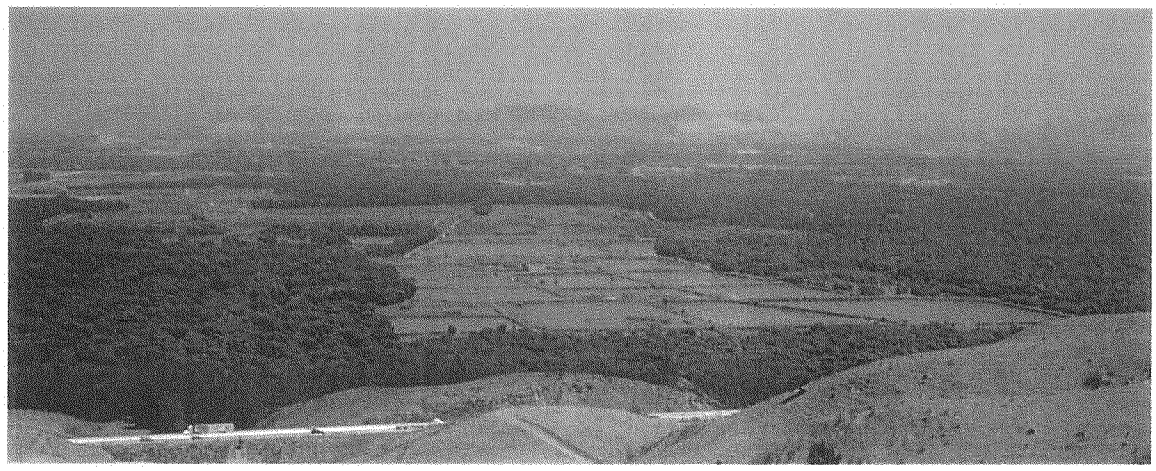
WIC 13

2004 Habitat Restoration And Mitigation Report for the Prado Basin



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Introduction

The OCWD owns about 2,150 acres of land in the Prado Basin. This acreage includes approximately 465 acres of constructed wetlands (See Figure 1). The constructed wetlands were originally a series of ponds that were developed and managed for waterfowl hunting. However, with the increases in nitrate on the Santa Ana River due to upstream treatment plant discharges and agricultural runoff, the OCWD converted the ponds to constructed wetlands to provide water treatment. A Biological Opinion and Conference Report (1-6-94-F-47) was issued by the Army Corps of Engineers on December 23, 1994. This will be referred to as the B.O. henceforth. Later, a Section 404 Permit 93-00572-RRS for the reconstruction and operation of the Prado Wetlands was granted. As a condition of this permit, OCWD agreed to enact the mitigation measures set forth in the Biological Opinion.

The Prado Basin contains the single largest stand of forested riparian habitat remaining in the southern California region. Wetland and riparian plant communities cover an area of 4,400 acres. Only a small number of riparian species are responsible for the native plant cover in the project area, mostly dominated by black willow (*Salix gooddingii*). In much of the basin, mule fat (*Baccharis salicifolia*) is the most abundant native in the understory, however, in the project area, stinging nettle (*Urtica holosercea*) and several weedy herbs are also abundant. The riparian woodland provides habitat for a wide variety of wildlife species. The most notable is the extensive avian population. The avifauna is a diverse assemblage including resident and migratory passerines and waterfowl. The raptor concentration in the Basin is among the largest in southern California. The OCWD manages a large portion of this property and has undertaken numerous habitat restoration and species recovery projects. The most notable is the efforts that OCWD has made towards the recovery of the federally endangered least Bell's vireo (*Vireo pusillus bellii*). In the mid-eighties, the vireo population had dropped to less than 20 breeding pairs. Now, over 400 breeding pairs out of a total of nearly 600 male territories are found in the basin (Pike, et al. 2004). This area also supports the federally listed southwestern willow flycatcher (*Empidonax traillii extimus*) and the yellow-billed cuckoo (*Coccyzus americanus occidentalis*). Several species designated by the California Department of Fish and Game (CDFG) as "Birds of Special Concern" have also been detected in the basin. These include the Cooper's hawk (*Accipiter cooperi*), yellow warbler (*Dendroica petechia*) and yellow-breasted chat (*Icteria virens*).

In compliance with the mitigation measures set forth by the biological opinion and in effort to provide high quality habitat, OCWD has embarked in numerous habitat restoration activities. The B.O. outlined the prescribed vegetation species to be planted in the mitigation areas. These species included black willow and mule fat. However, OCWD has also planted Fremont cottonwoods (*Populus fremontii*) and is considering planting narrow-leaf willow (*Salix exigua*) in areas that are predominately sand. The following is an update and an evaluation of the mitigation and restoration efforts in the Prado Basin. Each area will be discussed in detail. A map of the mitigation areas in the Prado Basin has been included as Figure 2. An intricate component of the habitat restoration process is the removal of exotics from the area. A discussion of the exotic plant species and efforts to remove them is included in this report as well.

OCWD Mitigation Requirements

Mitigation requirements have been set forth in response to two main activities within the Prado Basin. The first activity involves the retention of water behind the Prado Dam for the purposes of water conservation (Water-Con and Water-Con2). The second activity involves the reconstruction and operation of the constructed wetlands owned by OCWD. A discussion of the mitigation requirements has been listed below.

Water-Con

The 1992 EIS, 1993 Biological Opinion, 1995 Cooperative Agreement, and 1995 Biological Opinion outlined the mitigation requirements for retaining water behind Prado Dam to an ultimate elevation of 505' during the non-flood season (Water-Con). The 1992 EIS required that a total of 228 acres of vireo habitat and 278 acres of wildlife habitat must be restored and a fund must be created for the management of vireo within the basin. According to the 1999 Biological Assessment for the Prado Dam Water Conservation and Supply Feasibility Study, the required mitigation has been completed. The 1995 Cooperative agreement allowed OCWD to meet mitigation requirements by establishing a trust fund for the removal of Arundo donax within the basin by providing a one-time one million dollar contribution. This requirement has also been met. Agreements reached in 2004 for the second phase of Water-Con (Water-Con2), the ability to retain water to the 498' elevation during storm season, required an additional 37.5 acres of mitigation.

