be considered. Another possible herbicide application for locations away from water is triclopyr mixed with imazapyr (i.e., Chopper™ or Stalker™). In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:

   a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.

   b. Apply herbicide mixed with dye to facilitate identification of application areas. Apply herbicide and a dye per the selected application procedure.

   c. Re-inspect treated trees 7 to 14 days after control efforts to ensure treated vegetation is dead. Re-apply herbicide to resprouting vegetation as necessary.

6. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 5c).

5.1.4 Work Plan Timeline for Site R8-Rest-003

Nonnative invasive plant removal at R8-Rest-003 will begin in summer 2010 and will be completed in fall 2010.

5.1.5 Annual Maintenance Recommendations

Although annual maintenance is not included as part of this work plan, the following recommendations are provided to assist the City with future control efforts at the sites.

Following initial control efforts, ongoing maintenance is required to control re-infestation and to promote successful riparian woodland habitat conversion. Ongoing annual maintenance should continue for a minimum of 3 years, but likely will require 5 years or more to fully control red sesbania, tree-of-heaven, Himalayan blackberry, vinca, and nonnative invasive trees. The following suggested annual maintenance activities should be confirmed by field inspections as budget and resources permit:

- April: Manually remove red sesbania, target nonnative invasive tree seedlings, Himalayan blackberry, and vinca resprouts.
- June: Spot treat giant reed resprouts with herbicide. Manually remove red sesbania, target nonnative invasive tree seedlings, Himalayan blackberry, and vinca resprouts.
- September: Spot treat giant reed resprouts with herbicide. Manually remove red sesbania, target nonnative invasive tree seedlings, Himalayan blackberry, and vinca resprouts.

5.2 Work Plan for Site R8-Rest-026

5.2.1 Location

This work plan covers R8-Rest-026 (Figure 5-2).

5.2.2 Description

This work plan covers control of a variety of nonnative invasive plants located at R8-Rest-026, which includes a portion of Norris Tributary and the Del Paso Park off-channel wetland filtration and detention basin. Red sesbania, vinca, and nonnative invasive trees, such as catalpa and Japanese privet, occur along Norris Tributary.

Yellow star-thistle occurs on the graded knoll at the upstream end of the wetland basin and along the northern perimeter of the wetland basin. This nonnative invasive plant is dormant in the fall and winter, so it will not be treated as part of Phase II control efforts at this site. However, under the "Annual Maintenance Recommendations" section below, yellow star-thistle control is identified as part of maintenance activities for the site in April and June.

Some large, established stands of Himalayan blackberry are also present, but are not included in this work plan; rather, this nonnative invasive vining plant will be addressed as part of future phases of invasive plant control efforts along the Arcade Creek stream corridor.

This work plan includes the following major tasks:

- remove red sesbania plants,
- remove vinca infestations
- remove mature and seedling nonnative invasive trees, and
- conduct follow-up field inspections and re-treatments targeting resprouts and new seedlings of target invasive plants at this site.

General control protocols are described below but may need to be modified in the field to fit the actual site conditions encountered (e.g., site access, site topography, and size of plant to be treated).

5.2.3 Control Protocols

Control protocols for red sesbania, vinca, and nonnative invasive trees are provided below.

5.2.3.1 Red Sesbania

Red sesbania is a newly establishing plant at R8-Rest-026. The plants are relatively small and can be treated through a combination of manual removal using a weed wrench (for plants up to 3 inches in diameter) and herbicide application (for plants more than 3 inches in diameter). Control protocols for red sesbania are described below.

1. Collect and bag flowers, fruit, and seed pods in thick black plastic bags prior to control efforts.
2. Manually remove small seedlings up to 3 inches in diameter by pulling the entire plant from the ground.
3. Cut larger seedlings and small trees more than 3 inches in diameter close to ground level (i.e., no more than 6 inches above ground level). Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Treat larger and mature trees with a basal bark application of herbicide and cut the remaining stump at ground level (i.e., no more than 2 inches above ground level).
4. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), glyphosate should be used. In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.
    b. Apply herbicide mixed with dye to facilitate identification of application areas. A wick application and/or low-pressure, high-flow nozzle is recommended.
    c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.
5. Collect woody debris, cut material, and duff; remove the material from the site and dispose of it at an approved green waste facility.
6. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 4c).

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Figure 5-2
Site R8 Rest-026 Work Plan

5.2.3.2 Vinca

Vinca is a groundcover that spreads primarily from roots. Control protocols for vinca are described below.

