REVEGETATION IN THE SEPULVEDA WILDLIFE RESERVE: A SEVEN YEAR SUMMARY.

Emilia A. Parra-Szijj[1]

ABSTRACT: The Sepulveda Wildlife Reserve (SWR) is an area within the Los Angeles River basin, managed by the Corps of Engineers. Prior to its development in 1979, the 19.5ha site was leased for agricultural uses. Extensive revegetation has been done to restore the area and provide habitat for the many bird species utilizing the Refuge, including the rare Blue Grosbeak. Techniques are discussed for the establishment of the riparian woodlands, coastal sage scrub and *Stipa* grassland. Data are presented on survival of plant species and conditions favoring their continued existence. Irrigation techniques are discussed and analyzed in terms of their effectiveness and cost.

INTRODUCTION

The Sepulveda Wildlife Reserve (SWR) is located in the city of Van Nuys, Los Angeles County, California. The 19.5ha Reserve is located within the 647.5ha Sepulveda Flood Control Basin (SFCB), at an elevation of 213m. All property within the SFCB is owned by the Los Angeles District Corps of Engineers (COE), but approximately 80 percent of the land is leased out for recreational and agricultural uses. The SWR is located in the southeast corner of the basin, directly behind the Sepulveda Dam. The dam, completed in 1941, is a dry-land reservoir, with the purpose of controlling runoff from nearby San Gabriel, Santa Monica and Santa Susana Mountains (U.S. Army COE L.A. District 1981). The Reserve is bordered by Burbank Boulevard on the north, the Los Angeles River on the west and the Sepulveda Dam on the east and south. Refer to Figure 1 for the location of the Reserve. The area was set aside in 1979 with the implementation of the Sepulveda Basin Master Plan. Public Law 86-717, which authorizes the Corps of Engineers to develop and maintain reservoir lands for wildlife conservation, allowed for the establishment and development of the Reserve.

The SFCB is a completely managed system, retaining little of its historic biota. The Los Angeles River and several small channels within the basin still support marginal riparian habitat. Because of its isolated position within a highly urbanized surrounding community, the basin offers a significant area for habitat development. Prior to the establishment of the Reserve, the area had been used for agriculture, primarily vegetables. The oldest available aerial photos (taken in the 1930's) of the area show that agriculture was already established by that time.[2]

Therefore, it is difficult to determine what types of natural communities existed in the area before disturbance. If the present flood control basin was originally located in close proximity to the Los

---

[1]Ecologist, U.S. Army Corps of Engineers, Los Angeles District, P.O. Box 2711, Los Angeles, California. 90053-2325

[2]Aerial photos are stored at Whittier College, Whittier, CA.

Angeles River, there would have been the potential for periodic flooding which may have provided seasonal wetland habitat for migratory waterfowl and shorebirds. Wintering Canada geese (*Branta canadensis*) still visit the area regularly and use it as a stop over on their annual migration. The Los Angeles River has been channelized since the 1940's and does not flood with the regularity and intensity of pre-channelization days. The area receives annual rainfall of 48 cm, most of it occurring in April through October (Walter 1979). Summer daytime temperatures range from 27 to 39°C. Soils in the basin are generally composed of a high proportion of fine grained, silty clay materials derived from deposition from flooding (U.S.A.C.E. 1981).

Vegetation that may have been present before development was probably flood plain vegetation, consisting of trees and shrubs that tolerate periodic inundation, yet have deep enough root systems to survive through the hot summer. Ground water in the Reserve is estimated to be 7.5m below the surface. This does fluctuate depending on rainfall and location within the Reserve (U.S.A.C.E. 1980). The wettest areas would have supported fresh water marsh, with dominant species of cat-tail (*Typha* L.), bulrush (*Scirpus* L.) and spike-rush (*Eleocharis* R. Br.) (Munz 1974). Areas along the river and side channels probably had riparian woodland, with dominant tree species of boxelder (*Acer negundo* L. ssp. *californicum*), California sycamore (*Platanus racemosa* Nutt.), Fremont cottonwood (*Populus fremontii* Wats.), Coast Live Oak (*Quercus agrifolia* Nee) and Valley Oak (*Quercus lobata* Nee.). Associated understory would have consisted of *Baccharis* L., several species of willow (*Salix* L.) and California grape (*Vitis* L.) (Thorne 1976).