Constructed Wetlands Mitigation

Mitigation requirements were adopted for the impacts of reconstructing OCWD's wetlands and to also address past violations. The Biological Opinion issued in 1994 by the Army Corps of Engineers required that a minimum of 102 acres were restored for suitable vireo habitat. In addition, OCWD would be required to convert existing duck ponds (Raahauge's # 5 and Lower Roland 10, 11, 12, and 18) to riparian habitat, as well as insure that that a total of ten island areas would be built within the ponds. The additional mitigation amounted to 27 acres. The amount of mitigation required totaled 129 acres.

Other Requirements

Additional agreements and consultations resulted in a requirement to plant 10,000 mule fat per year outside of the above mentioned restoration areas. Cuttings are typically obtained on site and planted in areas throughout the project site.


PINE
HIGHWAY 83
EUCLID
71
Prado Lake
CHINO CORONA
Cucamonga
CUCAMONGA
HELLMAN
ARCHIBALD
BRAYTON
MCCARTY
RIVER
Santa Ana River
CORYDON
5TH
15
Chino Creek
Mill Creek
Prado Wetlands/ Ponds
Santa Ana River
BLUEF
COBRA
TRAIL
RIVER
2ND
PARKRIDGE
RINCON
LINCOLN
SMITH
Temescal Wash
Prado
Dam
91
CALIFORNIA
Orange County Water District
Mexico
Freeways/Roads
Water Bodies
Impermeable Formation
0.5
0
0.5 Miles
Figure 1.
Project Area Map
Reproduced with permission granted by THOMAS BROS. MAPS ®.
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Prado Mitigation Areas

N
W
E
S

1,000 0 1,000
Feet

ID, NAME, ACREAGE

- 1, 102 Acre Re-Vegetation Site, 102
- 2, Outlet Channel to Santa Ana River, 10
- 3, Raahague Pond 5, 16
- 4, Lower Rolands Ponds, 7
- 5, Willow/ Cocklebur Field, 7
- 6, PR-1 (The Hole), 14
- 7, Small Habitat Islands, 4
- 8, Habitat Strip, 8
- 9, Diversion Channel, 0
- 10, Water Con Re-Vegetation, 124
- 11, Old Fire Brick Road, 1
- 12, Diversion Burn, 40
- 13, Rozanski 1, 4
- 14, Rozanski 2, 2
- 15, Earth Day, 1
- 16, Highway 71, 24

Digital aerial imagery flown February 2002. 2-foot per pixel accuracy
Licensed to OCWD by AirPhoto USA.
Features depicted on this graphic are displayed at a planning level accuracy only. Distances and locations may be distorted at this scale.

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Original Mitigation Areas

Site 1 - (102-Acre Mitigation Site)

In past reports, this site was listed as a 104-acre mitigation site. However, per agreements in the original B.O., only 102 acres were designated for habitat restoration purposes. This area is a subset of that area. It is an area located on the southeast boundaries of OCWD property. The site is located on the north and south side of the Santa Ana River. It was originally designated as the southern Pheasant Field (PR-2) and represented only 36 acres. At one time, it used to be the day-hunt area for Mike Raahauge's operation. An additional 10 acres were added, bringing the total to 46 acres. The area is surrounded by cottonwood and willow habitat. Populations of vireo existed near the site prior to restoration efforts, but none were detected within the area.

The primary goal of this mitigation area was to remove the exotic species, most notably Arundo. The area was mowed in May of 1995. However, extensive re-growth had occurred. Additional removal activities commenced during the time period of June 8, 1996 to June 15, 1997 using heavy equipment. Much of the Arundo was pushed to the side or turned over. In October of 1997, a helicopter was utilized to apply the herbicide Rodeo® on the re-growth. Approximately 90% of the area was treated, and an in July of 1998 it was estimated that 60% removal was achieved. The remaining stands were again knocked down and sprayed with Roundup®. It was estimated in 1999, that 90% of the *Arundo* was removed. Some patches of Arundo have re-sprouted and will be cut and sprayed when necessary. The size of the restoration area is now about 100 acres. As of 2003, 90% of the removal area was still arundo-free. However, small patches continue to re-sprout and must be removed. Perennial pepperweed has colonized much of the area now.

Re-vegetation attempts have been limited in success. The 1999 mitigation report indicated that approximately 24,000 mule fat, 8,000 black willow, and 8,000 cottonwood stock from 2-inch liners were planted during the time period of December 1998 and March of 1999. The numbers indicated that 90% of the stock had survived the transplanting and exhibited "vigorous growth". However, two years later, almost none of the cottonwoods or willows survived, and less than 10% of the mule fat had survived.

In the 2000 mitigation report, it was stated that another 4,000 mule fat, 3,000 black willows and 2,000 cottonwoods were planted. The cottonwoods and willows were transplanted in 2-inch liners and the mule fat was from 12-inch rooted cuttings. These plants were irrigated twice a week during the time period of December 1999 to February 2000. Again, no willows or cottonwoods were detected one year after the planting. However, sporadic patches of mule fat did take. This represented approximately 10% of what was planted. These patches grew quickly, and a male least Bell's vireo was detected in them.

In November 2000, areas that had been planted previously but did not take were cleared again. This time, only mule fat was planted. Approximately 6,000 mule fat seedlings were planted during December 2000 to January 2001. These were irrigated once or twice a week for about three months. During the planting phase, a small subset of the seedlings were planted about six-inches deeper than the others. This was about 20% of the total seedlings. In this area, there was a 50% survival after one year,

compared to the 5% survival of the rest of the seedlings. During July and August 2001, hand weeding was conducted around the mule fat. The removal of Russian thistle (*Salsola tragus*) and sunflowers (*Heliathus* sp.) seemed to be a distinct benefit for the mule fat. All existing mule fat appeared healthy, and with the removal of the weeds, they would be expected to flourish this year.