1. Cut infestations close to ground level (i.e., no more than 6 inches above ground level) using a Pulaski, McLeod, fire rake, or machete, and then roll up the cut vegetation like a carpet.
2. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), a glyphosate such as Roundup Pro™ should be used. In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.
    b. Apply herbicide mixed with dye to facilitate identification of application areas. A wick application and/or low-pressure, high-flow nozzle is recommended. Broadcast spray cut vegetation.
    c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.
3. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 2c).

5.2.3.3 Nonnative Invasive Trees

The site supports scattered individual and small clusters of nonnative invasive trees (e.g., catalpa, Japanese privet, cultivated fruit trees such as fig). Most of the nonnative trees are perennials that reproduce primarily by seed. It is likely that other target invasive nonnative trees will be encountered at this site, and these should be treated concurrently with the other nonnative invasive trees. Control protocols for nonnative invasive trees are described below.

1. Collect and bag flowers, fruit, and seed pods in thick black plastic bags prior to control efforts.
2. Manually remove small nonnative invasive trees by pulling the entire plant from the ground using a weed wrench.
3. For large nonnative invasive trees, cut close to ground level. Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Very large stumps should be painted using the "ringing" method: pull back bark in a complete circle around the stump. At least 1–5 inches of fresh cambium (outer layer of tree) should be exposed. Paint herbicide on cambium and top of stump. Cut stumps can also be treated with solarization techniques
4. Collect woody debris and cut material; remove the material from the site and dispose of it at an approved green waste facility.
5. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and

federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), the use of a triclopyr such as Garlon 4™ or other woody vegetation-specific herbicide should be considered. Another possible herbicide application for locations away from water is triclopyr mixed with imazapyr (i.e., Chopper™ or Stalker™). In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:

a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.

b. Apply herbicide mixed with dye to facilitate identification of application areas. Apply herbicide and a dye per the selected application procedure.

c. Re-inspect treated trees 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting vegetation as necessary.

6. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 5c).

5.2.4 Work Plan Timeline for Site R8-Rest-026

Invasive plant removal at R8-Rest-026 will begin in summer 2010 and will be completed in fall 2010.

5.2.5 Annual Maintenance Recommendations

Although annual maintenance is not included as part of this work plan, the following recommendations are provided to assist the City with future control efforts at the sites.

Following initial control efforts, ongoing maintenance is required to control re-infestation and to promote successful riparian woodland habitat conversion. Ongoing annual maintenance should continue for a minimum of 3 years, but most likely will require 5 years or more to fully control red sesbania, vinca, nonnative invasive trees, and yellow star-thistle. The following suggested annual maintenance activities should be confirmed by field inspections:

- April: Manually remove red sesbania and target nonnative invasive tree seedlings and vinca resprouts. Treat yellow star-thistle with a glyphosate formulation herbicide.
- June: Herbicide spot treatment of giant reed resprouts. Manually remove red sesbania and target nonnative invasive tree seedlings and vinca resprouts. Treat yellow star-thistle with a glyphosate formulation herbicide.
- September: Herbicide spot treatment of giant reed resprouts. Manually remove red sesbania and target nonnative invasive tree seedlings and vinca resprouts.

Chapter 6
Proposed Work Plans for Future Phases of Work

This chapter presents work plans for some of the proposed nonnative invasive plant removal sites that may be undertaken during future phases of work. Please note that the work plans included in this chapter do not cover all the possible nonnative invasive plant removal sites that the City may consider addressing in the future (Table 2-2). Chapter 4 presents general guidelines for nonnative invasive plant control and management. Chapter 5 provides site-specific nonnative invasive plant control treatments for Phase II removal sites.

6.1 Work Plan for Sites R4-Rest-003, -004, and -006

6.1.1 Location

This work plan covers R4-Rest-003, -004, and -006 (Figure 6-1). These sites have been lumped together in this work plan because the sites are close to one another and control efforts at the sites will be similar.

6.1.2 Description

This work plan covers control of tree-of-heaven and red sesbania at R4-Rest-004 and -006 and control of giant reed at R4-Rest-003 and -004. Tree-of-heaven infestations are well established and mature at these sites. Red sesbania is a newly colonizing plant at these sites. Giant reed is resprouting from clusters of stalks treated in 2007 at these sites.

- This work plan includes the following major tasks: remove mature and seedling tree-of-heaven plants,
- remove red sesbania plants,
- continue giant reed control efforts (started in 2007 by Sacramento Weed Warriors),
- conduct follow-up field inspections and re-treatments targeting resprouts, and new tree-of-heaven and red sesbania seedlings.

General control protocols are described below but may need to be field modified to fit the actual site conditions encountered (e.g., site access, site topography, and size of plant to be treated).

