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#### **Authors**

Morton, Chuck  
Galloway, Michael

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## TIDAL MARSH RESTORATION AT TRIANGLE MARSH, MARIN COUNTY

**Chuck Morton** (Phone: 510-286-5681, Email: [chuck.morton@dot.ca.gov](mailto:chuck.morton@dot.ca.gov)), District Branch Chief, and **Michael Galloway** (Phone: 510-286-6069, Email: [michael.galloway@dot.ca.gov](mailto:michael.galloway@dot.ca.gov)), Biologist, Office of Biological Sciences and Permits, California Department of Transportation, 111 Grand Avenue, Oakland, CA 94623

**Abstract:** The California Department of Transportation (Caltrans) provided funding to help restore and enhance 0.48 hectare (ha) (1.19 acre (a)) of tidal marsh, 0.56 ha (1.39 a) of native wetland and upland habitat, and improve public access at Triangle Marsh in Corte Madera, Marin County, California. This restoration work mitigates for impacts to 0.015 ha (0.038 a) of wetland/tidal marsh habitat resulting from the Highway 101 widening at nearby Corte Madera Creek. The goals of this restoration are to increase the habitat for marsh-dependent species such as the California clapper rail and the salt marsh harvest mouse and to provide wildlife-viewing opportunities for the public while maintaining a suitable buffer from the restored tidal marsh.

In 2000, the Marin Audubon Society (MAS) purchased the 13 ha (31 a) Triangle Marsh, which is located along Paradise Drive in Corte Madera adjacent to San Francisco Bay. Triangle Marsh is a remnant of a larger area of historical marsh of the Marin Baylands. At some unidentified time within the past 100 years, a portion of Triangle Marsh was filled, creating large upland areas with pockets of wetlands where differential settling of fill material occurred.

This restoration occurred within three areas of the site: the eastern, middle, and western. Upland areas were excavated to tidal marsh elevations. An upland berm was constructed along the boundary between the marsh and Paradise Drive to provide a physical barrier between the public pathway and the middle restoration site. In the larger eastern section, this berm has more gradual slopes on its northern (restored marsh) side to provide wetland-upland transitional refugia habitat. The existing levee in the western section was lowered to provide additional transitional refugia habitat. Grading and contouring of the site began in January 2004 and was completed by January 2005. MAS began planting the upland areas with native species after the grading was completed.

Caltrans biologists obtained pre-restoration information on plants and wildlife and took photographic records of the Triangle Marsh in January 2004 before the site was graded and contouring. Caltrans biologists will take photographic records in the same locations annually during the five-year monitoring period to document the restoration progress. Caltrans biologists will conduct spring and summer plant surveys to detect early and late-seasonal species and will map the extent of the vegetation cover using a Global Positioning System (GPS). Surveys will include a minimum of 20 vegetation sample plots, each measuring 3 x 3 meters (m) (10 x 10 feet (ft)), to estimate plant coverage and dominance in the tidal marsh and upland areas. Caltrans biologists will measure wildlife usage of Triangle Marsh on an opportunistic basis.

During the June 2005 monitoring, biologists observed pickleweed, marsh gumplant, and California cordgrass naturally recruiting into the margins of the graded and contoured tidal marsh sections. At the end of the five-year monitoring period, Caltrans expects that the restored areas will have at least 70% coverage of native species typical of local tidal marsh habitats and native wetland and upland areas.

### Introduction

The California Department of Transportation (Caltrans) provided mitigation for widening work on Highway 101 that resulted in 0.015 ha (0.038 a) of impacts to wetland/tidal marsh habitat at Corte Madera Creek, in the City of Larkspur, Marin County, California (figure 1).

