

Status of Habitat Mitigation and Monitoring for
Magpie Creek Diversion Channel

Combined Annual Report 2007 & 2008



Prepared by:



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Area Flood
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Agency

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1. Introduction

1.1 Mitigation Project History

The Magpie Creek Diversion Channel (MCDC) was constructed in 1955 and 1956 by the USACE and the State of California as a flood control channel. The purpose of the USACE project was to provide flood control to the local area by diverting flows away from the lower portion of Magpie Creek into this constructed channel. The channel contained few natural features such as a meander pattern, bank development, riffles, pools, and other morphological features (Figure 1) and is constrained by residential development to the south.



Figure 1 – Old Section of MCDC Prior to Construction

The Enhancement Project reconstructed a portion of the MCDC to enhance the functions and values provided by this stream corridor. During 2002, it was observed that the steep slope of the levee along the south side of the MCDC was eroding. Additionally, the channel was dominated by non-native vegetation and the overall habitat value was low. In an effort to improve the habitat quality and stabilize the upper portion of the left bank, SAFCA proposed this enhancement project. SAFCA considered two alternatives for addressing this levee erosion. The first alternative was the construction of a flood wall to stabilize the levee slope. The second alternative, which was selected by SAFCA, was to flatten the slope of the levee and the channel bank. The project included moving the channel away from the steep levee slope, rebuilding a more gradual slope, and revegetating the riparian corridor with native plant species. The overall goals of the project are summarized below:

1. Improve the functions and values of wildlife habitat along this reach of the MCDC
2. Diversify the stream's geomorphic configuration (i.e. meanders, riffles, pools)
3. Increase stream and floodplain interaction
4. Improve bank and slope stability
5. Reduce maintenance needs

Project construction began during September 2006 and the total area disturbed during construction of this project was approximately 5.1 acres. The main project components are summarized below:

- Move the stream channel away from the levee and construct a more natural channel configuration that incorporates meander, riffle and pool features.
- Reduce the low flow channel width and depth and construct a low floodplain shelf to encourage flows to leave the low flow channel and inundate different levels of the floodplain.
- Revegetate the new channel banks with native trees, shrubs and herbaceous plants.

Other minor project components included the reconstruction of the levee road, the placement of rock within the channel invert below the Dry Creek Road bridge (to approximately 15 feet downstream), the reconstruction of the drainage swale between the levee road and adjacent housing, and the construction of a replacement culvert that conveys water collected in the drainage swale to MCDC (Figure 4 in Appendix B).

1.2 Site Description

The MCDC begins just downstream of Raley Boulevard and ends at the confluence with Robla Creek. The project site spans the area just downstream of the bridge crossing for Dry Creek Road to the MCDC's confluence with Rio Linda Creek (approximately 1,040 feet of channel). The project location map is depicted in Figure 2. On the north side of the project site is the Rio Linda Creek Conservation Area (RLCCA) which was recently created by SAFCA during the Lower Dry Creek and Robla Creek Levee Improvements Mitigation Project (Mitigation Project) to replace a constructed and degraded section of Robla Creek. The RLCCA is owned by SAFCA and is protected as open space habitat for giant garter snake (*Thamnophis gigas*), a species federally and state-listed as Threatened. A residential area lies south of the project site. Just to the east of the project site is Dry Creek Road and to the west is property owned and operated by SAFCA for flood control purposes.

The small project site includes a stream channel, levee and access roads, narrow floodplain and a non-native grassland with a small group of valley oaks that were transplanted to the site by SAFCA in 2003.