In November 2001, an area adjacent to a stand of black willow and cottonwoods was cleared for the planting of mule fat. Approximately 3,500 cuttings were made for planting, however, due to cold weather the root systems were not significant enough to plant. Therefore, planting was delayed until November of 2002. In November, due to access problems to the site, it was decided to plant the mule fat in the Rozanski Area..

As of July 2002, the established mule fat was doing well. Areas in which the mule fat has not established are either barren or is covered with perennial pepperweed (*Lepidium latifolium*) and other exotics. Approximately 10% of the mitigation area was covered with high quality habitat. Arundo began appearing in patches throughout the mitigation areas.

The dry sand of this area seems to hinder restoration efforts. Irrigation water is quickly absorbed and is not available to the young mule fat seedlings. To compensate, vegetation will be chipped and used for mulch in these areas. In January of 2003, this area was mowed. The primary target was the large expanses of pepperweed and other exotics. Arundo was cut and mulched throughout the site. Exotics were removed up to the edges of existing native vegetation. Re-vegetation occurred increasing the amount of native vegetation up to 15%. The section south of the Santa Ana River appears to be recovering much quicker than the north side.

The 2004 storms have had quite an impact on this area. A large blockage of debris within the river channel has caused the river to change course through this area. In March of 2004, the western portion of the southern area was flooded and a tributary to the river was formed. This small flow traversed the western portion and continued into the tree line in a southwest direction. The flooded area became a marsh supporting cattails (*Typha* sp.) and small sunflowers (*Bidens laevis*). Vireo numbers increased in this area again with a total of 6 vireo territories.

The winter storms in September 2004 altered the area even more. The debris blockage increased in size, forcing more water into the area. The roads within the mitigation area are now small streams. This additional water to the area is beneficial to the native vegetation, but will limit access to the area. Although the native vegetation within the site has increased, the amount of arundo has also increased. Without road access, the control of this arundo will be difficult.

Figure 3 – Mitigation Area 1 South

Figure 4 – Mitigation Area 1 North

Site 2 (Outlet Channel to SAR)

This area amounts to about 10 acres. The area was required mitigation due to a prior OCWD lessee violation. An outlet channel (Figure 5) from the Upper Roland Pond # 14 was constructed to divert flow to the Santa Ana River. Mitigation was to simply allow natural re-vegetation of this area. Arundo was removed in October of 1996. Originally, no vegetation has been planted, but many native plant species have returned to the area. Arundo and saltcedar (*Tamarix ramosissima*) are present. These species will be removed. After the receding of floodwaters in May of 2003, a large field of young saltcedar had sprouted. This was subsequently removed. Although there is still some exotic species present, this site is still dominated by healthy, native vegetation. The arundo within this site is concentrated along what used to be a road.

In 2003, approximately 300 black willow pole cuttings were placed in the area. Subsequent flooding drowned many of the new saplings, but approximately 25% survived into 2004. Willow pole cuttings generated during routine road maintenance activities will continue to be placed in this area whenever available.

Figure 5 – Mitigation Area 2(outlet channel)

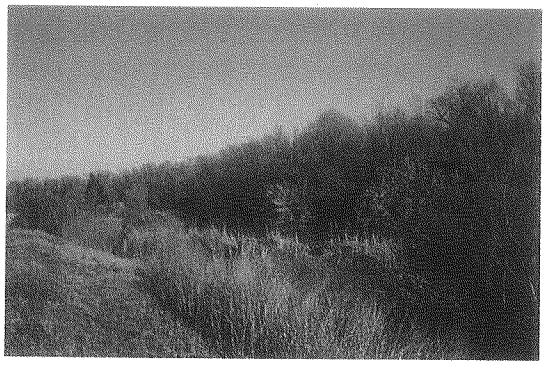

Figure 6 – Mitigation Area 2

Site 3 (Raahauge Pond 5)

This area was part of the original mitigation for the construction of the ponds (Raahauge violation). The whole area amounted to approximately 16 acres. The area has been allowed to naturally re-vegetate since the spring of 1993. Arundo removal has been

the only sort of habitat manipulation in the area. Approximately four acres of pure Arundo were knocked down in September and October of 1996. Arundo re-growth was sprayed by helicopter in October 1997. Additional herbicide applications were conducted in March of 1998. Some pole cuttings were panted at the same time. These cuttings were removed from a construction area. As of June 2000, 80% of the upper area contained willow saplings about 5 to 10 feet tall. This area is now considered to be viable vireo habitat and annually contains several vireo territories (Figure 7). In 2001, 2002, and 2003 no additional work was done in this area. In 2004, a patch of arundo was detected in the area and is scheduled to be removed.

Site 4 (Lower Roland's Ponds)

The lower Roland Ponds area was a requirement from the original construction of the ponds (Raahauge violation). The total area equaled about 7 acres. This site is located adjacent to the western-most ponds in the OCWD system. Due to the duration of inundation, this area was primarily cocklebur (*Xantium spinosum*). In June of 1996, cockleburs were knocked down. Willows removed from the construction project were placed in this area and covered with dirt. In previous reports, it was estimated that 20% of this area contained willows and the other 80% contained willow seedlings. However, it does not appear that all of these willow seedlings survived. Dense willow seedlings exist along the edge of the road. There is some coverage of willows and cattails in this area, but much of the cocklebur has returned. It is estimated that only 20% of the area is covered with willows and other suitable habitat (Figure 8). The cocklebur will need to be removed again to ensure willow success. Approximately 800 black willow pole cuttings were placed in this area. They were planted in April 2003. Unfortunately, significant rains occurred in May that caused this area to be inundated, killing most of the pole cuttings.

In September of 2004, the cocklebur was mowed to ground level. Over 400 black willow pole cuttings were placed into the ground. As of October 2004, 90% of them showed new leaf growth and multiple branches. However, the heavy storms in late October inundated the area, and it is likely that many will not survive the inundation. As with the area mentioned above, since willow pole cuttings are generated during the maintenance activities, this area will continue to have pole cuttings placed in the ground.