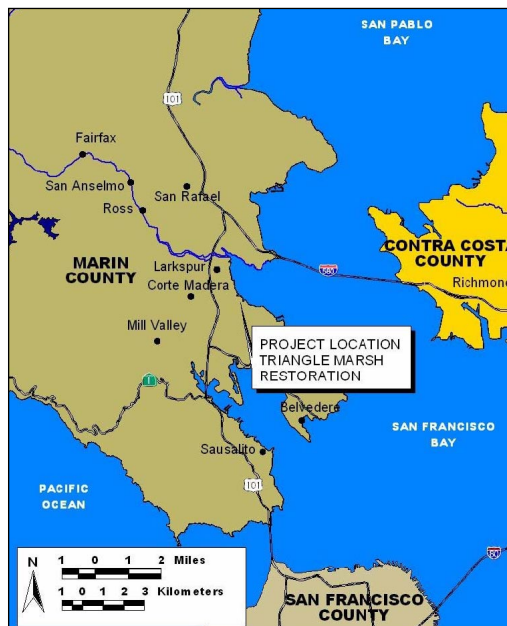


Figure 1. Project location.

Caltrans provided funding and assistance to the Marin Audubon Society (MAS) with monitoring work for the restoration of 0.48 ha (1.19 a) of tidal marsh habitat (figure 2). The restoration occurred within three areas of the site: the eastern and middle portions of the site along Paradise Drive and the levee along the western property boundary. Upland areas were excavated to tidal-marsh elevation while existing tidal marsh and transitional high marsh atop manmade land (fill) were left undisturbed. An upland berm was constructed along the boundary between the marsh and Paradise Drive to provide a physical barrier between the public and the middle site. In the larger, eastern restoration area, this berm has more gradual slopes on its northern (restored marsh) side to provide wetland-upland transitional refuge habitat. The existing western berm was lowered to provide additional transitional refuge habitat. An estimated 8,158 cubic meters (m<sup>3</sup>) (10,670 cubic yards (cy) of soil was excavated, 1,869 m<sup>3</sup> (2,445 cy) were used on site for berm construction, and 6,289 m<sup>3</sup> (8,225 cy) were removed for off-site disposal.



Figure 2. Aerial map of Triangle Marsh.

The topographic features were delineated using GPS after grading and contouring of the site (February 3, 2005). Future tidal-marsh areas (green outline), wetland-upland transition areas (yellow outline), and upland areas planted with native vegetation (orange outline) are shown. A channel was excavated at the eastern section (blue) to allow tidal inundation. Public viewing and access is shown in black. Numbers represent points where ground photos were taken (January 9, 2004 and January 13, 2005).

#### Functions and values of habitat to be created

The Triangle Marsh Mitigation Project will result in high-quality tidal marsh. Success is primarily dependent on establishment of the planted native marsh vegetation. Success criteria will include adequate hydrology of the marsh area after excavation and establishment of a self-sustaining tidal marsh.

The fundamental goals of this project are to enhance shorebird and waterfowl habitats and associated tidal marsh wildlife and plant communities. This restoration plan seeks to meet four specific ecological goals for tidal marsh and their associated wetland-upland transition areas.

#### California Clapper Rail

One goal of this plan is to increase habitat suitable for use by the federally endangered California clapper rail (*Rallus longirostris obsoletus*). Clapper rails utilize tidal marshes in the San Francisco Estuary. Individuals of this species have been observed at the site (Barbara Salzman pers. comm.), although no survey has been performed to determine the extent or breeding success of their populations.

Appropriate habitat for the California clapper rail includes tidal marsh with a predominance of pickleweed-vegetated (*Salicornia virginica*) marsh plains and cordgrass-vegetated (*Spartina* sp.) lower marsh, as well as access to other high marsh plants. Other habitat requirements for clapper rail establishment are marsh area, relative distance between the site and other marshes, size of buffer between marsh and upland, and low human disturbance.

#### Salt Marsh Harvest Mouse

Another goal of this plan is to increase habitat suitable for use and occupation by the federally endangered salt marsh harvest mouse (*Reithrodontomys raviventris*). The salt marsh harvest mouse (SMHM) can be found in salt marshes around San Francisco, San Pablo, and Suisun Bays. Populations of SMHM are present in salt marshes near the site, such as Corte Madera Ecological Reserve, and may already be present at Triangle Marsh. SMHM habitat requirements are the pickleweed and peripheral halophyte zone in mid-to upper marsh areas.