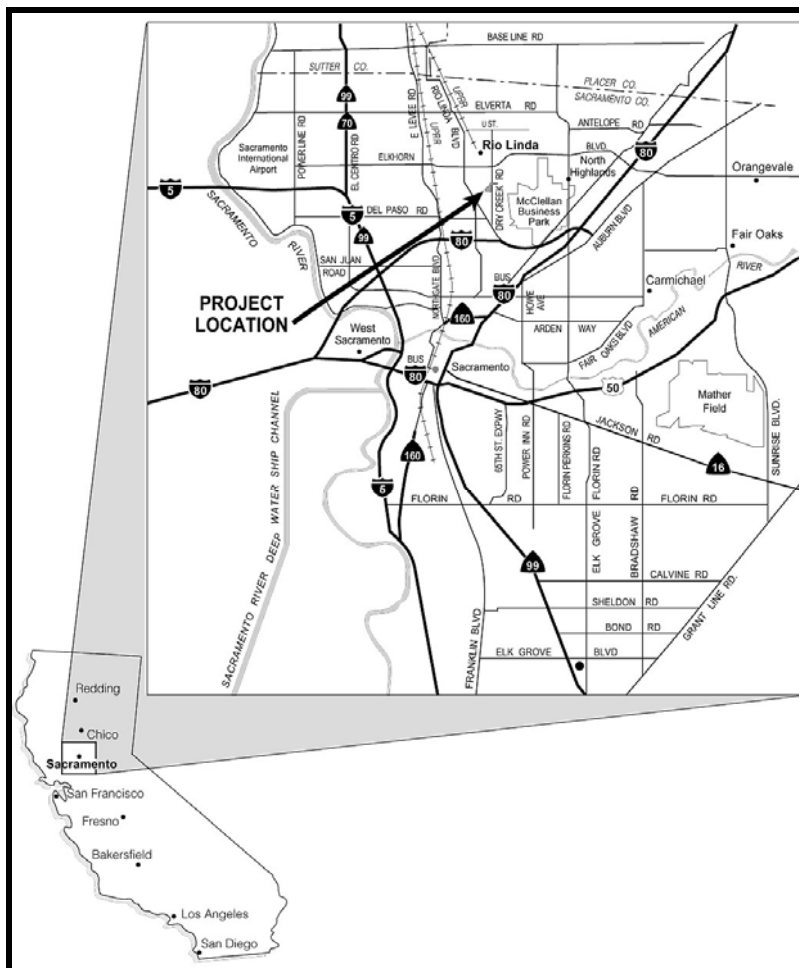


Figure 2 – Location of the Magpie Creek Diversion Channel.

1.3 Management Responsibility

SAFCA is financially responsible for the attainment of success criteria of required mitigation. SAFCA currently owns a portion of the site along with Sacramento and San Joaquin Drainage District and American River Flood Control District. SAFCA is committed to maintaining the area as open space in perpetuity. The water flowing in the MDCD is not controlled by any entity, but enters the channel from upper Magpie Creek. Water flows in the channel are expected to remain fairly consistent with existing conditions, but will likely be reduced following completion of groundwater clean-up efforts at McClellan Business Park in approximately 50 years.

1.4 Habitat Features & Goals

Prior to this enhancement project this section of the riparian corridor was characterized by many non-native weeds, poor water quality, a linear channel with eroding banks and low quality wildlife habitat. The objective of this project was to create a better function stream system that offered improved functions and values for the benefit of wildlife and water quality. The MDCD riparian corridor, created by SAFCA, now offers meanders, riffles and pool features, stable stream banks, and a larger floodplain. In addition, the constructed channel was designed to incorporate and maintain a native instream freshwater marsh habitat, a native riparian woodland habitat, as well as an open water habitat (Figure 3) to mitigate for project impacts.

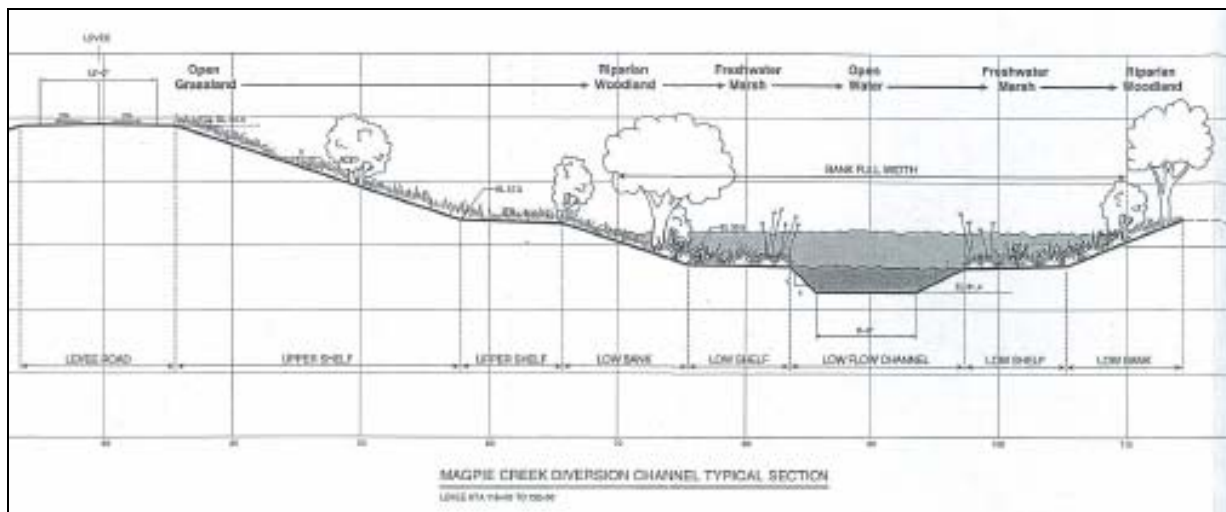


Figure 3 – Cross Section of MDCD indicating Habitat Locations

SAFCA is responsible for ensuring that a qualified biologist or restoration ecologist annually monitors the success of the mitigation project until success criteria (Table 1) are met by the end of the 5th year of monitoring (2011). If results indicate that the success criteria will not be met by the specified timeframe for any community type, adaptive management will be implemented and monitoring may likely be extended beyond the establishment period or until success criteria are met.