The original development plan for the Reserve consisted of four management areas: a grassland habitat, mainly composed of the perennial bunchgrass purple needlegrass (*Stipa pulchra* Hitchc.); riparian woodland associated with streamsides and the floodplain; coastal sage scrub (CSS); and aquatic habitat. Some areas were left open (not planted with trees and shrubs) and designated as raptor foraging areas. All of the habitat types occur locally in remaining undisturbed areas, but are rapidly disappearing due to increased development pressures. By converting 19.5 ha of disturbed land into four native habitat types, we hope to increase the wildlife value of the area, particularly for birds. This paper will describe the revegetation efforts associated with the four habitats discussed above and will summarize the results. Each habitat revegetation effort will be described and discussed separately. All of the revegetation work was designed, implemented and maintained by the Wildlife Management Unit (WMU), within the Natural Resource Management Section of the Los Angeles District COE.

REVEGETATION: 1981-1984.

The revegetation effort was divided into two sets of plantings. The first group was planted from 1981 through 1984; the second group from 1985 through 1988. The first group includes aquatic habitat (0.30 ha), CSS (2.3 ha), riparian woodland (6.8 ha) and 3.4 ha of raptor foraging space. Refer to Figure 2 for a habitat map of the Reserve. Table 1 summarizes the work completed in this time period. For all the areas, a total of 5,569 plants were used with an overall survival of 36 percent. The project with the highest success (67 percent survival) rate was the tree planting along Haskell Channel; the projects with the lowest success rate (17 percent survival) were the plantings around Open Area A and around the pond. Table 1 summarizes these projects. Almost all of the plantings were completed with volunteer assistance by the California Conservation Corps (CCC), Oat

Mountain Center, Chatsworth, CA. One project, the riparian planting around the pond, was completed with volunteer help from a local grade school.

Due to the low survival rates of the projects completed during this time period, the staff of the WMU decided to analyze the work completed and change the methodology of the revegetation work. Complete records were not kept from 1980-1984, so it was difficult to determine quantitative aspects of failure for certain projects. Personnel involved with the projects were no longer with the program, but a qualitative examination revealed problems that were common to all of the projects. First, the plants were not receiving proper after-planting maintenance. This included lack of consistent watering methods and weed control. Of the 7 projects completed, only 2 had irrigation systems installed prior to or directly after planting. The remaining projects relied on alternate watering methods. The majority of that watering was accomplished with an 1890 liter portable water tank with a long history of mechanical breakdowns! When the tank was not available, the plants received no water. High mortality occurred during the hot summer months and this fact accounted for the majority of plant deaths. Another factor was the density of plants and size (in total ha.) of the projects. The WMU (staffed by 3-4 persons) maintained all the plantings. Projects that were large in size (over 2 ha.) were very difficult to maintain properly. Also, if the densities were too high, the care involved increased. These conditions became quite evident during the maintenance of the riparian woodland planting of 1984. With over 1500 trees and shrubs to water, it was too large an area to handle with the small staff available. Plants were placed randomly in the 5.6 ha. area and it was often impossible to find each individual. Even with the help of the CCC, proper care could not be given to the plants. Density of plantings was based on subjective observations of nearby natural communities. Some quantitative data (cover values) were used, but they were incomplete.

Several projects were chosen from the earlier revegetation efforts for replanting. They were picked because of their low survival rates as well as their importance to the development of the Reserve. Plantings in both of the open areas were repeated because they are managed for raptor foraging. Revegetation consisted of planting trees around the open space to provide roosting and observation sites for the birds. Drip irrigation was installed for the second planting and survival rates were increased to 92 percent. Even though the area around the pond had a very low survival rate (17 percent), we chose not to repeat the effort because the area had revegetated itself with a dense thicket of mulefat (*Baccharis glutinosa* Pers.), arroyo willow (*Salix lasiolepis* Benth.) and mugwort (*Artemisia douglasiana* Bess.) along with the tree species that had survived the plantings. The flat area of the CSS was replanted but the slope was not because it had a dense covering of Calif. sagebrush (*Artemisia californica* Less.) and Calif. buckwheat (*Eriogonum fasciculatum* Benth.) from the 1981 revegetation effort. Finally, the riparian woodland had to be done over because of its relative importance in terms of the total ha. devoted to this habitat.