### *Other Plant and Wildlife Resources*

The third ecological goal of this plan is to provide habitats suitable for use and occupation by tidal marsh and wetland-upland transition dependent plant and wildlife species.

### *Wetland/Upland Transitional Refuge*

The fourth ecological goal of this plan is to provide wetland-upland transitional habitats along the margins of restored tidal marsh. This transitional zone consists of gently sloping topography across which microhabitats can establish provide refuge from extreme high-tide events, as well as tall native cover vegetation such as marsh gumplant (*Grindelia stricta*) and salt marsh baccharis (*Baccharis douglasii*) for predator avoidance.

## **Mitigation Site**

### **Location and size of mitigation area**

The Triangle Marsh property is 13 ha (31 a) and is bounded by Paradise Drive on the south, San Francisco Bay on the north, the Marin Country Day School on the east, and a narrow band of tidal marsh and the Mariner's Cove housing subdivision on the west. It lies immediately north of the Ring Mountain Nature Preserve, separated by Paradise Drive. The Corte Madera Ecological Reserve lies northwest of Triangle Marsh, separated by the housing subdivision.

Existing site features at Triangle Marsh include tidal marsh and tidal pannes on the western and central portions of the site, upland fill in the southeastern portion of the site adjacent to Paradise Drive and a remnant berm along the western site boundary. Central San Francisco Bay lies on the northern boundary, which includes intertidal mudflats and shallow open water. San Clemente Creek empties into the Bay a short distance west of the site.

## **Implementation Plan**

### **Rationale for expecting mitigation success**

Collection and analysis of data in this area by MAS combined with the fact that historically, all of Triangle Marsh was a part of a larger tidal marshland in the Marin Baylands, led to the determination that additional tidal marshland can be created at this site. This rationale was determined by analysis of tidal datum, storm water flow, soils, current ecosystem types, and existing vegetation within the Triangle Marsh area.

Vegetation planting will be limited to species that occupy the margins of the tidal marsh and may not necessarily colonize rapidly, including marsh gumplant, alkali heath (*Frankenia salina*), and jaumea (*Jaumea carnosa*). Planting will also include native species in the wetland-upland transition area and will include salt marsh baccharis.

Public access for this project aims to balance the needs of wildlife protection with opportunity for wildlife-sensitive viewing opportunities. The berm constructed parallel to Paradise Drive has a crest elevation 0.9 m (3 ft) above the roadway and is intended to discourage public entry into the restored marsh while maintaining viewing corridors for pedestrians, bicyclists, and motorists. Signs will be installed discouraging public entry and a small fence may be considered.

Along the eastern section of the new berm, a point-access location is also provided. This point access will consist of a 6 m (20 ft) diameter semicircle earthen platform located atop the eastern berm. The access will be reached via an earthen path up the berm slope. No additional improvements or interpretive signs for this access are planned as part of this project. This access point will allow open views to the existing and restored marsh and beyond to San Francisco Bay.

Construction occurred in upland areas and avoided areas dominated by pickleweed and other native marsh vegetation that may potentially provide habitat for the salt marsh harvest mouse. Clapper rails have been observed on the site in previous surveys, although locations were not documented. Therefore, it is inferred that clapper rails could be present at any location on the site. Cooper Crane and Rigging, contractors for MAS, began grading and contouring the site in January 2004. To avoid potential impacts to the California clapper rail, the contractor did not resume grading and contouring of the site until September 2004. Grading and contouring work was completed in January 2005 and MAS began planting the upland areas with native plant species.

## **Monitoring Plan**

### **Monitoring methods**

Caltrans biologists will take photographic records of the same locations annually during the five-year monitoring period to monitor the progress of the restoration work (figure 2). Figures 3, 4, and 5 are representative of the photographic records taken at the site.