6.1.3 Control Protocols

Control protocols for tree-of-heaven, red sesbania, and giant reed are provided below.

6.1.3.1 Tree-of-Heaven

A moderately dense stand of mature and seedling tree-of-heaven extends along the southern edge of R4-Rest-004 and R4-Rest-006. Tree-of-heaven reproduces by seed and vegetatively from cut stumps and roots; therefore, control efforts should focus on tree removal and herbicide treatment and collection and disposal of woody debris, duff, and seed pods from the site. Control protocols for tree-of-heaven are described below.

1. Collect and bag flowers, fruit, and seed pods in thick black plastic bags prior to control efforts and dispose of at an approved green waste facility.
2. Manually remove small seedlings up to 3 inches in diameter by pulling the entire plant from the ground.
3. Cut larger seedlings and small trees more than 3 inches in diameter close to ground level (i.e., no more than 6 inches above ground level). Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Treat larger and mature trees with a basal bark application of herbicide and cut the remaining stump at ground level (i.e., no more than 2 inches above ground level). Cut stumps can also be treated with solarization techniques.
4. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), the use of a triclopyr such as Garlon 3A™ or Garlon 4™ should be considered. Another possible herbicide application for locations away from water is triclopyr mixed with imazapyr (i.e., Chopper™ or Stalker™). In locations within 25 feet of water, a glyphosate formulation such as Aquamaster™ should be used. Herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.
    b. Apply herbicide mixed with dye to facilitate identification of application areas. Coat cut stumps with the herbicide and a dye per the selected application procedure.
    c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.
5. Collect woody debris, cut material, and duff; remove the material from the site and dispose of it at an approved green waste facility.
6. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 4c).

6.1.3.2 Red Sesbania

Red sesbania is a newly establishing plant at R4-Rest-004 and R4-Rest-006. The plants are relatively small and can be treated through a combination of manual removal using a weed wrench (for plants up to 3 inches in diameter) and herbicide application (for plants more than 3 inches in diameter). Control protocols for red sesbania are described below.

1. Collect and bag flowers, fruit, and seed pods in thick black plastic bags prior to control efforts.

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Figure 6-1
Sites R4-Rest-003,-004, and -006 Work Plan

2. Manually remove small seedlings up to 3 inches in diameter by pulling the entire plant from the ground.
3. Cut larger seedlings and small trees more than 3 inches in diameter close to ground level (i.e., no more than 6 inches above ground level). Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Treat larger and mature trees with a basal bark application of herbicide and cut the remaining stump at ground level (i.e., no more than 2 inches above ground level).
4. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), glyphosate should be used. In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.
    b. Apply herbicide mixed with dye to facilitate identification of application areas. A wick application and/or low-pressure, high-flow nozzle is recommended.
    c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.
5. Collect woody debris, cut material, and duff, and remove the material from the site and dispose of it at an approved green waste facility.
6. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 4c).

6.1.3.3 Giant Reed

Sacramento Weed Warriors treated giant reed along the Arcade Creek stream corridor from Marysville Road to Madison Avenue in 2007. Some of the treated clusters of stalks require re-treatment because of resprouting. Retreatment protocols for giant reed are described below.

1. Cut fresh giant reed stalks at ground level (i.e., no more than 2 inches above ground level). Dispose of cut vegetation biomass at an off-site disposal facility.
2. Monitor cut plants at least once a week until new growth appears. When new growth is 1 to 3 feet high, treat with herbicide. If new growth exceeds 4 feet, re-cut stalks and repeat procedure before treating with herbicide for the most effective results.
3. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), glyphosate should be used. In locations within 25 feet of water, a glyphosate formulation such as Aquamaster™ should be used. Herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.

b. Spray new growth with glyphosate mixed with dye to facilitate identification of application area. A wick application and/or low-pressure, high-flow nozzle is recommended.

c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting stalks and other live vegetation as necessary.

4. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 3c).

6.1.4 Work Plan Timeline for Sites R4-Rest-003, -004, and -006

Table 6-1. Work Plan Timeline for Sites R4-Rest-003,-004, and -006

Activity	Fall	Winter	Spring
Finalize herbicide application procedures			
Post herbicide application notice 24 hours before application			
Identify green waste disposal site			
Continue giant reed control			
Conduct initial tree-of-heaven and red sesbania control			
Conduct follow-up field inspection and spot treatment with herbicides, as needed			
Conduct follow-up field inspection			

6.1.5 Annual Maintenance Recommendations

Although annual maintenance is not included as part of this work plan, the following recommendations are provided to assist the City with future control efforts at the sites, as budget and resources permit.