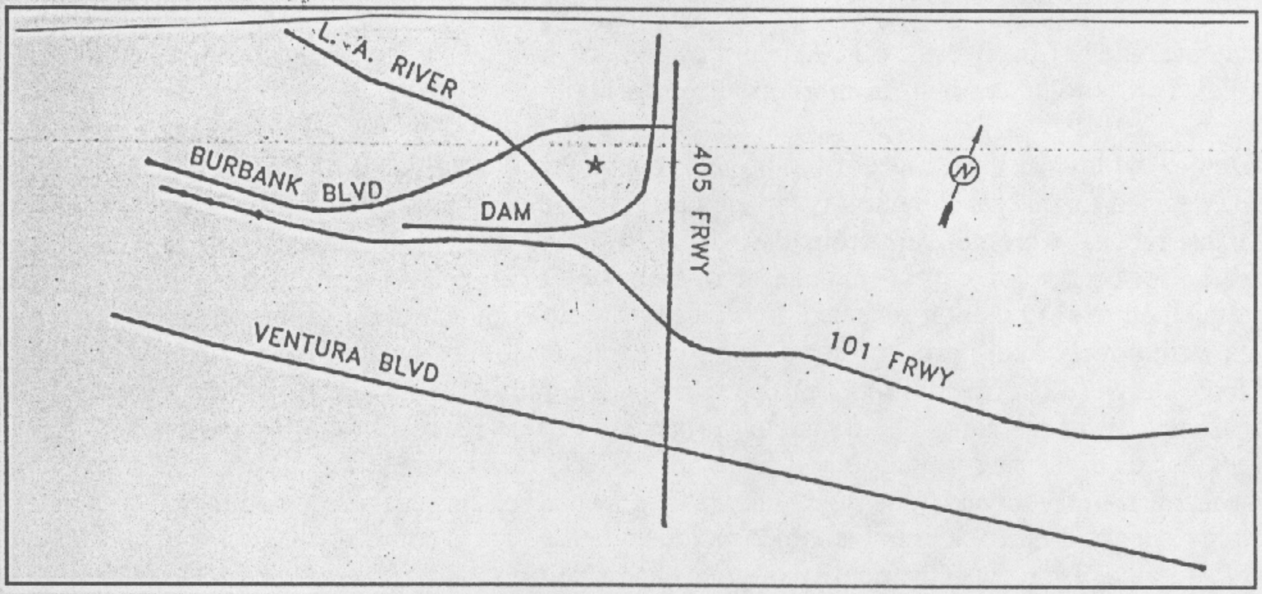

Figure 1. Sepulveda Wildlife Reserve (SWR) Location *.

