

2010/2011 Annual Monitoring Report

Arroyo De La Laguna
Alameda County, California

Project Identification

U.S. Army Corps of Engineers File Number: 30262S
California Department of Fish and Game Notification Number: 0600-2006-0272-3
Regional Water Quality Control Board Site No.: 02-01-C0903

Summary

The Arroyo de la Laguna Streambank Project has been monitored for four years since completion in November 2006. The site is geomorphically stable, the features are structurally sound and performing as expected, and vegetation is becoming established. 60-80% vegetation cover was observed in seeded areas during the monitoring event and survival rates for planted woody species other than willows (i.e. buckeye) is 72%. Of the unsuccessful buckeyes, two (11%) were outcompeted by volunteer native plants. Coast live oak and buckeye seedlings have also been observed on the banks. Natural regeneration is determined to be sufficient to even out mortality of planted species. Survival of the willow stakes installed during construction dropped below 80%, however the survival of additional willows planted in 2007 is very good, bringing the overall survival of willows planted to date to 80%. Volunteer willows can be found throughout the site. Additional planting of willows and many other species occurred at the site during the winter of 2010/2011 as part of a SFPUC mitigation project.

Project Description

The project site is approximately a 1000 foot reach of the Arroyo de la Laguna just north of the Hetch Hetchy Aqueduct. The watershed is approximately 405 square miles and includes the communities of Dublin, Pleasanton, Sunol and Livermore. As indicated by the name, the reach is incised with approximately 30 foot high, near vertical banks. The reach has two sharp bends in an "S" curve.

The overall project goals included:

- Protecting the streambank;
- Stabilizing the streamcourse;
- Reducing erosion; and
- Improving wildlife habitat.

The project was designed to encourage the natural creation of vegetated terraces along the toe of the banks to provide stability for moderate storm events. Further bed movement will be allowed for and the project is not expected to prevent erosion during very large storm events. The project should aid in the formation of edge habitat and eventually create shade that will reduce thermal loading to the stream water.

This demonstration project provides an opportunity to evaluate several cost-effective biotechnical practices for stream bank restoration and habitat enhancement in an urban/rural setting. The bank protection techniques utilized on this site fall under the NRCS practice Streambank Protection (580) and include:

- Channel Modifications including:
 - Moving thalweg of channel away from banks,
 - Creation of terraces, and
 - Bank shaping and planting
- Vegetated Spur
- Eucalyptus Pin Dikes
- Christmas Tree Revetment
- Rock Barbs with Rootwads
- Critical Area Planting
- Control of Overland Flow and Gully Erosion on Banks

Figure 2 shows the overall project plan and the location of streambank protection practices not including vegetative practices. Figure 3 shows the As-Built Vegetation Plan.

Purpose

This annual Monitoring Report has been compiled for documentation and for submittal to permitting agencies. As required by permitting agencies, this report includes the following:

- Map of photo monitoring sites (Figure 1)
- Photos from photo monitoring sites (Appendix A)
- Comparison of data to previous years (see Monitoring Results)
- Evaluation of geomorphic stability of the Creek channel
- Assessment of progress towards meeting final re-vegetation success criteria in the Monitoring Plan and long-term planting plan.

Monitoring Methods

Alameda County Conservation Partnership staff performed photo-monitoring prior to construction (August 24, 2006), upon completion of construction (December 7 & 8, 2006), at the end of the 2007 rainy season (May 22, 2007) and at the end of the summer (October 1, 2007). In 2008, photo-monitoring was performed at the end of the summer (August 1, 2008), capturing both the effects of winter flows and the dry summer. In 2009, photo-monitoring was performed April 6, 2009. In 2010, photo-monitoring was performed July 14 and 21. In 2011, photo-monitoring was performed on November 22-23. During these monitoring

visits, the staff utilized seven permanent photo-monitoring points. The site was also inspected in late March and early April in 2011 to assess damage from the heavy storm event in March 2011 (provisional peak discharge 5,610 cubic feet per second).

All physical features including vegetative features were physically assessed and compared to the "As Built" condition. These inspections document the integrity of the structures, health of the vegetative plantings and effectiveness of the practice based on its intended purpose. Additional photographs were taken to document changes to individual features as necessary. The results of the inspections are summarized below.

Monitoring Results

Photo Monitoring

Figure 1 shows a map of the permanent photo points and directions. The photographs from this monitoring period are included in Appendix A. Each photo is labeled with location point or feature name, purpose of photo, and date. Pre-Project photographs from the photo points are also included for comparison.