Table 1 – Success Criteria for Habitat Features

Habitat Type	Required Acreage	Created Acreage	Goal Year	Success Criteria
Freshwater Marsh	0.21	0.4	2009 (Year 3)	30% absolute coverage
				50% relative cover by wetland indicator species
				35% relative cover by native species
Riparian Woodland	0.29	0.4	2011 (Year 5)	50% survival of trees & shrubs growing with good vigor
				25% coverage within the OHWM by trees & shrubs
				20% cover above the OHWM by trees & shrubs
Open Water	0.22	0.2	2011 (Year 5)	5 th year must meet jurisdictional criteria for other waters of the US

1.4.1 Freshwater Marsh

A freshwater marsh community was designed and installed within the channel and along the stream edges and within the stream's OHWM to offset impacts to freshwater marsh habitat resulting from project implementation. The main objective is the creation of 0.4 acres of self-sustaining vegetation which will more than compensate for the 0.21 acres required for mitigation. Wetland plantings included Barbara sedge (*Carex barbarae*), Baltic rush (*Juncus balticus*) and tule (*Scirpus acutus*). This habitat is expected to help decrease turbidity during high flow events, capture sediments and pollutants as they move through the wetland vegetation, reduce flood water velocities and provide cover for aquatic species such as the giant garter snake (*Thamnophis gigas*).

This habitat will be considered successful at the end of the 3rd monitoring year (2009) if the absolute coverage by vegetation is 30%, the relative cover by wetland indicator species (i.e., OBL, FACW, or FAC) is greater than 50% and the relative cover by native species (including both wetland indicator and non-wetland indicator species) is at least 35% (Table 1). Additionally, during the 5th year the freshwater marsh habitat must be mapped onto an aerial photo and digitized to measure and determine if the required 0.21 acres have been met.

1.4.2 Riparian Woodland

A riparian woodland community, totaling 0.4 acres, was designed and installed along the stream channel to offset 0.29 acres of riparian woodland habitat that was impacted during project implementation. This habitat type is expected to enhance the aquatic habitat by 1) providing improved water quality by shading and cooling the water in the channel, 2) providing a source of litter and downed woody debris for aquatic species and 3) diversifying and improving the riparian habitat for wildlife.

The restoration will be considered successful at the end of the 5th monitoring year (2011) if at least 50% of trees and shrubs are alive and growing with good vigor. In addition, trees and shrubs must provide at least 25% cover within the ordinary high water mark (OHWM) and 20% cover above the OHWM (Table 1). This habitat must be mapped and digitized, during the 5th and final monitoring survey, to measure acreage targeted for mitigation.

1.4.3 Other Waters of the U.S.

An open water community, totaling 0.2 acres, was designed and installed at MCDC to offset impacted acreage during project implementation. The open water habitat now incorporates geomorphic stream features such as meanders, riffles and pools and is expected to increase not only stream and floodplain interactions but is also expected to provide foraging habitat for aquatic/riparian species.

Success will be determined by the 5th monitoring year (2011) if the banks remain stable, if the channel functions to carry water downstream to Robla Creek and if the channel provides open water habitat for aquatic and terrestrial wildlife. In addition MCDC will be required to meet jurisdictional criteria for other waters of the United States (i.e., bed and bank development) at the end of the five-year monitoring period. This habitat must be mapped and digitized, during the 5th and final monitoring survey, to measure acreage targeted for mitigation.

1.5 Wildlife

Common species of aquatic invertebrates, fish, amphibians, reptiles, birds and mammals were known to or could have utilized MCDC prior to project implementation. It is anticipated that as the vegetation matures and the site develops, wildlife diversity will increase.

2. Methods

All mitigation features, will be monitored annually 3-5 years, depending on the habitat type. SAFCA is responsible for ensuring that a qualified botanist or restoration ecologist annually monitors the success of the project (see Appendix A, Table 8 and Table 9 for a list of the surveyors). The construction of the MCDC channel project was completed in 2006 and the first monitoring year began in 2007. Therefore, the 5th and final year of monitoring is expected to be 2011.

2.1 Habitat Features

To constitute mitigation acreage, success criteria must be met by the 3rd year (2009) following construction of the freshwater marsh, and by the 5th year (2011) for the riparian woodland and the open water habitats. If the success criteria are met sooner and continue to be met for one or two years with no trend toward failure (i.e. non-sustainable habitat), the mitigation for that particular habitat type may be considered successful before the full 5-year period is completed.

1.5.1 Freshwater Marsh

The freshwater marsh habitat will be considered successful at the end of the 3rd monitoring year (2009) if the absolute coverage by vegetation is 30%, the relative cover by wetland indicator species (i.e., OBL, FACW, or FAC) is greater than 50% and the relative cover by native species (including both wetland indicator and non-wetland indicator species) is at least 35% (Table 1). This habitat must be mapped and digitized, during the 5th and final monitoring survey, to measure the acreage targeted for mitigation.

To monitor for Freshwater Marsh goals, eight (8) permanent transects were established along MCDC in 2008 and the GPS coordinates were logged (Figure 4 in Appendix B). A tape measure is started two feet in from the outer edge of the low flow channel (along the top of the water surface) and run up the slope 15 feet. A one (1) foot square quadrat is placed every five (5) feet, on the downstream side, along the transect line. All vegetation within the quadrat is identified to species and the approximate amount of cover by each species is noted.