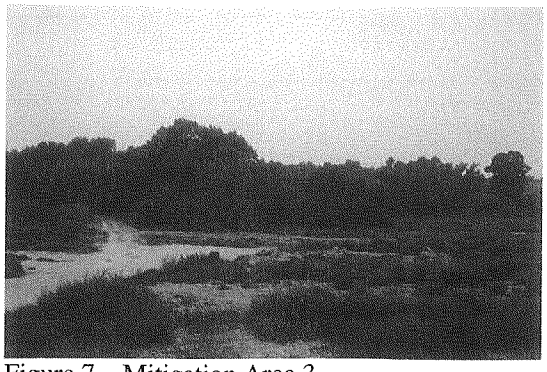

Figure 7 – Mitigation Area 3

Figure 8 – Mitigation Area 4

Site 5 (Willow/Cocklebur Field)

The original impact in this area was the mowing of the field. The area was dominated by sunflower and cocklebur at the time, but there were some sparse willows in the center. No further mowing was conducted. The re-vegetation attempts in this area have been slow and fairly ineffectual. This area is inundated from backwater of the Prado Dam for a significant portion of the year. Cottonwoods and willows were planted in the spring of 1997. Mule fat was not planted because it does not tolerate extended periods of inundation. Presently, very few of the cottonwoods and willows survived. Much of this area remains dominated by cocklebur and sunflowers.

Site 6 (Small Pheasant Field PR-1 "The Hole")

This area was part of the original construction mitigation. It is about 14 acres in size. The area was allowed to re-vegetate naturally prior to 1996. Re-growth of mule fat and willow were noted. Approximately 8 acres of Arundo were knocked down using a bulldozer. Aerial herbicide spraying was conducted in conjunction with the 102 acre mitigation site above. Approximately 6000 mule fat, 2000 willow, and 2000 cottonwood were planted in November and December of 1998. Immediately after planting 20% of the plantings died. In 1999, 60% of the plantings had died. As of today, only 15-20% of the original plantings remain. Arundo spraying has continued in the area, but there are large stands of Arundo surrounding the area. Perennial pepperweed dominates the area (See Figure 9).

The area was mowed in late August of 2004. In September, Telar® was applied to the site at a rate of 1 oz per acre. After two weeks, the pepperweed was showing signs of wilting and browning. The efficacy of the Telar was assessed in December of 2004. Nearly 98% of the pepperweed was dead. The area will be monitored on a continual basis. Follow-up treatments will be with Glyphosate®. The goal of this work area in 2005 will be to eradicate the exotics. Once the area is relatively free of exotics, additional plantings will be done if weather conditions are conducive. Access to this area is difficult and there is no water source nearby. Thus, planting should only be done in wet weather in years in which rainfall is above average.

Figure 9 - Mitigation Area 6

Figure 10 – Habitat Island

Site 7 (Habitat Islands)

10 small habitat islands ranging in size from ¼ to ½ acre were constructed within the ponds. Natural re-vegetation was allowed to occur. Some islands are highly vegetated with cottonwoods and willows growing in them (Figure 10). Some islands are not vegetated at all. These areas serve as mud flats or areas of shallow water for wading birds and waterfowl. To augment these habitat islands, black willows have been allowed to grow along banks of the ponds and in corners of the ponds. These willows serve as connectors to the surrounding habitat.

Site 8 (Habitat Strip)

The construction of the perimeter levee on the northern and southern portion of the wetlands was completed in 1997. Approximately 1,200 mule fat cuttings were planted in the spring of 1998 along the southern portion. The northern area seemed to be quickly re-vegetating, so no plantings were made there. Presently, these areas have filled in with a diverse assemblage of mule fat, willow, cottonwood, and stinging nettle (*Urtica* sp.)(Figure 11). However, saltcedar (*Tamarix spp.*), perennial pepperweed, and other exotics are present, and are targeted for removal. Certain areas have large amounts of Wild grape (*Vitis girdiana)* growing on the willows and mule fat (Figure 12). Dense mats of grape can smother the native vegetation but is often utilized by vireos for nesting. The grape in these areas will be removed on a trial basis. This area is home to numerous vireos and for the first time a southwestern willow flycatcher on the northern section. The habitat in this area is impacted with castor bean. This castor bean was scheduled to be removed this year in conjunction with the Mill Creek Diversion Project. However, high flows on Mill Creek early in the winter season forced postponement and re-analysis of the project.

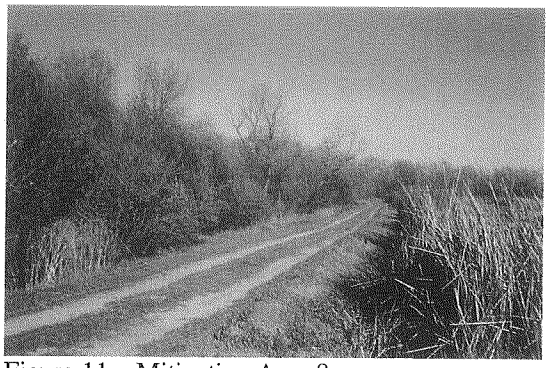

Figure 11 – Mitigation Area 8

Figure 12 - MA 8 - wild grape infestation

Site 9 (Diversion Channel)

In 1993, Arundo removal and subsequent planting was conducted along the diversion structure. Arundo was again removed in 1996. Herbicide applications occurred almost every year after that. This area has quickly re-vegetated itself (Figure 13). Mule fat and willows have moved into once Arundo dominated areas. This area supports a large number of vireo and is mostly successful. Arundo still persists in

portions of this area, but it is removed and sprayed on a regular basis. A portion of this property was planted with mule fat, black willow, and narrow-leaf willow this year. It has been separated out, and will be discussed in the "Earth Day" section.