Structural Features

For the most part, the structural features (not including vegetative plantings) were stable, had no issues with seating or scour, and require no maintenance. Exceptions noted in past monitoring reports (e.g. practices that have been covered by sediment deposition or experienced slight movement due to erosion) have not worsened and none are considered to threaten the success of the project. Several soil anchors were tightened in Summer 2010. Additional rootwads were installed between Rock Barb 2 and Rock Barb 3 in Summer 2010.

Vegetation

The "As Built" Vegetation Map (Figure 3) shows the vegetation plantings as of June 2007 including type, number and locations. In addition, over 100 willow stakes were installed in November 2007 to further enhance the site and replace stakes lost during the year. These stakes were installed in Zone 1, mostly along the Rock Barbs and the channel edge. More willows and other species were planted in winter 2010/2011. Appendix B presents the As-Built planting plan.

The terraces (Planting Zone 1) are within the alluvial zone of the creek and have varying rates of vegetative cover and diversity depending on the season and depth of recent sediment deposition. Terraces and other areas seeded for erosion control had 60-80% cover during the monitoring event and the areas along the stream channel were heavily vegetated. Invasive weed control, including weed-whacking, was performed a few days prior to vegetation

monitoring. The new sediment deposit and the recent weed-whacking effort reduced the vegetation cover observed during the monitoring event. A variety of native (mugwort, western goldenrod, rushes, sedges, cattails, coyote brush, cocklebur, willow, and cottonwood seedlings, perennial grasses, and forbs) and non-native (sweet clover, mustard, Harding grass, smilo grass, Johnsongrass, other annual grasses, stinkwort, poison hemlock, mustard, and thistle) vegetation is present. Although annual grasses are still prevalent, native grasses and other native species such as creeping wildrye, purple needlegrass and mugwort were much more successful this year than in past years. Weed control activities were conducted 1-2 times per month in 2011 and will be continued in 2012. An inventory of plant species identified at the site in November 2011 is included in Appendix C. The edges of the stream channel are dominated by: willows, cattails, cottonwood, rushes, sedges, cocklebur, and western goldenrod. Willow stake survival in Zone 1 is over 80%. The new willow stakes installed in November 2007 replaced any willows lost since construction in this zone and natural willows have begun establishing on the terraces closer to the stream (see photo). Trees and shrubs planted in winter 2010/2011 help filling in the gaps and will provide additional woody cover as the plantings become established.

In Planting Zone 2, 13 of the 18 California buckeyes planted on the east bank survived (72% survival). Three of the buckeyes have a coast live oak or valley oak growing right next to them inside the protection cage. Of the 5 buckeyes that died, one was replaced by a big mature blue elderberry and another by a coyote brush. Coast live oak and buckeye seedlings have also observed on the banks, especially where sloughing or grading during the project has decreased the slope. Natural regeneration of woody species onsite is determined to be sufficient to replace the loss from mortality of the planted species.

As part of a SFPUC mitigation project, elderberry, buckeye, and coyote brush were planted in Zone 2 in winter 2010/2011 to enhance woody species cover for this area. Several non-native tree tobacco were removed from the banks in winter 2010/11. A few more individuals this species were observed during the monitoring event and will be removed in winter 2011/2012. Willow stakes in Zone 2 and along the toe of the slopes have not survived well in most of the project (less than 20%) as many were installed too high on the terraces to survive the drought years. In winter 2010/2011, additional willow stakes were installed with an irrigation system in order to establish willows in Zone 2.