1.5.2 Riparian Woodland

The riparian woodland will be considered successful at the end of the 5th monitoring year (2011) if at least 50% of trees and shrubs are alive and growing with good vigor. In addition, trees and shrubs must provide at least 25% cover within the ordinary high water mark (OHWM) and 20% cover above the OHWM. This habitat must be mapped and digitized, during the 5th and final monitoring survey, to measure acreage targeted for mitigation.

During 2007 all of the planted trees were monitored and 20% of the shrubs were randomly selected for measurements (as per the Mitigation and Monitoring Plan). These selected individuals were tagged and the GPS coordinates were logged to ensure that these same plants will be evaluated for all future monitoring years. Measurements included plant vigor (dead=0, poor=1, poor-fair=2, fair=3, fair-good=4 or good=5),¹ crown size, and height. Trunk measurements of diameter at breast height (DBH) for trees were also collected for trees with a DBH of 1 inch or greater (all DBH measurements collected from a single tree with multiple stems were summed). Any signs of reproduction were noted and volunteer recruitment was tallied. To determine survival, a total plant count of each species (surviving planted stock + volunteer plants) was conducted and compared to the number of planted trees and shrubs. Sandbar willows were not included in the above measurements and neither was California rose beginning in 2008 because their multi-stemmed growth form made it too difficult to accurately count. Instead the length and width of the area that was occupied by these species was measured. The total number of sandbar willows was then estimated according to the following criteria: every 3 feet parallel to the stream channel equals one sandbar willow.

2.1.1 Other Waters of the U.S.

For Other Waters of the U.S., the site will be considered successful if the banks remain stable and the channel functions to carry water downstream to Robla Creek and if the channel provides open water habitat for aquatic and terrestrial wildlife. This habitat must be mapped and digitized, during the 5th and final monitoring survey, to measure the acreage targeted for mitigation. Additionally, MCDC will be required to meet jurisdictional criteria for other waters of the United States (i.e., bed and bank development) at the end of the five-year monitoring period.

The stream channel will be qualitatively assessed each year until the 5th year to determine the condition of the stream channel. Specifically, it will be noted if there is evidence of bed and or bank scour, if there is sedimentation, if there is erosion, if meanders are present and if there is variation in the width of the channel.

2.2 Wildlife

No performance or success standards have been established for wildlife monitoring. However, there is a requirement that the channel provides open water habitat for aquatic and terrestrial wildlife (see 2.1.1 Other Waters of the US above). Herpetological, mammal, bird and aquatic wildlife surveys will be conducted annually through the 5th year to determine the utilization of MCDC by wildlife. In addition, any wildlife observed during regular site visits will be noted.

During herpetological surveys, surveyors walk the banks upstream to downstream looking for reptiles basking in the sun, hiding under rocks or logs and for any tracks or sign. During aquatic surveys, surveyors walk the stream edge downstream to upstream using dipnets to sample for aquatic species. Identification and count of each captured organism is noted. Bird and mammal surveys can be conducted simultaneously during which each bank will be walked. Identification will be determined by site, sound, tracks and/or sign and a total count of each species identified will be recorded.

¹ Good – plants are healthy with large green leaves, and less than 10% yellow leaves
Good-fair – plants have 10-25% yellow leaves but otherwise look healthy
Fair – plants have 25-50% yellow leaves and are looking stressed
Fair-poor – plants have 50-75% yellow leaves, are drying out and looking stressed
Poor – plants have more than 75% yellow leaves, are losing leaves, dried out, and looking very stressed.

Photographs will be taken annually through the 5th year from permanent locations and will provide photographic documentation of the progress of all restoration and enhancement actions at MCDC.

3. Results & Discussion

Quantitative and qualitative monitoring has shown that the habitat types are becoming established and the vegetation is growing successfully. The results from surveys conducted in 2007 and 2008 are presented and discussed below, as well as a discussion of maintenance actions that have and will occur in each habitat. Regular site visits and yearly monitoring will continue to guide the adaptive management strategies implemented at MCDC to ensure the successful performance of the site.

3.1 Habitat Features

There are three (3) habitat acreage goals that were defined in the USACE-approved Mitigation and Monitoring Plan. In the year 2011, the 5th monitoring year, all habitats will be mapped onto an aerial photo and digitized to measure and determine if the required acreages have been met (Table 2).

Table 2 – Post-Construction Habitat Acreages

Habitat Type	Required Acreage	Created Acreage
Freshwater Marsh	0.21	0.4
Riparian Woodland	0.29	0.4
Other Waters of the U.S.	0.22	0.2

3.1.1 Freshwater Marsh

The freshwater marsh/seasonal wetland habitat was monitored during 2008 by KC Sorgen and Gina Disney to determine the progress toward the 3rd year (2009) performance goals. The results from the freshwater marsh survey for the 2nd establishment year, as seen in Table 3, indicate that the absolute coverage by vegetation is 55% and is exceeding the 3rd year (2009) performance goals. The relative coverage by wetland indicator species is 12% and is not expected to reach the 50% coverage goal by the 3rd year of monitoring. Native plant species coverage is 26% and falls below the 3rd year performance goal of 35% coverage. The complete dataset for the 2008 survey can be seen in Appendix C and has been summarized below in Table 3.