upside down

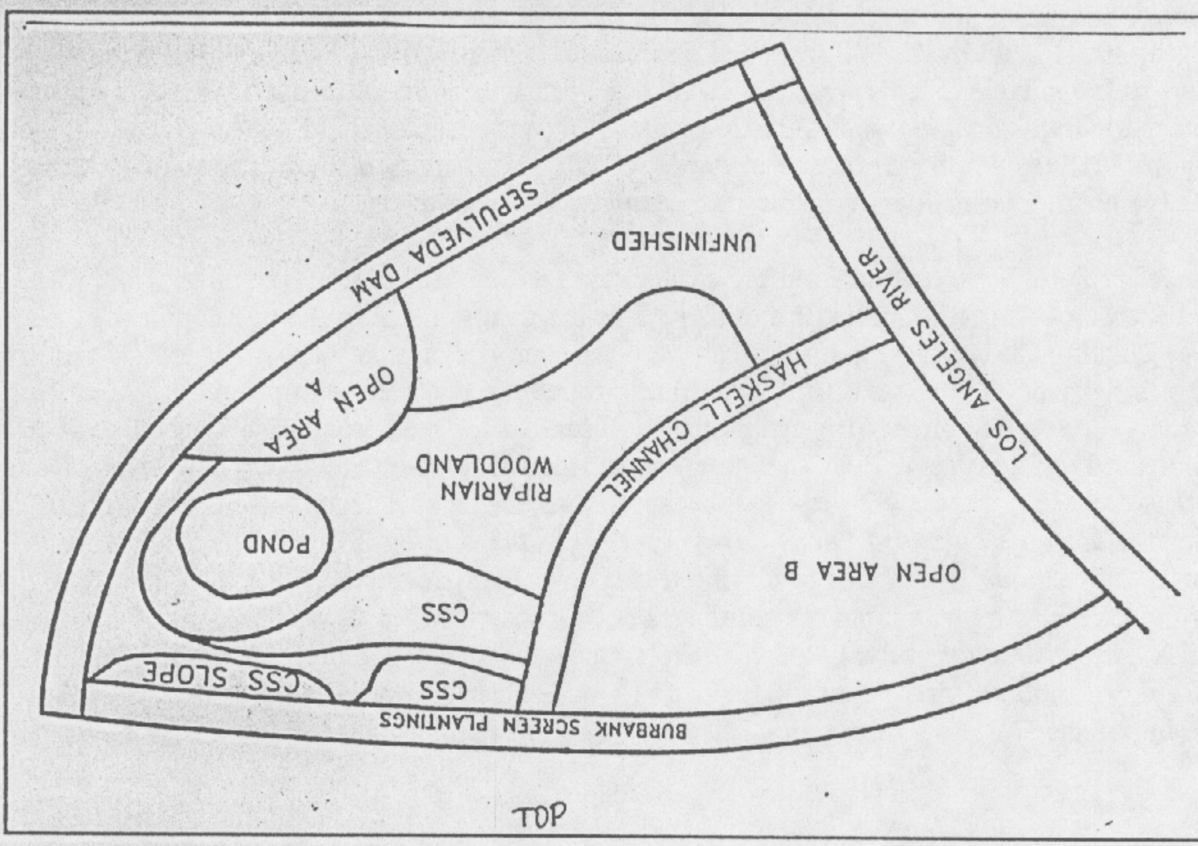

Figure 2. SWR Habitats

out of 11N

Table 1. Revegetation completed from 1981-1984.

Project	Number	Date	Pct. Survival	Type of Irrigation
Haskell Channel	81	1983	67(1985)	Hand water;water tank
* Open Area A	18	1983	17(1985)	Hand water:water tank
* Open Area B	78	1984	25(1985)	Hand water:water tank
Burbank Blvd.	435	1984	73(1985)	Drip irrigation
Pond Planting (Riparian)	887	1982	17(1985)	Overhead irrigation
* CSS[1]	2516	1984	28(1985)	Hand water;water tank
* Riparian Woodland	1554	1984	27(1984)	Hand water;water tank

[1]Numbers for the CSS slope planting were not available. The numbers listed are only for the berms and flat areas.

*These plantings were done over again in 1985-1988 due to their low survival rates. Overall: 5569 plants with 36 percent survival.

REVEGETATION: 1985-1988

Riparian woodland

After careful consideration of the many factors that may have contributed to the poor success of the projects, a decision was made to design a riparian woodland planting that would yield data to help us with future revegetation efforts. Three 0.40 ha. test plots were laid out in the previously planted area of the 1984 woodland planting. All plots were planted with the same number of individuals. Densities were determined using the equation:

$$\text{Density/Acre} = \frac{43560}{\text{Cover/Ind.}} \times \frac{\text{Pct.Cover/Category}}{\text{N/Category}} \times \text{Mortality Factor} \times \text{Cover Total}$$

Refer to Harlacher (1987) for a complete discussion of this density equation. A total of 31 trees and 13 dormant pole cuttings were planted in each plot. All trees were planted in March 1986. The dormant cuttings were arroyo willow and were planted following the technique described by Swenson and Mullins (1985). None of the plots received any site preparation. The plots were covered with low growing annual grasses and forbs. Below is a list of the tree species and their respective densities which were used for each plot:

Species	Number	Container Size	
Acer negundo	1	11	gallon
Alnus rhombifolia	6	15	gallon
Fraxinus velutina	7	10	gallon
Platanus racemosa	1	15	gallon
Populus fremontii	10	7	gallon
Populus trichocarpa	1	15	gallon
Quercus agrifolia	2	15	gallon
Quercus engelmannii	1	15	gallon
Quercus lobata	1	15	gallon
Salix lasiolepis	13		cuttings
Umbellularia californica	1	5	gallon

Plot A was watered with an overhead irrigation system. Plot B was watered by hand, with hoses. Hoses were hooked up to quick coupler valves located in plot A. Plot C was not irrigated, except during the planting. The pole cuttings were taken from nearby Haskell Channel and planted in augered holes (1.2 m depth) the same day. All of this work was completed by the CCC under the supervision of the WMU. None of the trees were fertilized in the field. All trees were marked with aluminum tags and survival data were taken during the following years (from 1985-1989).

Plot A was watered overnight once every two weeks for a period of 18 hours . Water penetrated to a depth of 1 m. Plot B was watered every week from April-September. Basins around the trees in Plot B were approximately 1.5m in diameter with a depth of 23 cm. Each basin holds approximately 230 l and takes 3.5 minutes to fill with a hose (flow rate of 68 l. per minute). Records were kept of the time the WMU staff spent on maintenance in each plot.