Caltrans biologists will conduct plant sampling in the spring and summer to detect early and late-seasonal species. This plant monitoring includes measuring the trend analysis for vegetation at the restoration areas (eastern section, middle section, and western section). Caltrans biologists will map the extent of the vegetation cover using a Global Positioning System (GPS). Annual reports submitted to MAS, California Department of Fish and Game, U.S. Army Corps of Engineers, San Francisco Bay Conservation and Development Commission, and the California Regional Water Quality Control Board will include the initial extent of vegetation coverage in the area, the types of species in the area, and an

estimation of the dominant types of vegetation present. The annual report will document the percentage of change in plant coverage from the previous year. Caltrans biologists will use a minimum of nine random vegetation sample plots to estimate plant coverage and dominance in each zone.

To obtain the sample plots, a grid with 3 x 3 m (10 x 10 ft) quadrats was placed over an aerial photo of the site. Each section was divided into three zones to provide an equal representation from different elevations. The upper zone contains mostly upland plants installed by MAS, the middle zone represents a transition between upland and tidal zones, and the lower zone represents the tidal marsh. Caltrans biologists will randomly choose a minimum of one quadrat from each zone to monitor percent cover change of vegetation from year to year. The objective is to conduct a random sampling of approximately 10% of the project area.

Caltrans biologists will record wildlife usage of Triangle Marsh when they are observed during field surveys.

At the end of the five-year monitoring period in 2009, Caltrans expects that the restored areas will have at least 70% coverage of native species typical of tidal marsh habitats and native wetland and upland areas.

## **Results**

### **Post-restoration survey**

Caltrans biologists Michael Galloway, Hal Durio, Tami Schane, and Chuck Morton conducted post-restoration surveys of Triangle Marsh on January 13, 2005, and June 7, 2005. Dominant plants and wildlife within the three restoration areas (eastern, middle, and western sections) were surveyed. The biologists photographed each restoration area at the same points where pre-restoration photographs were taken (figure 2). Figures 3, 4, and 5 are representative of the photographic records taken at the site. Caltrans biologists delineated the plant coverage of each of the three restoration areas by GPS to determine success of natural recruitment. Table 1 is a listing of the vegetation observed on June 7, 2005, for the eastern, middle, and western MAS sections of the site.

### **Eastern section**

Because the January 13, 2005, survey occurred shortly after the grading and contouring of the site was completed, not many plants were observed growing in the eastern section (figure 3). The upland berm of the eastern section was sparsely planted with California sagebrush (*Artemisia californica*), marsh gumplant, coyote brush (*Baccharis pilularis*), toyon (*Heteromeles arbutifolia*), and coast live oak (*Quercus agrifolia*). Pickleweed, marsh gumplant, and California cordgrass (*Spartina foliosa*) were growing at the margins of the eastern section adjacent to the tidal marsh.

Caltrans biologists observed least sandpipers (*Calidris minutilla*) and killdeer (*Charadrius vociferus*) in the excavated areas of the eastern section. Caltrans biologists also observed American crows (*Corvus brachyrhynchos*) and a turkey vulture (*Cathartes aura*) flying near the project area. Deer tracks (*Odocoiles hemionus*) and droppings and raccoon (*Procyon lotor*) tracks were observed throughout the eastern section.

A second plant survey was conducted on June 7, 2005, after MAS completed the installation of upland native plants. During this survey, Caltrans biologists determined plant coverage in quadrats sampled randomly in the eastern section.

Plant coverage in the randomly sampled plots in the tidal zone ranged from 0% to 51% with native marsh plants such as pickleweed, sparsescale (*Atriplex triangularis*), and saltgrass (*Distichlis spicata*) recruiting from the adjacent tidal marsh into the restoration area (Table 1). Plant coverage in the randomly sampled plots in the wetland-upland transition zone ranged from 31% to 100%, showing much more recruitment into these areas of tidal marsh plants, especially those directly adjacent to the tidal zone while those areas directly adjacent to the upland zone showed a recruitment of non-native plant species such as birdfoot trefoil (*Lotus corniculatus*) and perennial rye grass (*Lolium perenne*).