Figure 13 – Mitigation Area 9

Site 10 (Water-Con Re-vegetation)

This is a 124-acre site adjacent to the large pheasant fields southeast of the ponds. This area was cleared of Arundo and replanted with native willow and mule fat. This area has recovered and supports a large population of least Bell's vireo. Some Arundo has returned along the edges of this mitigation area and it was on the schedule to be removed this year. The road that runs adjacent to this area sustained severe damage due to storm flows. Vehicle access to the area will be impossible. The willows in this area are showing some stress. Many of the willows are defoliated more than normal. The increased water into the area during the storms may benefit the area, but arundo debris was deposited in the area.

Site 11 (Old Fire Brick Road)

This mitigation site was required for the access road that was created to the willow/cocklebur field mentioned above. Plantings were required in the violation area and an equal-sized adjacent area. This was a responsibility of Raahauge. Presently, this stretch has native mule fat and willow. This may have been a result of natural re-vegetation as well, but the area has recovered and supports least Bell's vireo.

Additional Mitigation Areas

Rozanski Area

This area is approximately 4 acres in size. It is adjacent to the diversion channel and close to existing vireo habitat. This site was selected to widen the habitat on the diversion channel. When this area is fully vegetated, it would double the amount of prime vireo habitat in the general area. The area was dominated by perennial pepperweed and other exotics. These exotics were removed and the area prepared for

planting. The Rozanski Area was named after an Eagle Scout that helped to organize a work party that assisted in the planting of 2000 mule fat seedlings in September 2002. After that, an additional 3000 mule fat were planted in the area (Figure 14). Cottonwoods, black willow, and narrow-leaf willow were also planted in the area. Due to a nearby field full of exotic weeds, the area became engulfed with weeds during the spring months. Once nesting season was over, this area was weeded. Only 40% of the mule fat survived. Those that did survive, are now four feet or taller.

Areas in which plants were lost were replanted. During 2004, 1989 mule fat were planted in the original footprint. These plants are showing vigorous growth. Another 3 acres of mule fat were planted in this area (This area is referred to as Rozanski 2). It was planted in two phases. The first phase involved the planting of over 1,500 mule fat in December of 2003. The second phase involved planting an additional 600 mule fat in early 2004 (See Figure 15). Another 3000 mule fat are scheduled to be planted in January 2005.

Figure 14 – Rozanski Area after planting

Figure 15 – Rozanski 2 Area

Earth Day

The earth day is a small section of narrow habitat that was planted on the diversion channel. The area was chosen because of the large number of vireos in the area. This section of the diversion channel becomes very narrow, with habitat only 20 feet wide in some places. This planting will widen the narrow band and augment the existing vireo habitat. Perennial pepperweed and arundo were removed and the area was graded. Approximately 500 mule fat were planted in this area. Almost all of the plants have survived and the area is filling in (Figure 16). Additional areas were planted in October 2003 and February 2004 totaling another 400 mule fat and a small number of narrow-leaf willows (*Salix exigua*). Re-plantings were done in areas where mule fat or narrow-leaf willow did not take, although the numbers were small. The area is now self-sufficient and no longer requires irrigation.

Figure 16 – Earth Day Area

Diversion Burn Area

On June 29, 2002, a fire started in an area located just southwest of the OCWD diversion structure. Approximately 40 acres burned. The area had some mixed native vegetation, but was highly dominated by arundo. After the fire, the area was treated with herbicide everywhere that arundo was re-sprouting. On three separate occasions herbicide was applied to the arundo and castor bean that was returning. As of September of 2003, the area had significant re-growth of black willow, cottonwoods, mule fat, and blackberry (Figure 17). Nearly 50% of the area is covered with native vegetation. Due to lack of follow-up, arundo has re-colonized some of this area (Figure 18). Most notably, arundo is growing amongst the native vegetation, and will require hand removal. The OCWD is generating a Request for Proposals to remove the arundo and any other exotics in this area and perform follow-up herbicide application for the next five years. In September and October high flows washed out a portion of the northern bank of the mitigation area. This area may require re-planting, but we will wait until the arundo removal is complete.

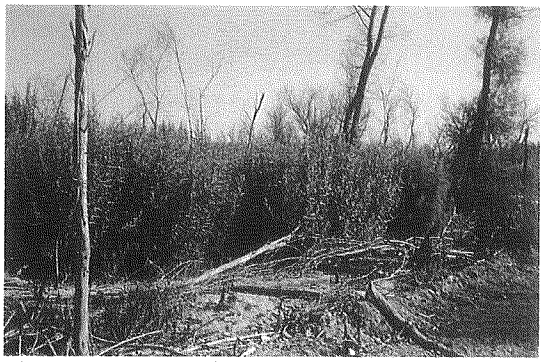

Figure 17 – Burn area in Oct. 2003

Figure 18 – Arundo re-growth in Burn Area

Highway 71

The Highway 71 Project is a joint project between the Orange County Water District and Caltrans. In an area that runs adjacent to the northbound side of Highway 71, approximately 10 acres of eucalyptus trees (*Eucalyptus* sp.) were removed. The entire area is about 12 acres in size. A systemic herbicide was applied to the stump immediately after cutting. An irrigation system was installed to water the 10,000 plants

that were planted in this area. Approximately 8,000 mule fat, 1,500 coyote bush (*Baccharis piluras*), and 500 trees were planted (Figure 19). As of September of 2003, 80% of the plants have survived. Since Caltrans is a partner in this restoration project, only half of this acreage can be claimed by the Orange County Water District (6 acres).

The removal of eucalyptus in the area has continued. Another 12 acres were cleared of eucalyptus. These areas will be re-planted with mule fat, black willow, and Mexican elderberry (*Sambucus mexicana*). In December of 2004, 840 mule fat were planted on a five acre plot (Figure 20). In addition, 2 elderberries, 24 black willows, and 12 arroyo willows were planted. Plantings are scheduled to continue, with another 4000 mule fat to be planted in early 2005. At the higher elevations near Highway 71, some white sage and black sage were planted as well.