As expected, all trees in the non-irrigated plot (C) died within a few months after planting, but survival of all species in the irrigated plots was high. After the first year, a decision was made to discontinue overhead watering and water all plants by hand, using hoses. This was because plots A and B had very similar survival rates, but plot A had an intense growth of non-target species. The growth of weeds was so overwhelming that it reached the height of the rainbird sprinkler heads, which were 1.5 m. above the ground. The weeds were approaching the height of the trees which averaged 1.8m. Given the information in the literature that ruderal species are already at an advantage in terms of nutrient uptake in disturbed areas (St. John 1987; Radosevich and Holt 1984) providing additional water just seemed to stimulate weed growth unnecessarily. In order to discourage weed growth, the overhead irrigation system was dismantled after the first year. Growth measurements were not taken on a regular basis due to lack of staff. The only visible difference detected between the two plots was that trees in plot A were taller than trees in plot B. Measurements taken at the end of the first growing season showed that trees in plot A had averaged 0.60m. while trees in plot B averaged 0.45m. Cottonwood trees had the fastest increases in height; the oaks had the slowest growth. It was decided that slower growth was acceptable if weeding could be reduced. The trees in plot B rarely needed weeding and growth around the basins and between the trees was limited to annual grasses and weeds, such as star thistle (*Centaurea melitensis* L.). Weeds in plot A consisted of curly dock (*Rumex crispus* L.), castor bean (*Ricinus communis* L.), arundo grass

(*Arundo donax* L.) and cocklebur (*Xanthium spinosum* L.). These weeds formed a dense "forest" that was almost impossible to walk through. It took 3 people 10 days to weed this plot. Gas powered weedeaters with blades were used to cut the weeds down. This plot was weeded twice during the first maintenance season (April-September). The weed problem was not quite as bad during the second year of maintenance; the same weed species that were present the first year were present the second year, but in somewhat lower proportions. Those weed species were rarely present in plot B. The cost breakdown and comparisons of the costs between plots A and B are summarized in Table 2.

Table 2. Comparative Costs of Overhead vs Hand watering in the Riparian Test Plot (Trees only).

	Overhead Irrigation	Hand watering
Irrigation	$4,416.00	$1,765.00
Labor to Water	$ 600.00[1]	$1,200.00[2]
Weed Control		
Equipment	$ 700.00	$ 700.00
Labor	$3,000.00[3]	$ 600.00[4]
Total	$8,716.00	$4,265.00

[3] 3 people, 20 hrs, twice in 6 mo.
[4] 2 people, 12 hrs, once in 6 mo.

footnote #s 1 and 2 are missing
1 2 people, 2 hrs/mo, for 6 mo.
2 2 people, 4 hrs/mo, for 6 mo.

Herbicides are rarely used to control weeds in the Reserve, due to mixed results. Using herbicides on a particular target species (i.e. arundo grass) worked very well. The preference is to avoid clearing large areas with herbicides, because once herbicide treatment is discontinued, the weeds seem to grow back even more densely than the original population. Also, the weed species that colonize areas after herbicide treatment are generally species that have resistance to herbicides (Radosevich and Holt 1984). It was also observed that the species of weeds that which return in treated areas are always the same: tree tobacco (*Nicotiana glauca* Grah.), castor bean and cocklebur. Additionally, in the Los Angeles area some of the plants of the "weedy" understory are species which have some wildlife value. Mugwort and mulefat are two species that fall into this category.

The understory in the test plots was planted the following year (1987) except for plot C, which was replanted with trees to replace those which died. The plots were set up for hand watering. Tree species were the same except for the absence of alder trees, which were unavailable at planting time. The willow cuttings did not do well in any of the plots. Plots A and B had no survivors, plot C had 5. Apparently, dormant pole cuttings only work well when it is possible to auger directly into the water table, otherwise it is difficult to keep the cuttings wet enough to promote rooting. Species used in the understory are listed below:

Species	Number	Container Size
Baccharis emoryi	32	2 gallon
Prunus illicifolia	22	2 gallon
Rhamnus californica	30	2,4 gallon
Ribes aureum	45	1,2 gallon
Rosa californica	14	1 gallon
Rubus ursinus	22	2 gallon
Sambucus mexicanus	59	1 gallon
Vitis girdiana	27	2 gallon

All understory species in the plots were placed randomly, with the exception of California grape. Since these plants need shade to get established, they were planted in the tree basins. Poultry wire cages were used around California grape (*Vitis girdiana* Munson), California blackberry (*Rubus ursinus* C.& S.) and California rose (*Rosa californica* C.& S.) to prevent herbivore damage, mainly from cottontail rabbits (*Sylvilagus audubonii* Baird) which are abundant in the Reserve. Shrub basins of approximately 1m in diameter were established with a depth of 18 cm; each held 38 l. of water. Watering was done every two weeks during the growing season. All plants were tagged prior to planting, and survival data were taken during the following years (1987-1989).