Plant coverage in the randomly sampled plots in the upland zone ranged from 35% to 70%. The majority of plants establishing in the upland area consists of non-native plants such as birdfoot trefoil, perennial rye grass, and rabbit's foot grass (*Polypogon monspeliensis*). Plants installed by MAS were found in 8 (73%) of the 11 random upland quadrat samples. The coverage of installed plants ranged from 2% to 15% of the sampled areas and consisted of California sagebrush, coyote brush, blue-eyed grass (*Sisyrinchium bellum*), creeping wildrye (*Leymus triticoides*), meadow barley (*Hordeum brachyantherum*), and bee plant (*Scrophularia californica*). Table 1 lists the plants observed in the sampled quadrats of the eastern section.



Point 1





Point 2



Point 3

Figure 3. Eastern restoration section.

Photos taken before restoration work (January 9, 2004) are shown on the left. Photos taken after grading and contouring of the site (January 13, 2005) are shown on the right.

Table 1. Post-Restoration Plants Observed at Triangle Marsh (June 7, 2005)

Scientific name	Common name	Habitat-community	Section <sup>1</sup>	Zone <sup>2</sup>
<i>Anagallis arvensis</i>	Scarlet pimpernel	Non-native upland plant	E,M	U, W-U
<i>Artemisia californica</i> <sup>3</sup>	California sagebrush	Native upland shrub	E	U
<i>Atriplex triangularis</i>	Sparscale	Native marsh plant	E,M	TM, U, W-U
<i>Avena barbata</i>	Slender wild oats	Non-native upland grass	E,M,W	W-U
<i>Baccharis pilularis</i> <sup>3,4</sup>	Coyote brush	Native upland shrub	E,M	U
<i>Bromus diandrus</i>	Ripgut grass	Non-native upland grass	M	U
<i>Cotula coronopifolia</i>	Brass buttons	Non-native marsh plant	E	TM, U, W-U
<i>Cuscuta sp.</i>	Dodder	Native marsh plant	E,M	W-U
<i>Distichlis spicata</i> <sup>4</sup>	Salt grass	Native marsh plant	E,M,W	TM, W-U
<i>Eryngium sp.</i>	Coyote thistle	Native plant	E	W-U
<i>Frankenia salina</i>	Alkali heath	Native marsh plant	E	W-U
<i>Grindelia stricta</i> <sup>3,4</sup>	Marsh gumplant	Native marsh plant	E	W-U
<i>Hordeum brachyantherum</i> <sup>3</sup>	Meadow barley	Native upland grass	E,M,W	U
<i>Jaumea carnosae</i> <sup>3</sup>	Jaumea	Native marsh plant	M	U
<i>Leymus triticoides</i> <sup>3</sup>	Creeping wildrye	Native upland grass	E,M,W	U
<i>Lolium perenne</i>	Perennial rye grass	Non-native upland grass	E,M,W	U, W-U
<i>Lotus corniculatus</i> <sup>4</sup>	Birdfoot deerweed	Non-native upland plant	E,M	U, W-U
<i>Melilotus officinalis</i>	Yellow sweetclover	Non-native upland plant	E,M,W	U
<i>Parapholis incurva</i>	Sickle grass	Non-native marsh plant	E	U
<i>Phalaris aquatica</i> <sup>4</sup>	Harding grass	Non-native wetland grass	E	W-U
<i>Plantago lanceolata</i>	English plantain	Non-native upland plant	M	U, W-U
<i>Polypogon monspeliensis</i>	Rabbit's foot grass	Non-native wetland grass	E,M	U, W-U
<i>Salicornia virginica</i> <sup>4</sup>	Pickleweed	Native marsh plant	E,M,W	TM, W-U
<i>Salsola soda</i> <sup>5</sup>	Alkali Russian thistle	Non-native marsh plant	E,M	TM, W-U
<i>Scrophularia californica</i> <sup>3</sup>	Bee plant	Native upland plant	E	U
<i>Spartina foliosa</i>	California cordgrass	Native marsh plant	M	TM, W-U
<i>Sisyrinchium bellum</i> <sup>3</sup>	Blue-eyed grass	Native upland grass	E	U
<i>Triticum aestivum</i>	Wheat	Non-native upland grass	E	U

1. E = Eastern, M = Middle, W = Western.

2. TM=Tidal Marsh, W-U=Wetland-Upland Transition Area, U=Upland.

3. Plants installed by the Marin Audubon Society.

4. Plants observed in the area during the pre-construction period (January 9, 2004).

5. *Salsola soda* was manually removed from site where feasible.