Geomorphic Stability

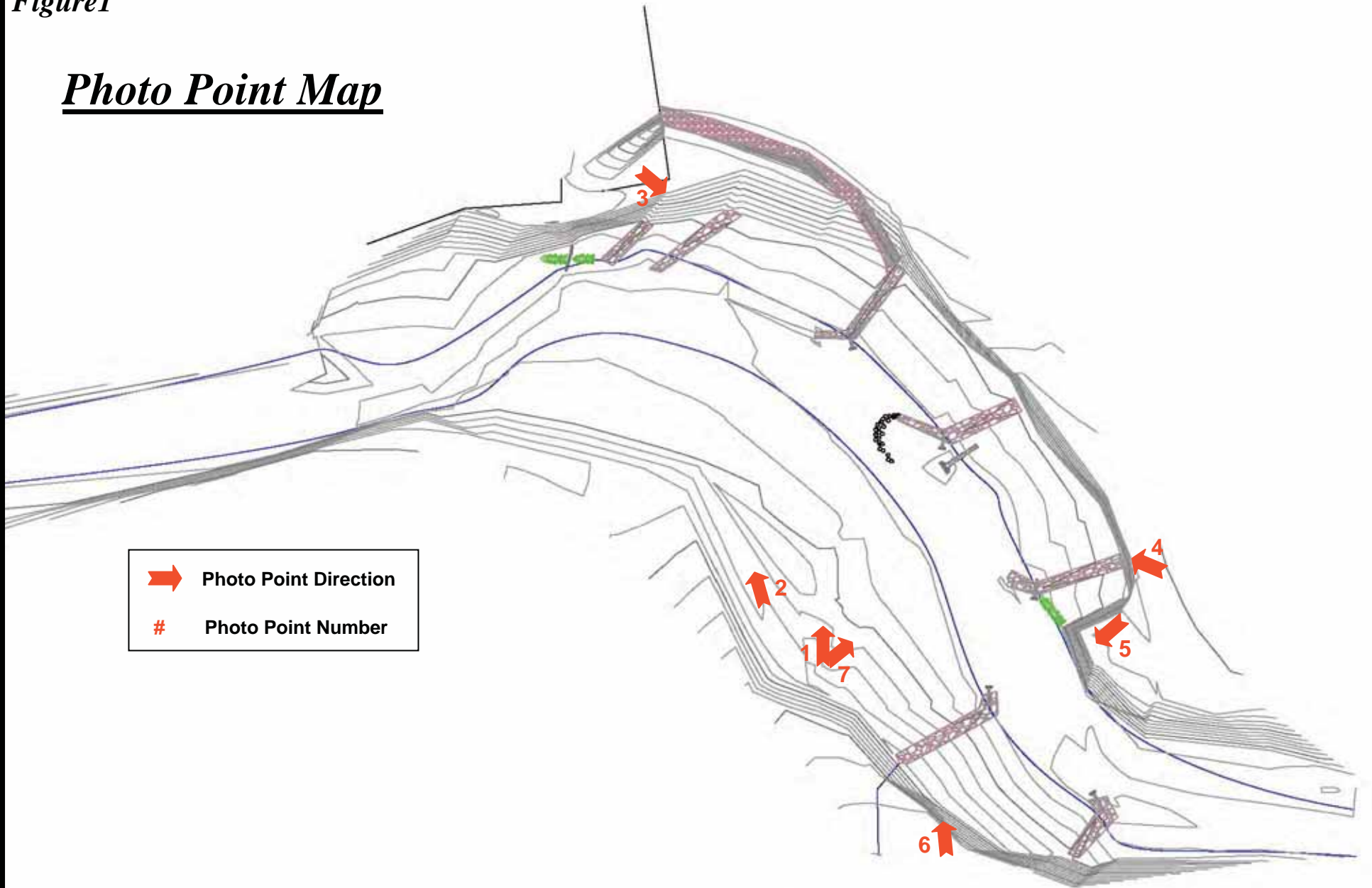
Overall the stream channel through the reach of the project appeared geomorphically stable during the monitoring period. According to provisional USGS Stream Gauge data collected near the project site, the peak flow during this monitoring period was 5,610 cfs from a storm on March 24, 2011. The channel forming, bankfull flow is estimated to be 3,000 cfs or less and the 25-year design flow is estimated to be 13,000 cfs.

No headcuts or nick points are visible in the channel reach. No evidence of significant incision or aggradation of the channel bed was seen. Some erosion of the terrace toe occurred between Rock Barb 2 and Rock Barb 3 in 2006/2007, but the erosion has not impacted the bank and there has been some recent deposition along the toe of the terrace where the scalloping had occurred. Rootwads, other large woody debris and willow brush spurs were installed in this area in 2010 in order to provide additional roughness and toe stability as well as aquatic habitat. Sediment build up is evident on the constructed terraces between rock barbs (this is desirable for the project) and on the inside stream curves.

Bank erosion did occur during this monitoring period in the form of bank sloughing during drawdown after storm events. Vegetation has established on the soil sloughed during storm events during previous winters.