Trees in plots A and B have completed three growing seasons. Plot C has just completed its second growing season. Plots were maintained for two years and the plants are monitored during the third year and watered as necessary. The trees in plot A and B were not watered during 1988 and only 1 tree in plot B died. The trees appeared stressed (water stress is likely), and the cottonwoods, alders and box elders turned deciduous about 1 month earlier than trees in plot C, which received irrigation. Understory plants in plots A and B had higher mortality rates than the trees, but the reasons for this are not known. Increased mortalities during 1988 could be related to the drought conditions present in that year. Some individuals (particularly elderberry) that were marked as dead individuals after the 1988 survey were resprouting from the base in January 1989, after some rainfall.

Coastal Sage Scrub

There were 2.3 ha of CSS community divided into 2 groups: CSS on the slope and berms and CSS in the flat area directly beneath the slope and the berm. These sites were chosen for this community type because they are located the furthest away from the river and therefore are less likely to be flooded and subjected to standing water. CSS is extremely intolerant of standing water and plants that are inundated quickly exhibit signs of anoxia. The traits we have seen most often are wilting and leaf abscission, but there are a host of other responses (Hook 1984). If the plants do survive the initial inundation, we have seen increased mortality about 1 month after the event. Almost certainly, the deaths can be associated with diseases that invade the damaged tissue in the roots. Species of soil borne fungi that are responsible for disease, such as *Rhizoctonia, Pythium* and *Phytophthora*, germinate during wet periods and may contribute to plant mortality (Stolzy and Sojka 1984). The berms and the majority of the slope were completed in 1980-1982. The survival for the slope is not known because there are incomplete records of the number of individuals that were used on the project. Line transects run on the slope in 1985 showed that the slope is primarily vegetated with California sagebrush and California buckwheat, covering approximately 60 percent of the slope.

Both the berms and flat area had an overall survival rate of 28 percent. These areas were replanted using some the same techniques used in the riparian woodland plots. The main difference was the time schedule for the watering. CSS usually grows right after winter rainfall and becomes summer dormant. We did not want to encourage the plants to grow (at least in terms of above ground biomass) unseasonably. Plants were watered every two weeks during January-May and once a month during the summer months. Watering was discontinued in August. Evidence from previous plantings had shown that watering CSS plants throughout the summer had led to high mortality rates during fall (September). The flat areas and berms were replanted in January of 1987 and 1988. Overall survival as of October 1988 was 60 percent. The species used in the CSS are a mixture of plants found in CSS alluvial scrub and chaparral communities of southern California. The other site for CSS planting was the eastern portion of the slope. This area was not completed with the original planting because it was the site of a direct seeding experiment. One month after the seeding was completed (1980) the Los Angeles River flooded and filled the reservoir to capacity with 9m of water. As the water receded, so did the project! The area was replanted in 1988 with 388 plants. Due to the steepness of the slope, hand watering was not considered; it would probably have increased erosion and would not have adequately watered the plants. An overhead system was installed and the slope was watered monthly for a 4 hour period. These plants are growing faster and with a much higher survival rate than plants in the flat area. It appears as if a second season of maintenance will not be required.

The survival rate in December 1988 was 84 percent. Most of that loss was represented by plants at the base of the slope that were run over by heavy equipment when a contractor was removing some soil from the Reserve. Even though there is no direct evidence, it is apparent that the flat area is not suitable for CSS. The drainage may not be appropriate, as soils in the reserve range from silty loams to heavy clays and the flat area may have a higher concentration of clay that contributes to slower drainage. Species and numbers used in all the CSS plantings are given in the following list:

Species	Number	Container Size
Artemisia californica	71	1 gallon
Baccharis emoryi	50	1 gallon
Ceanothus cuneatus	111	1,2 gallon
Eriogonum fasciculatum	342	1 gallon
Heteromeles arbutifolia	34	1,4 gallon
Rhamnus californica	30	2,4 gallon
Rhamnus crocea	14	2 gallon
Rhus integrifolia	45	2 gallon
Salvia apiana	105	1 gallon
Salvia leucophylla	124	2 gallon
Salvia mellifera	61	1 gallon
Senecio douglasii	88	1 gallon
Yucca whipplei	115	2 gallon

All of the species lists include the sizes of the plant containers. No quantitative study was done on the survival of species based on their size at transplanting, but it appeared that 1 gallon stock for shrubs usually produced the best results. Shrubs in larger sizes (especially 4 gallon) did very poorly after field transplanting. Plant success varied with the particular species. For instance, golden currant (*Ribes aureum* Pursh.) did well in any size container. Tree species did equally well in 5 and 15 gallon containers. The exception was with California sycamore, which never survived as a 15 gallon transplant. Sycamores did slightly better in 5 gallon containers, and future plantings will include 1 and 2 gallon stock. The U.S.A.C.E. L.A. District grows all of its own stock for revegetation work and maintains high quality. Table 3 summarizes results of riparian plots, CSS and open areas and the following list shows species that have grown well and those with poor performance in the Reserve.