Table 3 – Freshwater Marsh Success Criteria for the MCDC & Survey Results

Success Criteria	Goal	2008 Status
Total vegetation cover	30%	55.0%
Total cover by wetland indicator species	50%	11.7%
Total cover by native species	35%	25.8%

To date the only maintenance actions that have been required and will continue to be required include regular removal of debris and trash from the site. During the 2009 maintenance year SAFCA expects to enhance the freshwater marsh habitat by removing invasive weeds, such as water primrose, and by planting more native wetland indicator species, specifically, Baltic rush, common tule, Barbara sedge and deergrass.

3.1.2 Riparian Woodland

Surveys were conducted by SAFCA biologist in 2007 and 2008 to monitor the progress of the riparian woodland towards meeting the 5th year (2011) performance goals for survival, canopy coverage and vigor. Survival counts (a count of both planted and natural

regenerated plants) indicate that the survival rate of trees increased from 99% in 2007 to 108% in 2008 and the survival rate of shrubs increased from 96% in 2007 to 222% in 2008. The large increase in the survival rate of the shrubs in from 2007 to 2008 is attributable to the prolific spread of coyote brush across the site. The combined survival rate of trees and shrubs increased from 98% in 2007 to 161% in 2008 and far exceeds the 5th year success criteria of 50% survival (Table 4). The results for canopy coverage (Table 5) indicate that the tree canopy coverage across the 0.4 acres of riparian woodland increased from 4.84% in 2007 to 9.46% in 2008. Coverage of the monitored shrubs in 2007 was 0.9% and increased to 4.15% in 2008². The combined canopy coverage by both trees and shrubs across the 0.4 acres of riparian woodland increased from 5.74% in 2007 to 13.61% in 2008². Extrapolation of the data to simulate canopy coverage of 100% of trees and shrubs indicate that coverage increased from 8.46% in 2007 to 16.2% in 2008. Methods in 2007 and 2008 did not account for the canopy coverage within and above the OHWM but in 2009 the methods will be modified to incorporate a clear delineation of the canopy coverage within and above the OHWM. The health and vigor of the trees and shrubs remains high with a 4.89 average vigor rating for plants in 2007 and increasing slightly to 4.95 in 2008 (Table 6). We anticipate that the 5th year goals will likely be exceeded.

During monitoring surveys data is also collected to determine the average height of the plants and the average diameter at breast height (DBH) of the trees but there are no associated performance goals with these variables. The analysis of the average tree and shrub height data indicates that trees grew from 4.6 feet in 2007 to 5.6 feet in 2008 while shrubs grew from 3.0 feet to 3.8 feet from 2007 to 2008. The overall average height of both trees and shrubs increased from 4.3 feet to 4.9 feet between 2007 and 2008 (Table 6). The total number of trees with a DBH of 1" or greater increased from 1 tree in 2007 to 10 trees in 2008 with an average DBH increase from 0.01 inches in 2007 to 0.07 inches in 2008 (Table 6).

Table 4 – Plant Survivorship Results

Species	# Planted	2007		2008	
		Plant Count	Survival	Plant Count	Survival
Arroyo Willow	0	4	N/A	4	N/A
Box Elder	63	63	100%	63	100%
Gooding's Willow	14	14	100%	13	93%
Oregon Ash	40	39	98%	39	98%
Red Willow	19	14	74%	13	68%
Valley Oak	20	21	105%	21	105%
<i>Fremont Cottonwood</i>	0	0	N/A	14	N/A
† <i>Sandbar Willow</i>	0	0	N/A	2	N/A
TREES TOTAL	156	155	99%	169	108%
Buttonbush	72	67	93%	64	89%
† California Rose	54	49	91%	63	117%
Coyote Brush	39	43	110%	222	110%
SHRUBS TOTAL	165	159	96%	349	212%
TOTAL	321	314	98%	518	161%

† Sandbar willow and California rose were evaluated using a different method in 2007 and 2008 (see Methods and Results above)

² All of the California rose shrubs were surveyed in 2008 (see Methods) and are reflected in the 2008 results.

Table 5 – Percent of Canopy Coverage of the Sampled Trees and Shrubs over the 0.4 acres of Riparian Woodland

Species	2007	2008
Arroyo Willow	0.31	0.16
Box Elder	1.43	1.36
Gooding's Willow	0.79	0.68
Oregon Ash	0.72	0.45
Red Willow	1.24	0.63
Valley Oak	0.35	0.36
Sandbar Willow		0.15
Tree Total	4.84	9.46
Button Bush (n=13)	0.16 (0.64)**	0.22 (0.86)**
Coyote Bush (n=8)	0.28 (1.11)**	0.59 (2.35)**
*California Rose	0.47 (1.86)**	3.35
Shrub Total	0.90 (3.62)**	4.15 (6.57)**
TOTAL	5.74 (8.46)**	13.61 (16.02)**

*100% of California Rose Shrubs were evaluated in 2008 but only 20% were evaluated in 2007 (see Methods above).