Figure 1

Photo Point Map



-  Photo Point Direction
-  Photo Point Number

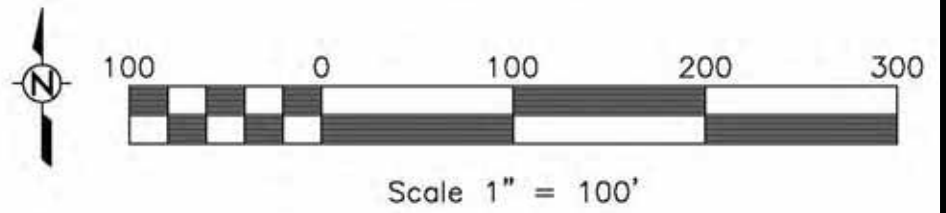


Figure 2

Overall Project Plan Map

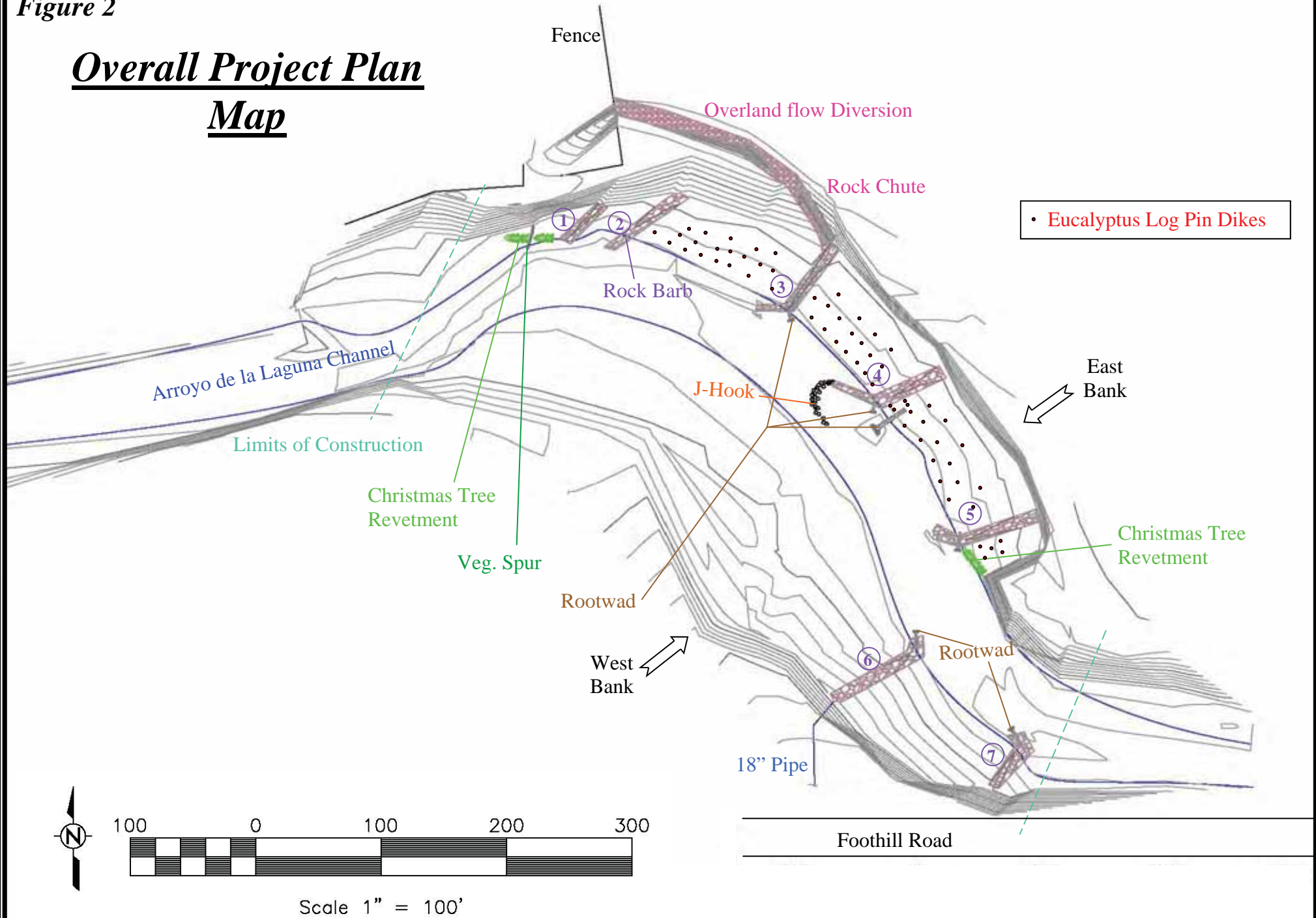
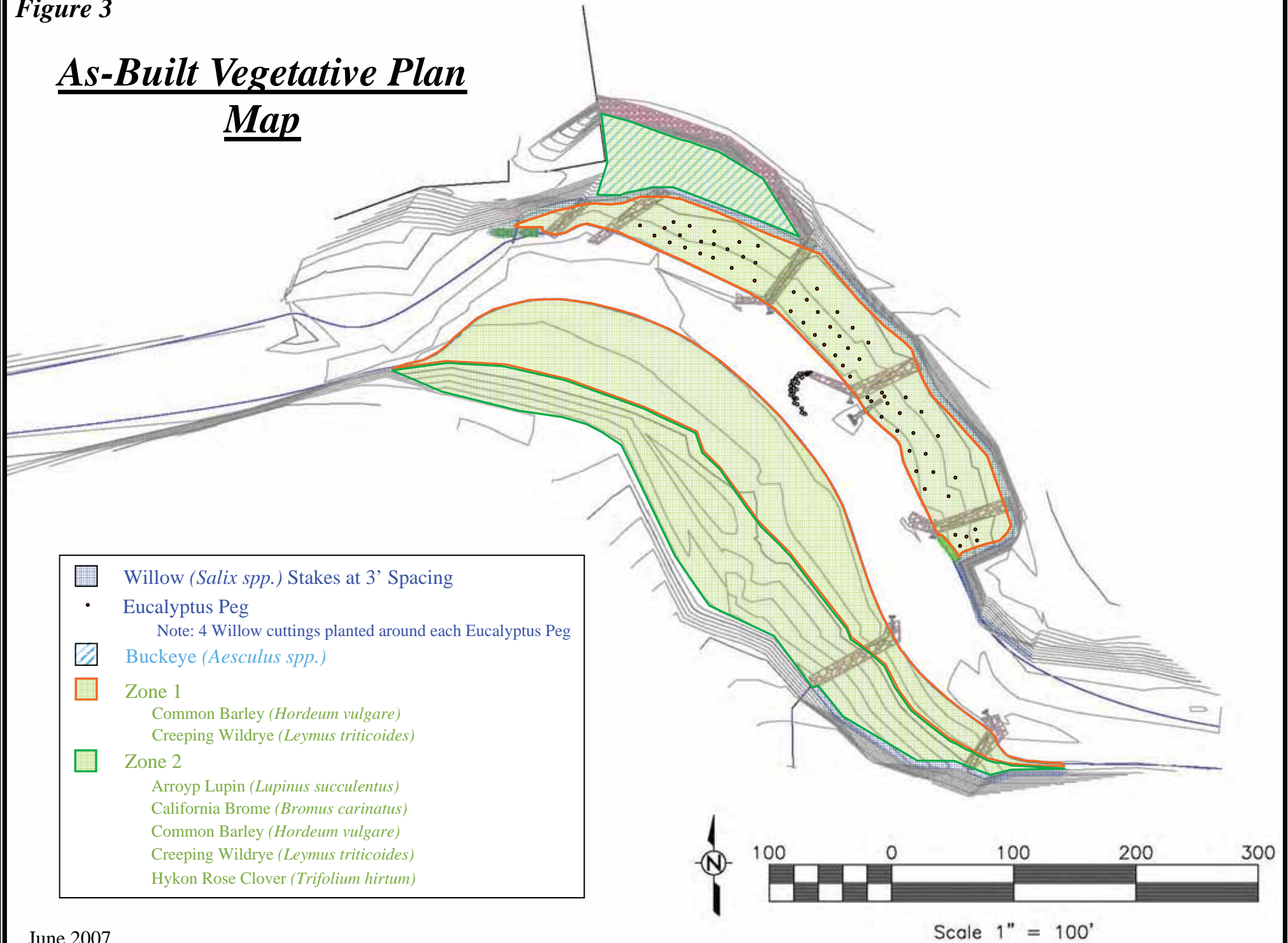