Figure 19 – Hwy 71 -Original planting area

Figure 20 – New Planting Area near Hwy 71

Summary of Mitigation Progress

Evaluation Criteria

Evaluation of the mitigation areas has been focused on two criteria: exotic species removal and native vegetation recruitment. A successful mitigation site will have a high percentage of native plants and few exotic species. In the summary table below, completed acreages have been assigned to mitigation areas. These acreages are dominated by native vegetation. Although exotic species removal may have occurred in the remaining acreages, only native vegetation acreages are listed as completed. Some of these mitigation areas only required the removal of arundo to satisfy the mitigation requirements. Therefore, the evaluation criteria utilized may be more stringent than required, and actual acreages could be higher.

Summary

Mitigation Areas 2 (Outlet Channel to SAR), 3 (Raahauge Pond 5), 8 (Habitat Strip), 9 (Diversion Channel), and 11 (Old Firebrick Road) all appear to have re-vegetated themselves and now provide high quality vireo habitat. Besides occasional Arundo and exotic removal, these areas will not require additional mitigation work. The habitat islands designated as Mitigation Area 7 are in place. Some are vegetated with willow and mule fat; some have little vegetation but still serve as shallow water habitat.

Between December of 1998 and March 1999 approximately 24,000 mule fat, 8,000 black willow, and 8,000 cottonwood were planted in Mitigation Area 1 (102 Acre Mitigation Area) and 6,000 mule fat, 2,000 black willow, and 2,000 cottonwood were planted in Mitigation Area 6 (The Hole). Between December 1999 and February 2000, 4,000 mule fat, 3,000 black willows, and 2,000 cottonwoods were planted. Finally, between December 2000 and January 2001, approximately 6,000 mule fat were planted. The total to present is 40,000 mule fat, 13,000 willows, and 12,000 cottonwoods. These plantings were in various locations throughout these two mitigation areas and spanned over three years. About 15% of the area is covered with native vegetation. It is estimated that there are over 10 acres of arundo in the center of Mitigation Area 1 South. Area 1 and Area 6 both have large amounts of perennial pepperweed and Russian thistle. Telar® was applied to Area 6 at a concentration of 1 oz per acre shortly after it was mowed, and nearly 100% kill was seen one month later.

Mitigation Area 4 (Lower Roland Ponds) has about 20% native vegetation with the remaining areas being covered with cocklebur. In September of 2004, this area was dominated by cocklebur, so the area was mown. Then over 400 black willow poles were put into the ground. After three weeks, the pole cuttings were showing new growth and lateral growth. Unfortunately, October storms put this area under water and it has been inundated ever since. It is unlikely that any of the young willows survived.

Mitigation Area 5 (Willow/cocklebur Field) is mostly dominated by cocklebur. Again, this area is inundated with backwater from the dam for about three months a year. Thus mule fat cannot establish itself. Willows and cottonwoods would most likely do well in this area.

The Earth Day area continues to do well. Approximately 99% of the mule fat has survived since planting. Arundo chippings have been used as mulch in this area and seem to be a benefit. Although some weeds have returned, the mulch helps to retain soil moisture. The irrigation lines have been removed from this area.

The Diversion–Burn area has shown enormous recovery. Numerous mule fat, black willow and cottonwood have re-sprouted in the area. Unfortunately, the re-growth has made the spraying of arundo difficult. Arundo has re-colonized much of the area due to lack of follow-up spraying. The area also received significant flood damage from the heavy October and November storms. The roads were damaged and a portion of the northern bank was lost. This area will need to have arundo removed. An RFP will be issued in February to remove arundo and follow-up with herbicide for the next 5 years.

The Ronzanski Area suffered a heavy loss of mule fat due to irrigation problems and a heavy infestation of exotic weeds. Of the 5000 mule fat cuttings planted in 2002, only 40% survived. An additional 3000 mule fat has been planted in the area with a nearly 95% success rate. 3000 more mule fat are scheduled to be planted in this area in late 2004 or early 2005.

The 71 Project continued, with a total of 10 acres of eucalyptus trees removed. Approximately 840 mule fat were planted in December. An additional 3200 are scheduled to be planted in January 2005.

A summary table has been included for easy reference.

Mitigation Area	Initiator	Acreage required	Mitigation Measures	Status/Work-in-progress	Acreage Credit
Raahauge Pond 5	Original Pond Construction (Raahauge)	16	Arundo Removal and Natural Re-vegetation	Done	16
Lower Roland's Pond	Original Pond Construction (Raahauge)	7	Planted willows.	All willows did not take. Only 20% of the area has taken. Will need to remove cocklebur and do more plantings.	1.4
PR-1 (The Hole)	Original Pond Construction (Raahauge)	14	Aerial Spraying and Arundo Removal. Planted 6,000 mule fat, 2,000 willows, and 2,000 cottonwoods. Exotic removal.	Approximately 15% of the plantings have taken. Much of the area is overgrown with pepperweed.	2.1
PR-2	Original Pond Construction (Raahauge) and SAR outlet construction	36+10	Over 100 acres of Arundo have been removed. 40,000 mule fat, 13,000 willows, and 12,000 cottonwoods planted. Exotic removal.	15% of plantings have taken. However, vireos now occupy this planting area. Arundo removal and planting will continue in this area.	15
Habitat Islands	Original Pond Construction (Raahauge)	4	Islands were created in ponds. Natural re-vegetation was allowed.	Done	4
Habitat Strip	Original Pond Construction (Raahauge)	8	1,200 mule fat were planted and natural re-vegetation allowed.	Done	8
Remove 30 acres of Arundo	Original Pond Construction (Raahauge)	30	Arundo was removed from designated area.	Done with required area. Additional Arundo removal continues annually.	30+
Cocklebur field and Road	Creation of road and mowing of field.	7	Willows were planted.	About 30% of the willows established.	2.5
WaterCon		Subtotal: 132		**Total of 129 mitigation acres**	**79**
124 Acre Watercon Area	Watercon	124	The Nature Conservancy was contracted to plant the area.	Done.	**124**
WaterCon2					
Diversion Burn Area	WaterCon2	37.5	Removing and Spraying arundo re-growth	Approx. 50% native vegetation	10
Additional Areas		Subtotal: 293.5		Completed:	223
Rozanski Area	None	4	5000 Mule fat planted. 2100 re-planted.	40-50% Survival	2
Highway 71	None	24	Remove Euc and re-plant. Only 13 acres have been replanted. Another 4 acres will be planted in Jan 05.	6 acres are Caltrans	7
Earth Day	None	1	Remove pepperweed/arundo	Replant mule fat	1
				Total Acreage	**10**