**Results in parenthesis are extrapolated data to simulate data for 100% of the shrub canopy across the site.

Table 6 – Mean Vigor, Height and DBH of Sampled Trees and Shrubs

SPECIES	2007			2008		
	Mean VIGOR	Mean HEIGHT	Mean DBH	Mean VIGOR	Mean HEIGHT	Mean DBH
Arroyo Willow	4.75	6.75	0.25 (n=1)	5.00	6.75	0.25 (n=1)
Box Elder	4.87	4.73	0.00	4.78	6.19	0.13 (n= 8)
Gooding's Willow	5.00	5.21	0.00	5.00	6.85	0.15 (n=1)
Oregon Ash	4.82	3.85	0.00	5.00	4.59	0.00
Red Willow	4.93	5.29	0.00	4.92	5.62	0.00
Valley Oak	4.90	3.95	0.00	4.67	4.29	0.00
Tree Total	4.88	4.55	0.01	4.86	5.54	0.07
Button Bush	4.69	2.46	n/a	5.00	2.69	n/a
California Rose	5.00	3.17	n/a	5.00	3.94	n/a
Coyote Bush	5.00	3.50	n/a	5.00	4.75	n/a
Shrub Total	4.88	2.97	n/a	5.00	3.81	n/a
Grand Total	4.88	4.27	0.01	4.90	4.98	0.06

Since 2007, maintenance within the riparian woodland has included hand weeding and herbicide events as well as cage maintenance and trash and debris removal. Additionally, during 2007 many of the box elders were pruned to remove harmful aphid infestations and by showed no signs of infestation in 2008. During 2008 some extra soil was added to a low point on the lower bench that was causing a box elder to remain inundated with water. Due to some losses of native herbaceous vegetation, replanting will occur during 2009. The species mix may include common gumplant (*Grindelia camporum*), tomcat clover (*Trifolium wildenovii*), purple clarkia (*Clarkia purpurea*), mugwort (*Artemisia douglasiana*), annual lupine (*Lupinus bicolor*) and California aster (*Aster chilensis*).

3.1.5 Other Waters of the U.S.

The stream channel was qualitatively assessed during both 2007 and 2008 and there were no observations of erosion, sedimentation or bank and bed scours. Photopoints of the MCDC can be seen in Appendix D. Wildlife surveys at MCDC have included observations of aquatic wildlife using the open water habitat and terrestrial wildlife utilizing the riparian woodland habitat (see 3.2 Wildlife below). These observations indicate that SAFCA is currently meeting the 5th year performance goals for the open water habitat.

3.2 Wildlife

During 2007 and 2008 surveys of birds, mammals, reptiles and aquatic wildlife were conducted to see how site utilization has changed over time. The total number of species observed decreased from seven (7) species in 2007 to four (4) species in 2008 but of the four (4) different species, three (3) species had not previously been detected at MCDC (Table 7). There were no recorded observations during the 2007 mammal and reptile surveys. However, in 2008, beaver scat was observed along the creek and a dead common garter snake (bird predation was the likely cause of death) was found also observed along the creek. The 2007 and 2008 shoreline dip-net surveys did not differ dramatically between years and the results included mosquitofish, crawdads and tadpoles of unidentified species. In 2007 a spiny soft shell turtle was identified and a school of about 20 unidentified 3 inch long fish were visually observed in the creek.

Table 7 – Morning bird survey conducted September 2007 and August 2008

Common Name	Scientific Name	2007	2008
American Crow	<i>Corvus brachyrhynchos</i>	2	
Anna's Hummingbird	<i>Calypte anna</i>		1
Black Phoebe	<i>Sayornis nigricans</i>	2	1
California Quail	<i>Callipepla californica</i>		1
Domestic Duck	<i>Anas platyrhynchos</i>	4	
Green Heron	<i>Butoroides striatus</i>		1
Mourning Dove	<i>Zenaida macroura</i>	4	
Spotted Sandpiper	<i>Actitis macularius</i>	1	
Western Meadowlark	<i>Sturnella magna</i>	1	
Yellow-billed Magpie	<i>Pica nuttalli</i>	2	

4. Conclusions & Recommendations

Except for total cover by wetland indicator species, the habitat types within the MCDC are progressing toward establishment and meeting the performance goals. SAFCA will continue to maintain the MCDC site until all habitat criteria have been met and until the trees and shrubs are self sustaining. Annual monitoring efforts will continue to track changes in the various habitats and adaptive management strategies will continue to be utilized to help ensure that 3rd and 5th year mitigation goals are met.

Over the next year, general maintenance activities will include regular trash and debris removal, weed control and irrigation for plants in the riparian savannah. Supplemental to routine maintenance efforts, SAFCA will also be scheduling some additional plantings in the freshwater marsh to enhance the coverage by native and wetland indicator species. Additional plantings will also occur along the slope with seeds and plugs of native herbaceous cover to augment the native herbaceous understory of the riparian woodland habitat at MCDC.

5. References

EDAW. 2005. Mitigation and Monitoring Plan for the Magpie Creek Diversion Channel Enhancement Project. Prepared for the Sacramento Area Flood Control Agency on February 10, 2005.