### Middle section

The middle section, like the eastern section, did not have many plants growing in the area as of the January 13, 2005, survey because this section was recently graded and contoured (figure 4). The upper berm of the middle section was also sparsely planted with toyon, coyote brush, marsh gumplant, California sagebrush, and bee plant. Caltrans biologists observed killedeer and deer tracks in the middle section.

A second plant survey was conducted on June 7, 2005, after MAS completed the installation of upland native plants. During this survey, Caltrans biologists determined plant coverage in quadrats sampled randomly in the middle section.

Plant coverage in the randomly sampled plots in the tidal zone ranged from 10% to 30%, with native marsh plants such as pickleweed, sparscale, marsh gumplant, and saltgrass recruiting from the adjacent tidal marsh into the restoration area. Plant coverage in the randomly sampled plots in the wetland-upland transition zone range from 35% to 55%, showing much more recruitment into these areas of tidal marsh plants, especially those directly adjacent to the tidal zone while those areas directly adjacent to the upland zone showed recruitment of non-native plant species, such as perennial rye grass and yellow sweetclover (*Melilotus officinalis*). Plant coverage in the randomly sampled plots in the upland zone ranged from 36% to 70%. The majority of plants establishing in the upland area consist of non-native plants such as yellow sweetclover, perennial rye grass, and rabbit's foot grass. Plants installed by MAS were found in three (75%) of the four random upland quadrat samples. The coverage of installed plants ranged from 0% to 7% of the sampled areas and consists of coyote brush, creeping wildrye, meadow barley, and jaumea. Table 1 lists the plants observed in the sampled quadrats of the middle section.



Point 4



Point 5



Point 6

Figure 4. Middle restoration section.

Photos taken before restoration work (January 9, 2004) are shown on the left. Photos taken after grading and contouring of the site (January 13, 2005) are shown on the right.

**Western section**

The western section was also recently graded and contoured down to marsh elevations (figure 5). Pickleweed and marsh gumplant were growing at the margins of the western section adjacent to the tidal marsh on the January 13, 2005, survey. As natural recruitment of the area is expected to occur, the western section was not planted.

Caltrans biologists observed a dead deer, a turkey vulture, and killedeer near the western section. Caltrans biologists identified a California red-sided garter snake (*Thamnophis sirtalis infernalis*) at the edge of the western section in the pickleweed.

A second plant survey was conducted on June 7, 2005, after MAS completed the installation of upland native plants. During this survey, Caltrans biologists determined plant coverage in quadrats sampled randomly in the western section.

The tidal zone in the western section was completely submerged during the survey and no plant coverage in this area was observed. Plant coverage in the randomly sampled plots in the wetland-upland transition zone ranged from 24% to 55%, showing recruitment into these areas of tidal marsh plants such as pickleweed and saltgrass from the adjacent tidal zone. Plant coverage in the randomly sampled plot in the upland zone was 95%, consisting mostly of non-native plants such as yellow sweetclover, perennial rye grass, and slender wild oats (*Avena barbata*). MAS planted creeping wildrye in this area and it was found in 10% of the sampled area. Table 1 lists the plants observed in the sampled quadrats of the western section.



Point 7



Point 8



Point 9

Figure 5. Western restoration section.

Photos taken before restoration work (January 9, 2004) are shown on the left. Photos taken after grading and contouring of the site (January 13, 2005) are shown on the right.



## **Conclusions**

At the eastern section, Caltrans expects that 0.412 ha (1.019 a) of the 0.781 ha (1.929 a) area of land that was contoured and graded will become tidal marsh habitat, 0.084 ha (0.207 a) will become wetland-upland transition areas and 0.285 ha (0.704 a) will become upland habitat after five years.