Species with >75 pct. survival

Acer negundo
Artemisia californica
Baccharis emoryi
Eriogonum fasciculatum
Populus fremontii
Populus trichocarpa
Ribes aureum
Rhus laurina
Rhus ovata
Rosa californica
Rubus ursinus
Sambucus mexicanus
Yucca whipplei

Species with <40 pct. survival

Alnus rhombifolia
Heteromeles arbutifolia
Platanus racemosa
Rhamnus californica
Salvia mellifera
Umbellularia californica

Table 3. Revegetation completed from 1985-1988.

Project	Number	Date Compl.	Pct. Survival	Type of Irrigation
Open Area A	20	1985	95(1987)	Drip irrigation
Open Area B	73	1985	88(1988)	Drip irrigation
RiparianplotA[1] (Trees only)	44	1986	93(1988)	Overhead irrigation
Riparian plot B[2]	44	1986	93(1988)	Hand water
Riparian plot C[3]	31	1987	100(1988)	Hand water

Riparian plot A (Understory only)	283	1987	78(1988)	Hand water
Riparian plot B	220	1987	62(1988)	Hand water
Riparian plot C	270	1988	96(1988)	Hand water
CSS	1189	1988	73(1988)	Hand water

Overall: 2174 plants with 87 percent survival.

[1]The 13 willow pole cuttings are not included:there was 0 survival in this plot.
[2]In this plot there was 38 percent survival on the willow cuttings.
[3]Does not include the dead trees from 1986 non-irrigated trial.

Stipa grassland

This is the title for the next section.

This is an update of the work started in 1985. A complete description of the project is found in Parra (1987). Since that time several significant events have occurred. The experiment was to have a 3 year duration. During data accumulation in the second year, the plot was vandalized. A section of fence was cut and removed and a horse was brought in to graze. The grazing caused extensive damage to the plot, and data collection discontinued. The two most successful techniques for grassland establishment were chosen,and the grassland was enlarged to cover all the area within Open Area A (0.80 ha). One-half was transplanted with 10 cm seedlings at a density of one per m^2, this totalled over 2500 plants. The other half was to be seeded. The entire area was irrigated with an overhead system. Annual weed cover was not removed because evidence from earlier work had shown that colonizing weed species were more difficult to control than existing ones.
Planting directly into the annual grass cover began in January 1988 and was completed in March. A small area (0.30m) was cleared before planting each clump. The other one-half did not receive seeding due to lack of time. The results from the transplanted side were discouraging. The plot had not been fenced off, and the plants were continually grazed by rabbits. Even though the existing natural cover was left intact, the rabbits located almost every new plant. All of the plants showed significant above-ground decrease in biomass. None of the plants were more than 2cm in height, compared with an average height of 15 cm at planting time. This grazing stress, combined with water stress from the drought, took its toll. Only 38 percent of the individuals were alive by September 1988.

The grass would probably grow here if it were protected from herbivore pressure, because it grew well when fenced off. The U.S.A.C.E. is currently testing chemical deterrents that are supposed to keep rabbits from eating sprayed plants. Three products have been tested and all have failed. Future plans involve rabbit population management. Although raptors that utilize the area take their share of rabbits (as evidenced by the large number of rabbit body parts under the raptor foraging pole), that is not enough to control the population. The grass planting project will not be continued until the rabbit population is decreased.

SUMMARY AND CONCLUSIONS

1. All plantings at SWR required some type of irrigation. In general, overhead irrigation allowed for quicker establishment, but that was offset by the growth of non-target species that competed for water, nutrients and sunlight. The ease of overhead watering was offset by the cost involved in weed management.

2. All plantings at SWR required at least two years of intense maintenance. In the case of the riparian woodland understory, a third year may be required.

3. Use of herbicides to control weeds was not always beneficial. Non- selective weeding did not allow for the establishment of species that may have been of value, and may have encouraged the growth of weed species that were not present before and that may have had higher herbicide resistance.

4. High density plantings can be avoided if more post-planting care is provided. Over-planting areas may cause competition among the intended species and be as damaging as weed competition.

5. The control of herbivores is an unavoidable management tool. Habitat is created to attract animals, but without natural predator control, which is missing in the SWR, herbivores can overgraze newly planted areas. Fencing is a temporary solution, but when the fence is removed herbivore grazing starts. And, permanent fencing is not allowed in the flood control basin (it traps debris during flood events).