Figure 3

As-Built Vegetative Plan Map



APPENDIX A PHOTOGRAPHS

BEFORE & AFTER 2006 CONSTRUCTION PHOTOGRAPHS: PHOTO-MONITORING POINTS

2010/2011 PHOTOGRAPHS: PHOTO-MONITORING POINTS

2010/2011 PHOTOGRAPHS: FEATURES, STORM EVENTS AND VEGETATION



November 2011 Photo Monitoring Point 1



November 2011 Photo Monitoring Point 2



November 2011 Photo Monitoring Point 3



November 2011 Photo Monitoring Point 4



November 2011 Photo Monitoring Point 5



November 2011 Photo Monitoring Point 6



November 2011 Photo Monitoring Point 7



March 11 2011: Site Before March 24, 2011 Storm Event



Sediment Deposition →

March 29 2011: Site After March 24, 2011 Storm Event



November 2011 – Vegetation Growth (elderberry and buckeye)



November 2011 – Recent Plantings on West Bank



November 2011: Post-Installation of Additional Rootwads



August 2010: Post-Installation of Additional Rootwads

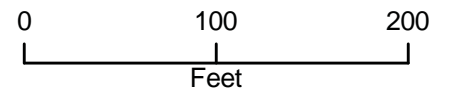
APPENDIX B
2010/2011 Planting Plan

As-Built Planting Plan 2010/2011

Arroyo de la Laguna



- AECA
- ARDO
- BAPI
- BASA
- SAME
- Vegetative Spur
- Area Planted with Cuttings (Willow & Cottonwood)
- Project Site



Note: The numbers on the map represent the # of cuttings installed.

(See Table 1 for plant species key)



Appendix B: As-Built Planting Plan 2010/2011

Table 1

East Bank Terrace:					
Plant Key	Scientific Name	Common Name	Location	Plant Material	Quantity
POFR	<i>Populus fremontii</i>	Fremont cottonwood	channel edge to terrace	woody cutting	60
SAXX	<i>Salix spp.</i>	willow	channel edge to terrace	woody cutting	150
SAME	<i>Sambucus mexicana</i>	blue elderberry	transition zone	containerized stock	6
	total				216
West Bank Terrace:					
Plant Key	Scientific Name	Common Name	Location	Plant Material	Quantity
AECA	<i>Aesculus californica</i>	California buckeye	transition zone	containerized stock	9
ARDO	<i>Artemisia douglasiana</i>	mugwort	terrace	containerized stock	30
BAPI	<i>Baccharis pilularis</i>	coyote brush	transition zone	containerized stock	25
BASA	<i>Baccharis salicifolia</i>	mule fat	terrace	containerized stock	30
POFR	<i>Populus fremontii</i>	Fremont cottonwood	channel edge to terrace	woody cutting	25
SAXX	<i>Salix spp.</i>	willow	channel edge to terrace	woody cutting	100
SAME	<i>Sambucus mexicana</i>	blue elderberry	transition zone	containerized stock	15
	total				234