Appendix A – Surveyors

Table 8 – 2007 Monitors

Name	Title	Affiliation	Duties
Lizette Crosbie	Natural Resource Specialist (Biologist)	SAFCA	Data Collection and Reporting
KC Sorgen	Natural Resource Intern (Sacramento State)	SAFCA	Data collection and reporting
Desiree Davenport	Natural Resource Intern (Sacramento City College)	SAFCA	Data collection
Kelly McJunkin	Natural Resource Intern (UC, Davis)	SAFCA	Data collection

Table 9 – 2008 Monitors

Name	Title	Affiliation	Duties
Lizette Crosbie	Senior Natural Resource Specialist (Biologist)	SAFCA	Data Collection and Reporting
KC Sorgen	Natural Resource Specialist (Biologist)	SAFCA	Data Collection and Reporting
Gina Disney	Natural Resource Intern (Sacramento State)	SAFCA	Data collection
Gabby Bohrer	Natural Resource Intern (Sacramento State)	SAFCA	Data collection

Appendix B – Project Features

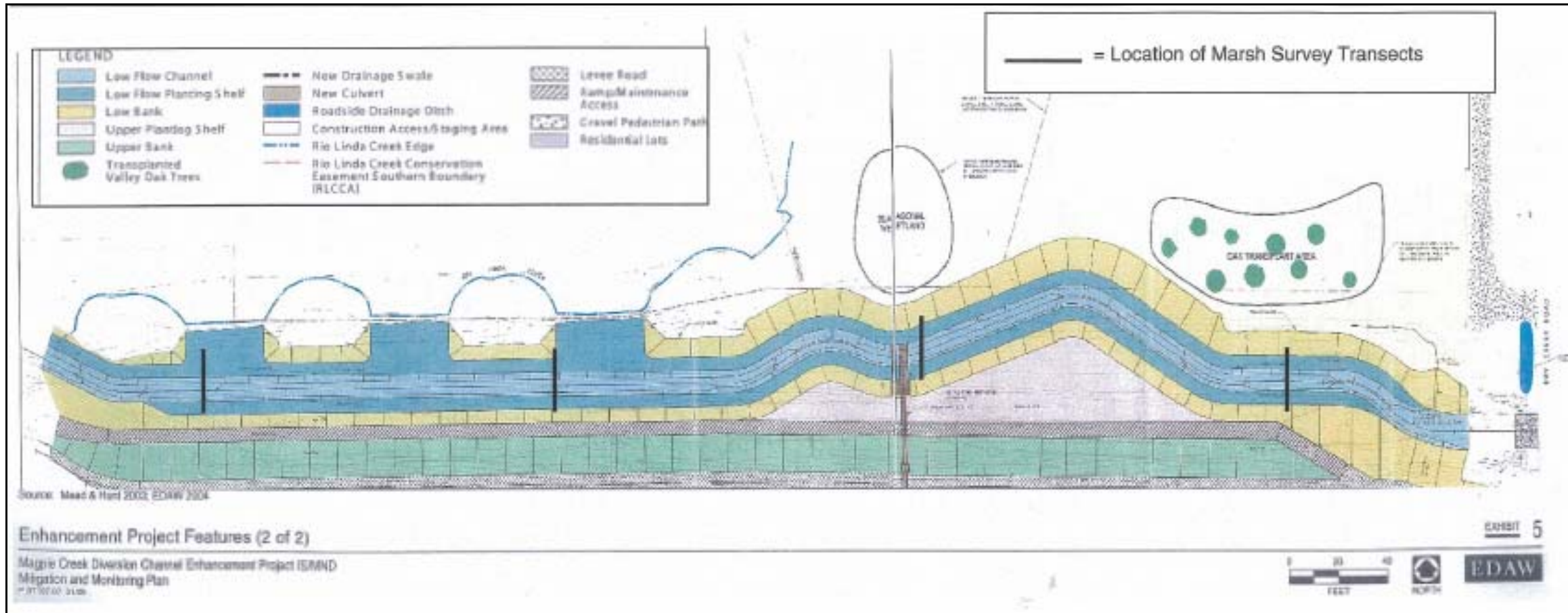


Figure 4 – Project Features and the Locations of the Transects for Marsh Surveys

Appendix C – Wetland Vegetation Monitoring Data

Table 10 – Species List of Plants found at MCDL during the Freshwater Marsh Survey (8/7/08)