After initial control efforts at the sites, ongoing maintenance is required to control re-infestation and to promote successful riparian woodland habitat conversion. Ongoing annual maintenance should continue for a minimum of 3 years, but most likely will require 5 years or more to fully control tree-of-heaven, red sesbania, and giant reed. The following suggested annual maintenance activities should be confirmed by field inspections:

- April: Manually remove red sesbania seedlings.
- June: Spot treat giant reed and tree-of-heaven resprouts with herbicide. Manually remove tree-of-heaven and red sesbania seedlings.
- September: Spot treat giant reed and tree-of-heaven resprouts with herbicide. Manually remove tree-of-heaven and red sesbania seedlings.

6.2 Work Plan for Site R5-Rest-002

6.2.1 Location

This work plan covers R5-Rest-002 (Figure 6-2).

6.2.2 Description

This work plan covers control of a variety of nonnative invasive plants located at R5-Rest-002. The site supports red sesbania, Spanish broom, English ivy, and vinca. The site also supports nonnative invasive trees such as Mexican fan palm. Giant reed is resprouting from clusters of stalks treated in 2007 at this site. With the exception of red sesbania, Spanish broom, and Mexican fan palm (three species that have limited occurrence at the site), most of the invasive plant populations are well established and mature.

This work plan includes the following major tasks:

- remove red sesbania plants,
- remove mature and seedling Spanish broom and Mexican fan palm,
- remove English ivy and vinca infestations,
- remove nonnative invasive trees,
- continue giant reed control efforts (started in 2007 by Sacramento Weed Warriors), and
- conduct follow-up field inspections and re-treatments targeting resprouts and new seedlings of target invasive plants at this site.

General control protocols are described below but may need to be field modified to fit the actual site conditions encountered (e.g., site access, site topography, and size of plant to be treated).

6.2.3 Control Protocols

Control protocols for red sesbania, Spanish broom, English ivy, vinca, nonnative invasive trees, and giant reed are provided below.

6.2.3.1 Red Sesbania

Red sesbania is a newly establishing plant at R5-Rest-002. The plants are relatively small and can be treated through a combination of manual removal using a weed wrench (for plants up to 3 inches in diameter) and herbicide application (for plants more than 3 inches in diameter). Control protocols for red sesbania are described below.

1. Collect and bag flowers, fruit, and seed pods in thick black plastic bags prior to control efforts.
2. Manually remove small seedlings up to 3 inches in diameter by pulling the entire plant from the ground.
3. Cut larger seedlings and small trees more than 3 inches in diameter close to ground level (i.e., no more than 6 inches above ground level). Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Treat larger and mature trees with a basal bark application

of herbicide and cut the remaining stump at ground level (i.e., no more than 2 inches above ground level).

4. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), glyphosate should be used. In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:

    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.

    b. Apply herbicide mixed with dye to facilitate identification of application areas. A wick application and/or low-pressure, high-flow nozzle is recommended.

    c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.

5. Collect woody debris, cut material, and duff; remove the material from the site and dispose of it at an approved green waste facility.

6. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 4c).

6.2.3.2 Spanish Broom

Spanish broom occurrence at the site is limited. Individual plants produce many seeds that remain viable in the soil for decades. This shrub also reproduces by stump sprouting. Control protocols for Spanish broom are described below.

1. Manually remove small shrubs by pulling the entire plant from the ground using a weed wrench.

2. Depending on density and topography, remove seedlings manually by pulling or scraping with a hula hoe or mowing with a string-trimmer outfitted with a blade. Mow seedlings close to ground level (i.e., no more than 3–4 inches above ground level) late in the growing season and follow with an herbicide application.

3. For large shrubs, a truck-mounted winch may be required. For large shrubs that cannot be removed in their entirety, cut the plants to the ground surface (i.e., no more than 6 inches above ground level) using pruning shears, loppers, or brushcutters. Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Alternatively, the plant can be girdled by cutting the bark from the circumference of the stem about 2 inches above the ground surface and peeling back the bark to ground level.

4. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), a glyphosate such as Roundup Pro™ should be used. In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. A concentration of 25 to 50% should be used for both formulations. Herbicide application involves the following procedures:

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Figure 6-2
Site R5-Rest-002 Work Plan

a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.

b. Apply herbicide mixed with dye to facilitate identification of application areas. A wick application and/or low-pressure, high-flow nozzle is recommended.

c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.

5. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 4c).

6.2.3.3 English Ivy and Vinca

English ivy and vinca are grouped together because they are removed using similar treatments. English ivy is a woody evergreen vine that reproduces both sexually and vegetatively. Vinca is a groundcover that spreads primarily from stolons. Control protocols for English ivy and vinca are described below.