Future Mitigation and Habitat Restoration Plans

Planting will continue in the Mitigation Areas that do not meet recovery criteria. Mule fat will be the primary plant, however, sites will be analyzed to determine if other vegetation types are more appropriate. For instance, in areas that are wet for much of the year, black willows and cottonwoods will be planted. In some of the drier areas, coyote bush may be planted.

Exotic plant removal will continue and be the primary focus in most of the mitigation areas, especially in Mitigation Areas 1 and 6. Arundo is the main species of concern, however, the species discussed below will be removed as well. Arundo will be cut down and mulched. This mulch will be spread around in the mitigations area to provide an organic base and to help maintain soil moisture. New equipment has been purchased to aid in the biomass removal. Subsequent spraying will be conducted to ensure exotics do no return to the area.

Another project that has been underway at Prado has been the Tree Swallow/Bluebird Project. Over 150 bluebird boxes have been placed throughout the pond system to provide nesting locations for tree swallows and western bluebirds. This program has been very successful with more than 60% utilization of the boxes. Similar programs will continue this year, including projects for barn swallows, cliff swallows, and barn owls. Although this type of program is not actual habitat restoration, it does provide additional breeding locations for species that provide natural pest control in the basin.

The Diversion-Burn area will be closely monitored this year. Winter bird surveys will be conducted to document anticipated increases in bird populations. Arundo and castor bean removal will continue in the area. The area does not appear to require additional planting. Many of the cottonwoods and willows have rapidly grown since the burn and will offer suitable habitat this coming spring.

The 71 Project continues. The first 12 acres of the site was planted in 2003 and is showing vigorous growth. The original plants are doing well with a nearly 95% success rate. There is no longer a need for irrigation on these acres. Another 10 acres of Eucalyptus trees have been removed this year. Five acres are scheduled to be planted in January 2005.

As a side note, January storms, during the preparation of this report, flooded many of the mitigation areas. The waters have receded, but there is a large amount of silt and sediment that has been deposited in many of the planting areas. Nearly 3000 small mule fat have been covered. Attempts will made to dig them out, but this may have negative impacts on the mitigation sites.

The Exotics

The section has been included in the report to discuss the exotic species of concern within the basin. This section is retained to serve as an educational resource for staff. Each year, new exotic species of concern are added to this section.

Ailanthus altissima

Tree-of-heaven (Ailanthus altissima) is a deciduous tree with gray bark that can reach heights of thirty to sixty-five feet. It has large, compound leaves with 10-40 lanceolate leaflets. Leaflets are green with several circular glands on the underside. They have 2-4 rounded teeth at the base. Flowers are small and green and form in large clusters at the tips of the branches. Female flowers are ill-smelling. Female flowers develop into yellow or reddish-brown colored fruits, about 1-2 inches in length and propeller-shaped. If the foliage of the tree is crushed, an unpleasant odor can be detected.

Tree-of-heaven is a native to eastern China, and was introduced for it's exotic look and it's ability to tolerate urban areas. Tree-of-life spreads by seeds and root sprouts. Tree-of-heaven is tolerant of shade, so this gives it an advantage over many plants. Rapid growth and abundant root sprouts allow for the formation of dense thickets. In California, its most significant displacement is in riparian zones (Bossard et al., 2000).

This plant can be found in areas surrounding most of the creeks entering the Prado Basin. It is found near Chino, Mill, and Temescal Creeks. This plant has been targeted for removal. Removal methodology includes the cutting of the original biomass and treatment with herbicides afterwards. Spring-time is the most effective time to apply herbicides for this species. Adult bark is resistant to herbicides and girdling may be required for larger trees.

Figure 21 – Tree-of-heaven
Photo courtesy of DNR, Ohio

Figure 22 - Tree of heaven leaf photo courtesy
Photo courtesy of UC Davis

Araujia sericifera

Araujia sericifera, a.k.a. white bladder flower and moth plant, is a noxious weed that has recently been discovered in the Prado Basin (Figures 23 and 24). The plant is an

escaped ornamental from the milkweed family. The plant flowers in the summer and has sticky pollen that traps insects. This species is a fast growing (as much as 6-9 meters in one season) perennial vine. It has opposite leaves and a milky sap that can be irritating to the skin. The white flower is funnel shaped and is 2-3 cm in size. It produces large amounts of seeds that are dispersed by the wind.

This plant is a recent invader to the Prado Basin, but is already seen in numerous sites. When seen, it is in large stands climbing up the side of native vegetation. This year, a southwestern willow flycatcher built a nest in one of the vines. The nest was unsuccessful. The plant is targeted for eradication in the basin, and we will begin removing it this year.