Species	Common Name	Native/non-Native	Indicator Species
<i>Baccharis pilularis</i>	Coyote brush	Native	UPL
<i>Bidens laevis</i>	Bur marigold	Non-Native	OBL
<i>Brassica nigra</i>	Black mustard	Non-Native	NI
<i>Brassica spp</i>	Unknown	Unknown	Unk
<i>Chamaesyce maculata</i>	spotted sandmat	Native	UPL
<i>Convolvulus arvensis</i>	Bindweed	Non-Native	Unk
<i>Conyza canadensis</i>	Horseweed	Native	FAC
<i>Cyperus eragrostis</i>	Tall flatsedge	Native	FACW
<i>Elymus glaucus</i>	Blue wildrye	Native	FACU
<i>Epilobium ciliatum</i>	Willow herb	Native	FACW
<i>Eschscholzia californica</i>	California poppy	Native	NI
<i>Gnaphalium palustre</i>	Cudweed	Native	FACW
<i>Lactuca serriola</i>	Prickly lettuce	Non-Native	FAC
<i>Leptochloa fascicularis</i>	Bearded sprangletop	Native	OBL
<i>Lotus purshianus</i>	Spanish clover	Native	Unk
<i>Lupinus bicolor</i>	Lupine	Native	Unk
<i>Medicago polymorpha</i>	Burclover	Non-Native	FACU
<i>Muhlenbergia rigens</i>	Deergrass	Native	FACW
<i>Oenothera biennis</i>	Evening primrose	Non-Native	NI
<i>Paspalum dilatatum</i>	Dallisgrass	Non-Native	FAC
<i>Plantago major</i>	Plantain	Non-Native	FAC
<i>Poaceae spp</i>	Unknown	Unknown	Unk
<i>Polygonum hydropiperoides</i>	Swamp smartweed	Native	OBL
<i>Portulaca oleracea</i>	Little hogweed	Non-Native	FAC
<i>Raphanus sativa</i>	Wild radish	Non-Native	UPL
<i>Rumex crispus</i>	Curly dock	Non-Native	FACW
<i>Sorghum halepense</i>	Johnson grass	Non-Native	FACU
<i>Tragopogon dubius</i>	Western salsify	Non-Native	NI
<i>Verbena spp</i>	Unknown	Unknown	Unk
<i>Xanthium strumarium</i>	Cocklebur	Native	FAC

Table 11 – Percent Cover of each Quadrat by Species Type (8/7/08)

Transect #	Quadrat #	Native	Non-Native	Unknown	Total
1L	1	0.00	0.00	0.00	0.00
	2	70.00	5.00	5.00	80.00
	3	55.00	7.00	13.00	75.00
	4	0.00	0.00	0.00	0.00
1R	1	0.00	0.00	0.00	0.00
	2	10.00	20.00	30.00	60.00
	3	5.00	18.00	47.00	70.00
	4	40.00	45.00	15.00	100.00
2L	1	0.00	0.00	0.00	0.00
	2	25.00	25.00	50.00	100.00
	3	60.00	5.00	35.00	100.00
	4	75.00	0.00	25.00	100.00
2R	1	0.00	0.00	0.00	0.00
	2	20.00	20.00	60.00	100.00
	3	35.00	30.00	35.00	100.00
	4	10.00	0.00	3.00	13.00
3L	1	0.00	0.00	0.00	0.00
	2	0.00	48.00	52.00	100.00
	3	80.00	2.00	8.00	90.00
	4	70.00	0.00	30.00	100.00
3R	1	0.00	0.00	0.00	0.00
	2	4.00	0.00	50.00	54.00
	3	5.00	0.00	0.00	5.00
	4	0.00	0.00	0.00	0.00
4L	1	20.00	0.00	0.00	20.00
	2	0.00	75.00	10.00	85.00
	3	75.00	0.00	10.00	85.00
	4	85.00	0.00	15.00	100.00
4R	1	0.00	0.00	0.00	0.00
	2	15.00	0.00	45.00	60.00
	3	30.00	30.00	40.00	100.00
	4	35.00	5.00	25.00	65.00
Average		25.75	10.47	18.84	55.06

Table 12 – Percent cover by wetland indicator type (8/7/08)

Transect #	Quadrat #	Non-Indicator Species				Wetland Indicator Species				Unk	Grand Total
		FACU	NI	UPL	Total	OBL	FAC	FACW	Total		
1L	1	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	5	65	70	10	10
	3	50	7	0	57	0	0	5	5	13	13
	4	0	0	0	0	0	0	0	0	0	0
1R	1	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	5	20	3	28	32	32
	3	0	0	0	0	0	8	15	23	47	47
	4	25	0	0	25	10	10	0	20	55	55
2L	1	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	25	25	0	50	50	50
	3	10	5	0	15	0	0	0	0	85	85
	4	0	0	0	0	0	0	0	0	100	100
2R	1	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	10	20	10	40	60	60
	3	0	20	30	50	0	10	5	15	35	35
	4	0	0	5	5	0	0	0	0	8	8
3L	1	0	0	0	0	0	0	0	0	0	0
	2	15	0	3	18	0	30	0	30	52	52
	3	0	0	0	0	0	0	0	0	90	90
	4	0	0	0	0	0	10	0	10	90	90
3R	1	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	1	3	4	50	50
	3	0	5	0	5	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0
4L	1	0	0	0	0	0	0	20	20	0	0
	2	25	50	0	75	0	0	0	0	10	10
	3	0	0	0	0	0	0	0	0	85	85
	4	0	0	0	0	0	5	0	5	95	95
4R	1	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	15	0	15	45	45
	3	0	0	0	0	0	35	0	35	65	65
	4	0	5	0	5	0	0	5	5	55	55
Average		3.9	2.88	1.19	7.9688	1.5625	6.063	4.09	11.72	35.375	35.38

Appendix D – Photopoints



Photopoint 1 – October 2007



Photopoint 1 – August 2008



Photopoint 2 – October 2007



Photopoint 2 – August 2008



Photopoint 3 – October 2007



Photopoint 3 – August 2008