The quadrats sampled in the tidal marsh of the eastern section show an average of 3% total plant coverage. Because biologists conducted a plant survey of the area only five months after the area was recontoured, this survey does not adequately represent annual plant growth in the area. Plant surveys scheduled for January 2006 will provide a better estimate of annual plant growth in the tidal-marsh area.

The quadrats sampled in the upland-wetland transition areas of the eastern section show an average of 80% total plant coverage. The transition areas directly adjacent to the marsh show recruitment of native marsh plants. Approximately half of the transition area directly adjacent to the upland berm shows recruitment of non-native plant species. MAS will determine whether to control the spread of non-native upland plant materials that have established in the area.

The quadrats sampled in the upland areas of the eastern section show an average of 54% total plant coverage, but only 13% of total plant coverage is represented by plants installed by MAS. MAS will determine whether to install more native plants or to implement weeding methods to control the spread of non-native upland plant materials that have established in the area.

At the middle section, Caltrans expects that 0.057 ha (0.141 a) of the 0.182 ha (0.451 a) area of land that was contoured and graded will become tidal marsh habitat, 0.021 ha (0.053 a) will become wetland-upland transition areas and 0.104 ha (0.257 a) will become upland habitat after five years.

The quadrats sampled in the tidal marsh of the middle section show an average of 21% total plant coverage. The tidal area in the middle section may have more plant coverage than the eastern section because of differences in tidal inundation, differences of elevation of the sampled areas, or differences in how the quadrats were sampled. Plant surveys scheduled for January 2006 will provide a better estimate of annual plant growth in the tidal-marsh area. The quadrats sampled in the upland-wetland transition areas of the middle section show an average of 46% total plant coverage. The transition areas directly adjacent to the marsh show recruitment of native marsh plants. Approximately 21% of the transition area directly adjacent to the upland berm show recruitment of non-native plant species. MAS will determine whether to control the spread of non-native upland plant materials that have established in the area.

The quadrats sampled in the upland areas of the middle section show an average of 54% total plant coverage, but only 4% of total plant coverage is represented by plants installed by MAS. MAS will determine whether to install more native plants or to implement weeding methods to control the spread of non-native upland plant materials that have established in the area.

At the western section, Caltrans expects that 0.014 ha (0.034 a) of the 0.081 ha (0.200 a) area of the levee that was contoured and graded will become tidal marsh habitat and 0.067 ha (0.166 a) will become wetland-upland transition areas after five years.

The quadrat sampled in the tidal marsh of the western section did not show any plant coverage. This area is constantly submerged, which may inhibit plant growth or prevent plants in the area from being identified. Future plant surveys may identify plants growing in this area.

The quadrats sampled in the upland-wetland transition areas of the western section show an average of 39% total plant coverage. Because this transition area is located directly adjacent to the marsh, it shows recruitment of a high percentage of native marsh plants.

The quadrat sampled in the upland area of the western section show approximately 95% total plant coverage, but only 10% of total plant coverage is represented by plants installed by MAS. MAS will determine whether to install more native plants or implement weeding methods to control the spread of non-native upland plant materials that have established in the area.

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**Biographical Sketches:** Chuck Morton is a district branch chief for the California Department of Transportation in the Oakland office. His area of responsibility encompasses Marin, Sonoma, Napa, Solano, and Contra Costa Counties and includes over 700 miles of roadway. He holds a B.S. in biology and marine science and a M.S. in environmental planning.

Michael Galloway is currently employed as a biologist for Caltrans. He graduated from San Francisco State University in 2001 with an M.A. degree in marine biology. His master's thesis focused on Pacific harbor seal (*Phoca vitulina richardii*) haul-out behavior at a haul-out site in the San Francisco Bay. He is currently monitoring several Caltrans restoration projects in the San Francisco Bay area, including this project, and the Triangle Marsh Restoration Project in Corte Madera, California.

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