1. Cut infestations close to ground level (i.e., no more than 6 inches above ground level) using a Pulaski, McLeod, fire rake, or machete and then roll up the cut vegetation like a carpet. Once cut, the remaining stems should be broadcast sprayed with an herbicide or the area can be treated using solarization techniques.

2. For English ivy vines that are climbing into native trees, cut the vine close to ground level near the base of the tree and then remove a 12- to 16-inch section of the vine's vertical stem. The aerial portion of the stem eventually will die. The cut stump should be painted with herbicide.

3. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), a glyphosate such as Roundup Pro™ should be used. In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:

   a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.

   b. Apply herbicide mixed with dye to facilitate identification of application areas. A wick application and/or low-pressure, high-flow nozzle is recommended. Broadcast spray cut vegetation (see 1 above) and paint cut stumps (see 2 above).

   c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and vegetation as necessary.

4. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 3c).

6.2.3.4 Nonnative Invasive Trees

The site supports scattered individual and small clusters of nonnative invasive trees, including a mature cultivated palm tree. It is likely that other target invasive nonnative trees will be

encountered at this site, and these should be treated concurrently with the other nonnative invasive trees. Control protocols for nonnative invasive trees are described below.

1. Collect and bag flowers, fruit, and seed pods in thick black plastic bags prior to control efforts.
2. Manually remove small nonnative invasive trees by pulling the entire plant from the ground using a weed wrench.
3. For large nonnative invasive trees, cut close to ground level. Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Very large stumps should be painted using the "ringing" method: pull back bark in a complete circle around the stump. At least 1 to 5 inches of fresh cambium (outer layer of tree) should be exposed. Paint herbicide on cambium and top of stump. Cut stumps can also be treated with solarization techniques.
4. Collect woody debris and cut material; remove the material from the site and dispose of it at an approved green waste facility.
5. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), the use of a triclopyr such as Garlon 4™ or other woody vegetation-specific herbicide should be considered. Another possible herbicide application for locations away from water is triclopyr mixed with imazapyr (i.e., Chopper™ or Stalker™). In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.
    b. Apply herbicide mixed with dye to facilitate identification of application areas. Apply herbicide and a dye per the selected application procedure.
    c. Re-inspect treated trees 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting vegetation as necessary.
6. An alternative treatment to herbicide application would be to cut the tree close to ground level and then cover the cut stumps with barrier fabric (e.g., thick black plastic or similar barrier) to reduce resprouting potential.
7. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 5c).

6.2.3.5 Giant Reed

Sacramento Weed Warriors treated giant reed along the Arcade Creek stream corridor from Marysville Road to Madison Avenue in 2007. Some of the treated clusters of stalks require re-treatment because of resprouting. Re-treatment protocols for giant reed are described below.

1. Cut fresh giant reed stalks at ground level (i.e., no more than 2 inches above ground level).
2. Monitor cut plants at least once a week until new growth appears. When new growth is 2 to 3 feet high, treat with herbicide. If new growth exceeds 4 feet, re-cut stalks and repeat procedure before treating with herbicide for the most effective results.

3. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), glyphosate should be used. In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:
   a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.
   b. Spray new growth with glyphosate mixed with dye to facilitate identification of application area. A wick application and/or low-pressure, high-flow nozzle is recommended.
   c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting stalks and other live vegetation as necessary.
4. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 3c).

6.2.4 Work Plan Timeline for Site R5-Rest-002

Table 6-2. Work Plan Timeline for Site R5-Rest-002

Activity	Fall	Winter	Spring
Finalize herbicide application procedures			
Post herbicide application notices 24 hours before application			
Identify green waste disposal site			
Continue giant reed control			
Conduct initial red sesbania and Spanish broom control			
Conduct initial target nonnative invasive tree control			
Conduct initial English ivy and vinca control			
Conduct follow-up field inspection and spot treatment with herbicides, as needed			
Conduct follow-up field inspection			

6.2.5 Annual Maintenance Recommendations

Although annual maintenance is not included as part of this work plan, the following recommendations are provided to assist the City with future control efforts at the sites.

Following initial control efforts at the site, ongoing maintenance is required to control re-infestation and to promote successful riparian woodland habitat conversion. Ongoing annual maintenance should continue for a minimum of 3 years but most likely will require 5 years or more to fully control red sesbania, Spanish broom, English ivy and vinca, nonnative invasive trees, and giant reed. The following suggested annual maintenance activities should be confirmed by field inspections.

- April: Manually remove red sesbania and target nonnative invasive tree seedlings, English ivy, and vinca resprouts.