Note: Quantity of plants installed is the same as the planting plan

APPENDIX C
2010/2011 Plant Inventory

APPENDIX C- 2010/2011 Plant Inventory
Vegetation Species List - November 2011

Scientific Name	Common Name	Native/ Introduced	Present? (East Bank)	Present? (West Bank)
<i>Acer negundo</i>	boxelder	N	y	
<i>Aesculus californica</i>	California buckeye	N	y	y
<i>Artemisia douglasiana</i>	mugwort	N	y	y
<i>Avena sp.</i>	wild oat	I		y
<i>Baccharis pilularis</i>	coyote brush	N	y	y
<i>Baccharis salicifolia</i>	mule fat	N	y	y
<i>Bromus sp. (B. hordeaceus or B. diandrus)</i>		I	y	y
<i>Cardamine oligosperma</i>	bitter cress	N	y	y
<i>Carduus pycnocephalus</i>	Italian thistle	I	y	y
<i>Centaurea solstitialis</i>	yellow starthistle	I		y
<i>Conium maculatum</i>	poison hemlock	I	y	y
<i>Convolvulus arvensis</i>	bindweed	I		y
<i>Conyza sp.</i>	horseweed	?		y
<i>Cotula coronopifolia</i>	brass buttons	I		y
<i>Cynodon dactylon</i>	Bermuda grass	I	y	y
<i>Cyperus eragrostis</i>	tall flatsedge; nutsedge	N	y	y
<i>Datura stramonium</i>	Jimsonweed	I	y	y
<i>Dittrichia graveolens</i>	stinkwort; stinkweed	I	y	y
<i>Echinochloa crus-galli</i>	Barnyard Grass	I	y	y
<i>Elymus glaucus</i>	blue wild-rye	N		y
<i>Erodium cicutarium</i>	filaree	I	y	y
<i>Euthamia occidentalis</i>	Western goldenrod	N	y	y
<i>Foeniculum vulgare</i>	fennel	I		y
<i>Galium sp. (probably G. aparine)</i>	bedstraw	?	y	
<i>Geranium molle</i>	cranesbill; Dove's-foot Geranium	I	y	y
<i>Gnaphalium luteo-album</i>	cudweed	I	y	
<i>Hedypnois cretica</i>	creteweeder	I	y	
<i>Helenium puberulum</i>	sneezeweed	N	y	
<i>Heliotropium curassavicum</i>	Salt Heliotrope	N		y
<i>Heterotheca grandiflora</i>	telegraph weed	N		y
<i>Hirschfeldia incana or Brassica nigra</i>	shortpod mustard	I	y	
<i>Juglans californica</i>	blackwalnut	N		y
<i>Lepidium latifolium</i>	perennial pepperweed	I	y	y
<i>Leptochloa fascicularis</i>	Bearded Sprangletop	N	y	y
<i>Leymus triticoides</i>	creeping wildrye	N	y	y
<i>Lolium multiflorum</i>	Italian ryegrass	I	y	y
<i>Lotus corniculatus</i>	birdfoot trefoil	I	y	y
<i>Ludwigia sp. (Probably L. hexapetala)</i>	water primrose	N	y	y
<i>Malacothamnus fremontii</i>	bush mallow, Fremont mallow	N	y	
<i>Malva sp.</i>	cheeseweed	I		y
<i>Medicago polymorpha</i>	bur clover	I		y

APPENDIX C- 2010/2011 Plant Inventory
Vegetation Species List - November 2011

Scientific Name	Common Name	Native/ Introduced	Present? (East Bank)	Present? (West Bank)
<i>Melilotus alba</i>	white sweetclover	I	y	y
<i>Mentha spicata?</i>	spearmint	I	y	
<i>Nassella pulchra</i>	purple needlegrass	N		y
<i>Nicotiana acuminata var. multiflora</i>	Many-flowered Tobacco	I	y	y
<i>Nicotiana glauca</i>	tree tobacco	I	y	y
<i>Oenanthe sarmentosa</i>	water parsley	N	y	
<i>Paspalum dilatatum</i>	Dallis Grass, Dallisgrass	I	y	
<i>Phalaris aquatica</i>	harding grass	I	y	y
<i>Picris echioides</i>	bristly ox-tongue	I	y	y
<i>Piptatherum miliaceum</i>	smilgrass	I	y	y
<i>Platanus racemosa</i>	western sycamore	N		y
<i>Polygonum sp.</i>	water smart weed	N	y	y
<i>Populus fremontii</i>	Fremont cottonwood	N	y	y
<i>Quercus agrifolia</i>	coast live oak	N	y	
<i>Raphanus sativa</i>	wild radish	I	y	y
<i>Rorippa nasturtium-aquaticum</i>	watercress	N	y	
<i>Rumex crispus?</i>	curly dock	I	y	y
<i>Salix lasiolepis</i>	arroyo willow	N	y	y
<i>Salix sp.</i>	willow	N		
<i>Sambucus mexicana</i>	blue elderberry	N	y	y
<i>Scirpus acutus</i>	hardstem bulrush	N	y	y
<i>Sirpus sp.</i>		N	y	y
<i>Silybum marianum</i>	milk thistle	I	y	y
<i>Solanum sp.</i>	nightshade	I	y	
<i>Sonchus sp.</i>	sowthistle	I	y	y
<i>Sorghum halepense</i>	Johnsongrass	I		y
<i>Symphoricarpos sp. (probably S. albus)</i>	snowberry	N	y	
<i>Torilis arvensis</i>	Field Hedge Parsley	I		y
<i>Trifolium hirtum</i>	rose clover	I		y
<i>Typha sp.</i>	cattail	N	y	y
<i>Urtica dioica</i>	stinging nettle	N		
<i>Veronica sp. (probably Veronica anagallis-aquatica)</i>	water speedwell	?	y	y
<i>Xanthium strumarium</i>	cocklebur	N	y	y
unknown forb		I		y

Note: Species highlighted in orange are targeted invasive species