Figure 23 – White bladder flower
Photo courtesy of the CDFA

Figure 24 – Seed Pods
Photo courtesy of the CDFA

Arundo donax

Arundo donax was introduced in to the United States from the Mediterranean Basin as early as 1820. However, it was introduced to Europe prior to this from the Indian sub-continent. It was originally used for roofing material and fodder. Later it was used for erosion control, which led to its ultimate escape to the wild. This highly invasive perennial grass is also known as Giant Reed and is most often referred to as simply Arundo. Arundo grows in many-stemmed clumps and reaches heights of nine to thirty feet (See Figure 25). At first glance, Arundo resembles ornamental and introduced bamboo. It spreads from horizontal rootstocks below the soil and forms large colonies. Additionally, Arundo spreads vegetatively. Large pieces of Arundo can wash down stream and take root on banks. It grows rapidly, up to 3-4 inches a day during the growing season. It uses large amounts of water and loses much of it to evapotransiration. Arundo invades areas and quickly colonizes. It out-competes many of the native understory shrubs, often dominating the area. It offers little to the native wildlife. Insect populations are significantly lower than native vegetation. It does not produce edible seeds and when mature, the stems are hard and callous so it does not provide a food source even to grazers. With its rapid growth, it often shades out smaller, native vegetation, and can even be seen enveloping large cottonwoods and willows. When dry, Arundo is a severe fire hazard. The thin leaves and hollow, wood-like stems offer ideal fuel for fires. Arundo fires burn at a higher temperature than native vegetation fires, so native vegetation often does not survive fires. Coupled with Arundo's rapid growing, burned areas are often completely taken over by Arundo. The best methods of removal

require the cutting of Arundo, removing the biomass, and application of herbicide on the new growth. Arundo can be chipped if the pieces are so small that they will not take root. Spraying and cutting are both being utilized in the Prado Basin.

Figure 25 - Arundo

Lepidium latifolium

Perennial pepperweed (*Lepidium latifolium*) is a multi-stemmed herb than can grow from 3 to 8 feet tall (See Figure 26). Pepperweed has clusters of tiny white flowers. The stems and leaves are gray-green and waxy. They are broad and oval shaped. Pepperweed flowers between May and July; however, the flowers can still be seen even in September. When pepperweed dies, it leaves a thick patch of brown woody stems. It can reproduce by seed or vegetatively from intact rootstocks. It is also a very invasive plant, taking over much of the open ground in the Prado Basin. It can be found around the ponds and deep into riparian habitat. The chemical Telar® has been shown to work best of all the commercially available pesticides. Mechanical means of removal have shown to have little effect. After mowing and discing a field of pepperweed, re-growth was seen within two weeks.

Figure 26 - Perennial pepperweed – flowering

Ricinus communis

Castor bean (See Figure 27) is a non-native shrub with large, palmately lobed leaves with serrate edges. The leaves are typically dark green but can be reddish in some strains (Figure 28). Castor bean is a perennial shrub, three to 5 meters tall. It has distinctive fruits. They are quarter-sized, round, and spiny (Bossard et. al., 2000). Castor bean is native to parts of Asia and Africa but is frequently found in riparian areas along the southern coast in California. It is invasive and displaces native riparian vegetation. It grows quickly; nearly 3 meters in a single growing season. It spreads by seed, mainly by water. Castor bean seeds are extremely toxic to humans and animals.

Castor bean is found throughout the Prado Basin and has dominated some areas. The northern side of Mitigation Area 8 is infested with it. The Diversion-burn area is spotted with it. An interesting fact is that no vireos or flycatchers have ever nested in castor bean. Because of its invasive qualities and its lack of habitat value, castor bean is targeted for removal in the basin. Castor bean will be sprayed with an herbicide and removed where possible.

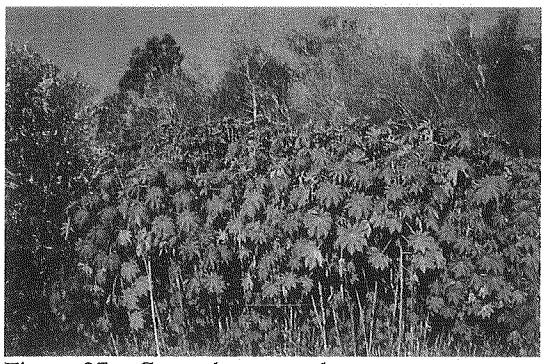

Figure 27 – Castor bean stand

Figure 28 – Castor bean leaves

Tamarix ramosissima

Tamarix ramosissima (also known as tamarisk and saltcedar) was introduced to the United States from central Asia for erosion control and windbreaks. It is a large shrub with scale-like branches. It has salt glands on the leaves, and often, salt crystals are seen. These crystals fall to the ground and often form a halo around the plant. Its leaves resemble that of cedar. Saltcedar has white to deep pink flowers and the bark is reddish-brown (See Figure 29). It is a notorious water user and extremely invasive. It regenerates quickly after burns by sending up shoots from it's root mass. It grows quickly and out-competes the new shoots of native plants for sunlight. Saltcedar roots can go as deep as 30 feet. Drops in the local water table and the drying of wells have been associated with the invasion of saltcedar. Native riparian plants that depend on groundwater (phreatophytes) cannot compete with saltcedar's extensive root system and often fall victim to the lack of water. The salt exuded from saltcedar also inhibits the growth of new seedlings of other plants that are not nearly as salt tolerant. Recently, there has been some debate over the usefulness of saltcedar. There are documented cases

along the Colorado River where the endangered southwestern willow flycatcher has actually chosen saltcedar over native vegetation. However, most agree that because of the invasive qualities of saltcedar, small amounts often lead too much larger, uncontrollable amounts. Thus, there are numerous saltcedar eradication projects underway. OCWD is conducting a systematic removal of saltcedar that involves cutting and follow-up herbicide application.

Figure 29 - Saltcedar in foreground with pink flowers

Vitis girdiana

A.k.a. desert wild grape or southern California wild grape, *Vitis girdiana*, is not an exotic plant. It is native to many of the drainages in southern California. Wild grape is a prolific vine often seen climbing other plants. The leaves are broad and velvety-green. The fruit occurs in bunches, arising from yellow flowers. This species is typically not problematic. In many cases, the species is beneficial. Least Bell's vireo nest in the plant, and it is an important component of the understory. However, in some areas, wild grape has completely covered an entire area (See Figure 12 above). The concern is that the grape completely blankets the existing vegetation, inhibiting photosynthesis and adding unnecessary weight to the branches. In areas completely dominated by wild grape, small patches will be removed to assess the impacts. The goal is not to harm this species, but to protect the willows and mule fat that it grows on.

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