- June: Herbicide spot treatment of giant reed and Spanish broom resprouts. Manually remove red sesbania and target nonnative invasive tree seedlings and English ivy and vinca resprouts.
- September: Spot treat giant reed and Spanish broom resprouts with herbicide. Manually remove red sesbania and target nonnative invasive tree seedlings and English ivy and vinca resprouts.

6.3 Work Plan for Sites R7-Rest-005 and -008

6.3.1 Project Location

This work plan covers R7-Rest-005 and -008 (Figure 6-3). These sites have been lumped together in this work plan because the sites are close to one another and control efforts at the sites will be similar.

6.3.2 Project Description

This work plan covers control of black locust and red sesbania at R7-Rest-005 and -008. These sites support a large, well established black locust population located along the edge of Haggin Oaks Golf Course Complex. This nonnative invasive tree is sometimes used as a landscaping tree and may have been planted at these sites as a visual or wind buffer between Arcade Creek and the golf course. Currently, the population is spreading from the original planting boundary into the stream corridor and may be a seed source for black locust spreading into the stream corridor. Red sesbania is a newly colonizing plant at these sites and occurs sporadically. Mexican fan palm trees also occur sporadically at the site.

Some established stands of Himalayan blackberry are also present but are not included in this work plan; rather, this nonnative invasive vining plant will be addressed as part of future phases of invasive plant control efforts along the Arcade Creek stream corridor.

This work plan includes the following major tasks:

- remove black locust trees and seedlings,
- remove red sesbania plants,
- remove Mexican fan palm trees, and
- conduct follow-up field inspections and re-treatments targeting resprouts and new seedlings of target invasive plants at this site.

6.3.3 Control Protocols

Control protocols for black locust, red sesbania, and Mexican fan palm trees are provided below.

6.3.3.1 Black Locust

Black locust is a prolific seed-producer but few seeds germinate because the seed coat is largely impermeable. Most natural reproduction occurs vegetatively through root suckers and stump sprouting. Root suckers arise spontaneously from the extensive root system of trees as young as 4 to 5 years old. The trees can be interconnected by fibrous roots to form groves of trees with the oldest

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Figure 6-3
Sites R7 Rest-005, and -008 Work Plan

trees in the center and youngest trees on the periphery. Control protocols for black locust are described below.

1. For small trees and seedlings up to 3 inches in diameter, manually remove the trees by pulling the entire plant from the ground using a weed wrench.
2. For small trees and seedlings more than 3 inches and less than 6 inches in diameter, cut trees to a height of 15 to 20 inches above the ground. Apply herbicide to the entire cut stump (i.e., sides [basal bark area] and top) immediately (i.e., within 15 minutes of cutting). Thoroughly spray basal bark area, including crown buds and ground sprouts. A thorough spraying that continues until runoff at the ground line occurs is necessary to eliminate resprouting. For non-sensitive areas, use Remedy™ (a formulation of triclopyr) with a tackifier to ensure coverage of the stump. For sensitive areas (areas within 25 feet of the creek shoreline), use Rodeo™ (a formulation of glyphosate). Cut stumps can also be treated with solarization techniques.
3. For large trees 6 inches in diameter and greater, cut trees to a height of 15 to 20 inches above the ground. Apply herbicide on the cut stump immediately (i.e., within 15 minutes of cutting). For non-sensitive areas, use Garlon 3A™ (a formulation of triclopyr) as a paint application to the cut stump. This is an effective treatment but one that requires retreatment of suckers. For sensitive areas (areas within 25 feet of the creek shoreline), use a moderate concentration of Aquamaster™ (a formulation of glyphosate). Cut stumps can also be treated with solarization techniques.
4. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. General herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.
    b. Apply herbicide mixed with dye to facilitate identification of application areas.
    c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.
5. Collect woody debris and cut material; remove the material from the site and dispose of it at an approved green waste facility.
6. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 4c).

6.3.3.2 Red Sesbania

Red sesbania is a newly establishing plant at R4-Rest-004 and R4-Rest-005. The plants are relatively small and can be treated through a combination of manual removal using a weed wrench (for plants up to 3 inches in diameter) and herbicide application (for plants more than 3 inches in diameter). Control protocols for red sesbania are described below.

1. Collect and bag flowers, fruit, and seed pods in thick black plastic bags prior to control efforts.
2. Manually remove small seedlings up to 3 inches in diameter by pulling the entire plant from the ground.