Plans for the future include the planting of a 1.2 ha oak woodland and completing the Wildlife Reserve with some type of aquatic habitat. These projects are now in the planning and design stage. New products and equipment are being tested and purchased in order to enhance the revegetation work. Irrometers are now being used on project sites to monitor moisture content in the soil, and a soil tensiometer will be used for this purpose in the future. Weed mats will be used around trees and shrubs to reduce the weed crop. As technology improves, new ideas will be incorporated into project designs. Monitoring will continue at the Reserve to evaluate the successes and failures of our revegetation efforts and to provide useful data for other revegetation projects.

ACKNOWLEDGMENTS

The author wishes to thank all those individuals who have worked on this project: Karen A. Jensen, Mary Matteson-Hughes, Steve Johnson, Ron Tiller, Zach Traywick and Rick Harlacher. Their hard work and dedication has made this project a reality. Also, thanks to Anne Sands, T. J. Stetz and Dr. Laszlo Szijj for their critical review of this paper.

REFERENCES

Harlacher, R.A. 1987. Determination of planting densities for revegetation projects. Pages 22-27 In: John P. Rieger and B. K. Williams,eds. Proceedings of the second native plant revegetation symposium; San Diego, California.

Hook, D. D. 1984. Adaptations to flooding with fresh water. Pages 265-288 In: T. T. Kozlowski, ed. Flooding and plant growth. Academic Press, Inc. Orlando, Florida.

Munz, P. A. 1974. A flora of Southern California. University of California Press, Berkeley. 1086 pp.

Parra, E. A. 1987. Growth of *Stipa pulchra* in experimental field conditions. Pages 157-163 In: John P. Rieger and B. K. Williams, eds. Proceedings of the second native plant revegetation symposium; San Diego, California.

Radosevich, S. R. and J. S. Holt. 1984. Weed ecology-Implications for vegetation management. John Wiley & Sons, New York.

St. John, T. V. 1987. Soil disturbance and the mineral nutrition of native plants. Pages 34-39 In: John P. Rieger and B. K. Williams, eds. Proceedings of the second native plant revegetation symposium; San Diego, California.

Swenson, E. A. and C. L. Mullins. 1985. Revegetating riparian trees in southwestern floodplains. Pages 135-138 In: Interagency North American riparian conference, Riparian ecosystems and their management: reconciling conflicting uses; Tucson, Arizona.

Stolzy, L. H. and R. E. Sojka. 1984. Effects of flooding on plant disease. Pages 222-256 In: T. T. Kozlowski, ed. Flooding and plant growth. Academic Press, Inc. Orlando, Florida.

Thorne, R. F. 1976. The vascular plant communities of California. In: Latting, J. ed. Plant communities of Southern California; California Native Plant Society Publication No. 2.

U S. Army Corps of Engineers, Los Angeles District. 1980. Sepulveda basin master plan and draft environmental impact statement. Appendix. 97 pp.

U.S. Army Corps of Engineers, Los Angeles District. 1981. Sepulveda basin updated master plan.

Walter, H. 1979. Development of the sepulveda wildlife management area. Report for Los Angeles District COE. 12 pp.

20 Nov. 1989.

Dear Steve:

As promised, I eventually found the information you requested. We had to go dig in the archives and find the original plans. I took the numbers off the original landscape sheets. It looks like total acerage might add up to ~16 acres.

- Baccharis glutinosa: 5,140 cuttings. Mule Fat
- Salix lasiolepis: 955 cuttings. } Willow
- Salix laevigata: 955 cuttings.
- Salix goodingii: 90 cuttings.
- Sambucus mexicanus: 54 (5 gallon). Elderberry
- Alnus rhombifolia: 54 (5 gallon). White Alder
- Fraxinus velutina: 36 (5 gallon). Arizona Ash
- Populus fremontii: 342 (5 gallon). } Cottonwood
- Populus trichocarpa: 54 (5 gallon).
- Platanus racemosa: 18 (5 gallon). Sycamore
- Baccharis emoryii: 270 (1 gallon). Coyote Bush
- Rubus ursinus: 1980 (1 gallon). Wild Blackberry
- Vitis girdiana: 990 (1 gallon). — wild grape
- Rosa californica: 2970 (1 gallon). Cal. Rose

TOTAL: 13,908.

Golden Currant

Now, I know some substitutions were made (like Ribes aureum was added, but we cannot find the changes that were made. This will give you a good place to start. I've also enclosed a irrigation map for the area. I am still in the process of trying to get you some keys that ~~fi~~ fit the quick coupler valves that were installed.

Plants that you should consider planting are: more willows (from rooted cuttings), more mule fat, more cottonwoods, and perhaps more sycamores.