3. Cut larger seedlings and small trees more than 3 inches in diameter close to ground level (i.e., no more than 6 inches above ground level). Paint the cut stump immediately (i.e., within 15 minutes of cutting) with herbicide. Treat larger and mature trees with a basal bark application of herbicide and cut the remaining stump at ground level (i.e., no more than 2 inches above ground level).
4. Apply herbicides under the direction of a licensed herbicide applicator. Final herbicide mixtures and application techniques should be determined by a licensed herbicide applicator in association with the County Agricultural Commissioner's office and in compliance with state and federal laws and labeling instructions. In locations away from water (i.e., more than 25 feet from the shoreline), glyphosate should be used. In locations within 25 feet of water, a glyphosate such as Aquamaster™ should be used. Herbicide application involves the following procedures:
    a. Post herbicide application notification signs a minimum of 24 hours prior to herbicide application.
    b. Apply herbicide mixed with dye to facilitate identification of application areas. A wick application and/or low-pressure, high-flow nozzle is recommended.
    c. Re-inspect treated plants 7 to 14 days after control efforts to ensure treated vegetation is dead. Reapply herbicide to resprouting root suckers and other live vegetation as necessary.
5. Collect woody debris, cut material, and duff; remove the material from the site and dispose of it at an approved green waste facility.
6. Re-inspect the site approximately 1 month after control efforts (this is in addition to the inspection described under 4c).

6.3.3.3 Mexican Fan Palm

Cut down Mexican fan palm trees close to ground level. Immediately treat all exposed surfaces with full-strength glyphosate. Spot-treat vegetation arising from roots with glyphosate before resprouts are more than 3 feet tall. Cut stumps can also be treated with solarization techniques.

6.3.4 Work Plan Timeline for Sites R7-Rest-005 and -008

Table 6-3. Work Plan Timeline for Sites R7-Rest-005 and -008

Activity	Fall	Winter	Spring
Finalize herbicide application procedures			
Post herbicide application notices 24 hours before application			
Identify green waste disposal site			
Conduct initial red sesbania control			
Conduct initial black locust and palm control			
Conduct follow-up field inspection and spot treatment with herbicides, as needed			
Conduct follow-up field inspection			

6.3.5 Annual Maintenance Recommendations

Although annual maintenance is not included as part of this work plan, the following recommendations are provided to assist the City with future control efforts at the sites.

Following initial control efforts at the sites, ongoing maintenance is required to control re-infestation at the sites and to promote successful riparian woodland habitat conversion. Ongoing annual maintenance should continue for a minimum of 3 years, but most likely will require 5 years or more to fully control black locust, red sesbania, and Mexican fan palm. The following suggested annual maintenance activities should be confirmed by field inspections.

- April: Cut black locust and Mexican fan palm resprouts and paint stumps with herbicide. Manually remove red sesbania resprouts.
- June: Cut black locust and Mexican fan palm resprouts and paint stumps with herbicide. Manually remove red sesbania resprouts.
- September: Cut black locust and Mexican fan palm resprouts and paint stumps with herbicide. Manually remove red sesbania resprouts.

Chapter 7

Long-Term Nonnative Invasive Plant Species Maintenance Requirements

As described in Section 4.6, nonnative invasive plant species removal sites will require ongoing maintenance for 3 to 5 years, and, in the case of invasive tree to native riparian forest habitat conversion projects, up to 10 years. This chapter describes necessary long-term maintenance activities and provides a timeline for conducting these maintenance activities, as budget and resources permit.

7.1 Maintenance Activities

Invasive plant species removal sites, and in particular active restoration sites, will require ongoing maintenance and inspection. Follow-up maintenance activities include the following components:

- **Annual Inspection of Active Restoration Sites.** Visually inspect installed plants in late summer or early fall. Note condition of plants (e.g., evidence of new growth, reproduction, die-off, disease, damage). Note whether sites show visitor trespass, trash dumping, unusual plant die-off patterns, overgrowth of tall grasses or nonnative invasive plants, signs of soil or water erosion, or other conditions that require maintenance. Undertake necessary site maintenance (typically in fall before the onset of winter rains), including string trimming around planting sites, installing replacement plantings if plant mortality exceeds performance criteria, installing herbivore protection structures if necessary, repairing any detected erosion problems, and following up on invasive plant control.
- **Annual Invasive Plant Survey.** Conduct an annual nonnative invasive plant survey of the Arcade Creek stream corridor to detect new invasive plants and re-infestations of target invasive plants that were treated previously. Trained volunteers can conduct such surveys.
- **Annual Photo-Monitoring and Reporting.** Annual reporting will include remedial actions required to successfully maintain the removal sites.

7.2 Monitoring Schedule

Table 7-1 shows the schedule for inspecting, annual invasive plant surveys, and annual photo-monitoring and reporting.

Table 7-1. Long-Term Monitoring Schedule

Monitoring Tasks	May-June	September-October
Conduct Annual Inspection of Active Restoration Sites	X	
Conduct Annual Invasive Plant Survey	X	
Conduct Photo-Monitoring and Prepare Report	Baseline photo-monitoring	Photo-monitoring and report preparation

Chapter 8
References Cited

8.1 Printed References

ICF Jones & Stokes. 2008. *Existing Conditions and Assessment Report and Stream Corridor Management Plan for the Arcade Creek Watershed, Sacramento County, California.* Final. September. (J&S 06766.06.) Sacramento, CA. Prepared for City of Sacramento, Department of Utilities, in coordination with the State Water Resources Control Board.

Jones & Stokes. 2005. Initial Study/Negative Declaration for Del Paso Regional Park Detention and Filtration Wetland Project (CIP #LV96). Revised. February. Prepared for City of Sacramento, Development Services Department, Department of Parks and Recreation, and Department of Utilities.

8.2 Personal Communications

Burmester, Daniel. Biologist. Bay-Delta Branch, California Department of Fish and Game, Sacramento, CA. 2004, 2005, and 2006—e-mail messages and telephone conversations.

Healey, Michael. District Fisheries Biologist. California Department of Fish and Game, Rancho Cordova, CA. March 15, 2007—voice mail message to Jeff Kozlowski, Fish Biologist, ICF Jones & Stokes.

Appendix A

Common and Scientific Species Names

Table A-1. Common and Scientific Names of Plant Species Referenced in the Document

Common Name	*Scientific Name*
acacia	*Acacia* spp.
Ahart's dwarf rush	*Juncus leiospermus* var. *ahartii*
almond	*Prunus dulcis*
apple	*Malus* domestica
black locust	*Robina pseudoacacia*
Boggs Lake hedge-hyssop	*Gratiola heterosepala*
California blackberry	*Rubus ursinus*
California wild rose	*Rosa californica*
catalpa	*Catalpa bignonioides*
Chinese pistache	*Pistacia chinensis*
cottonwood	*Populus fremontii*
Creeping wild rye	*Leymus triticoides*
dwarf downingia	*Downingia pusilla*
elm	*Ulmus* spp.
English ivy	*Hedera helix*
English walnut	*Juglans regia*
fig	*Ficus carica*
giant reed	*Arundo donax*
Himalayan blackberry	*Rubus discolor*
Japanese privet	*Ligustrum japonicum*
legenere	*Legenere limosa*
Mexican fan palm	*Washingtonia robusta*
Mugwort	*Artemisia douglasiana*
mulberry	*Morus* spp.
pampas grass	*Cortaderia selloana*
plum	*Prunus* spp.
red sesbania	*Sesbania punicea*
Sacramento Orcutt grass	*Orcuttia viscida*
Sanford's arrowhead	*Sagittaria sanfordii*
Santa Barbara sedge	*Carex barbarae*
Scotch broom	*Cytisus scoparius*
Spanish broom	*Spartium junceum*
tree-of-heaven	*Ailanthus altissima*
vinca	*Vinca major*
Wild grape	*Vitis californica*
willow	*Salix* spp.
yellow star-thistle	*Centaurea solstitialis*

Table A-2. Common and Scientific Names for Wildlife Species Referenced in the Document

Common Name	*Scientific Name*
bank swallow	*Riparia riparia*
burrowing owl	*Athene cunicularia*
California linderiella	*Linderiella occidentalis*
Cooper's hawk	*Accipiter cooperii*
giant garter snake	*Thamnophis gigas*
great blue heron	*Ardea herodias*
great egret	*Ardea alba*
house wren	*Troglodytes aedon*
loggerhead shrike	*Lanius ludovicianus*
Nuttall's woodpecker	*Picoides nuttallii*
oak titmouse	*Baeolophus inornatus*
pallid bat	*Antrozous pallidus*
purple martin	*Progne subis*
red-shouldered hawk	*Buteo lineatus*
spotted towhee	*Pipilo maculatus*
Swainson's hawk	*Buteo swainsoni*
Townsend's big-eared bat	*Corynorhinus townsendii*
tree swallow	*Tachycineta bicolor*
tricolored blackbird	*Agelaius tricolor*
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*
vernal pool fairy shrimp	*Branchinecta lynchi*
vernal pool tadpole shrimp	*Lepidurus packardi*
western pond turtle	*Actinemys marmorata*
white-tailed kite	*Elanus leucurus*
Yuma myotis	*Myotis yumanensis*