MVSD River Otter Study

Interim Report: February 2017

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Introduction

The North American River Otter (*Lontra canadensis*) is a semi-aquatic mustelid endemic to North America, a keystone carnivore and a sentinel for environmental contamination. Although the species is highly dependent on freshwater, otters traverse through and forage within a variety of habitats that include terrestrial, marine, estuarine, and freshwater ecosystems. They predate an array of species such as native and non-native freshwater, anadromous, and marine fishes, waterbirds, crustaceans and amphibians.

Very little is known about the current status, distribution, and ecology of river otters in California. Historically documented, but shortly thereafter extirpated from much of their range in the early 20th century, populations were offered protection through fur trapping restrictions in 1961. Since then, and only just within the past few years, a selection of research has been published on populations in California, with these studies limited to Northern California, the San Francisco Delta, inland mountainous regions of the state and the San Francisco Bay Area.

The River Otter Ecology Project (ROEP) monitors ~225 linear km of coastal, wetland, riverine and reservoir in Marin County, California, using noninvasive methods, for population, health, prey and dispersal information. Moorhen and McNabney Marshes comprise ROEP's initial site outside Marin County, and make an interesting contrast to Marin sites, in part because river otters were never extirpated from the Martinez area as they were in coastal and southern Marin. Additionally, McNabney Marsh is heavily managed by tide gate operations, and Moorhen Marsh is a constructed wetland that receives almost all of its water from treated wastewater effluent. Both wetlands occur in a heavily industrialized area and Peyton Slough and McNabney Marsh are both affected by Shell Martinez Refinery's storm water discharges during the wet season.

Habitat description

Moorhen Marsh is a 21-acre, constructed treatment wetland dependent on treated effluent as its primary water source. It is surrounded on two sides by the Shell Martinez Refinery, and on one side by Interstate 680. Native wildlife species dependent on the wetland for habitat include the western pond turtle, North American river otter, mink, North American beaver, and many species of birds including marsh wren, San Francisco common yellow-throat, Suisun song sparrow, green heron, snowy egret, and black-crowned night heron.

McNabney Marsh is a restored, muted tidal wetland located east of I-680 in Martinez. The 138-acre wetland is jointly owned by MVSD and the East Bay Regional Park District, with an agreement that gives MVSD responsibility for its management. Notable species include American white pelican, California black rail, northern harrier, and salt marsh harvest mouse.

River otters have been routinely observed in the wetlands since at least 2009. A group of 9 river otters was observed by MVSD Biologist, Kelly Davidson, in Moorhen Marsh in 2011 and reported to ROEP via its Otter Spotter citizen science web portal. One river otter was reported to the California Roadkill Observation System as a mortality on Waterbird Way, adjacent to McNabney Marsh, in 2011; however, until 2016 there were no formal surveys or monitoring for river otters on these properties.

Project Goals

MVSD and ROEP partnered in September 2016 to:

- noninvasively gather information on river otter presence, abundance and habitat use within Moorhen and McNabney Marshes,
- document sex ratios as possible,
- document pup emergence and survival; and to
- advise on mitigations for disturbance in otter habitat due to vegetation removal, dewatering, dredging and other work associated with upcoming maintenance and habitat enhancement projects in Moorhen Marsh and McNabney Marshes.

Methodology

ROEP surveyed Moorhen and McNabney Marshes on foot, marking likely otter corridors/paths (as determined by their proximity to water and otter sign such as scat and wallowing places), dens, latrine sites and wallows, using Collector for ARC GIS (ESRI). ROEP placed six motion detector, infrared Bushnell trail cameras at latrine sites, in wildlife corridors and at crossovers between the two marshes (Peyton Slough and culverts under Highway 680), and one camera dedicated to moving from place to place as needed. Cameras were programmed to record video both day and night.

The moving camera was originally deployed in McNabney Marsh at the Bridge in Peyton Slough, then moved to the south end of the marsh, then located at the north side of the marsh and finally removed due to high water and risk of inundation. Please see Map 1.

Surveys and camera checks are conducted weekly and are ongoing, beginning in September 2016. ROEP collected, viewed and documented videos including otter activity. We noted other wildlife, saving videos of other animals that were of particular interest, such as North American beaver. Documentation of otter videos includes date, time, number of otters seen in each video and unusual behavior, such as mating and pregnancy. Identifying traits, if any, are noted, such as a particular otter with an ocular defect that eliminates eye shine at night in that individual. Cameras were adjusted as necessary for better video. Video is catalogued and stored in multiple locations for backup.

Due to heavy rains in December and January, the McNabney Marsh cameras were removed to avoid submersion and camera failure. They will be replaced once the danger of high water/flooding is past.

When vegetation removal began at Moorhen Marsh on January 25, 2017, one camera was used solely for "roaming", and was deployed in two different spots to record otter reaction to vegetation pulling. Those placements are indicated on Figure 1 by triangular icons.

Figure 1: Camera Sites, Moorhen and McNabney Marshes

Data represented in this report from Sites MH01, MH02, MH03 and MC01, MC02 and MC03 includes all videos from camera deployment in September 2016 through January 31, 2017.

Data from MH04A and MH04B (diamond-shaped) are from the moving camera deployed during vegetation removal at Ponds C, D and E. The data includes videos from January 25 through February 17, 2017.

Results

Initial surveys indicated heavy otter use of Moorhen Marsh, with multiple otter scats and latrine sites noted mainly at and around Ponds C, D and E, and one latrine site at Pond A. Numerous otter slides and wildlife corridors were noted around the ponds. These paths are used by various species; therefore we deployed cameras primarily at otter latrine sites and wallows.

In McNabney Marsh, cameras were deployed at the Peyton Slough/I-680 underpass as well as the center culvert under I-680, where we noted a clear path through aquatic vegetation from the marsh to the central culvert tunnel. The third McNabney camera was placed near the East Channel tide gate structure bridge (Bridge), at the location of a large otter latrine site, to discover whether the otters proceeded through the slough and as far as the Bridge, or moved in a different direction in that area.

Our results can be summarized as follow:

1. Otters traversed the Moorhen Marsh cameras significantly more often than the McNabney Marsh cameras. Out of 472 total videos, the three Moorhen Marsh cameras accounted for 381 detections (76%), and the three McNabney cameras accounted for 91 detections (24%).
2. At the two southernmost of the Moorhen Marsh sites, the otters visit more frequently than other sites and stay longer when they visit (See Fig. 3)
3. The otters used the center culvert 67 times (76%) to go between the marshes, and used Peyton Slough only 16 times (24%).
4. Once the otters leave the culvert and/or Peyton Slough on their way into McNabney Marsh it is unclear as yet how they travel in McNabney.
5. During and after mowing and vegetation removal, the otters changed their pathways and use of the ponds.
6. River otters are breeding in the Moorhen Marsh area and most likely have a den on Shell Martinez Refinery property.
7. River otter mortalities: 2 by car strike and 1 from unknown etiology.

Otter, McNabney Marsh, by Karen James

Discussion Findings #1, #2 and #3

Otters use Moorhen Marsh to hunt, to socialize, to gather information from scent-markings and as a corridor between the Shell Martinez Refinery property and McNabney Marsh. Survey and video findings show a large and well-used latrine site at MH01. Otters use the site as a pass-through and scent-marking area before moving on to hunt. As they come back through the area toward the Shell Refinery, they exhibit the same behaviors.

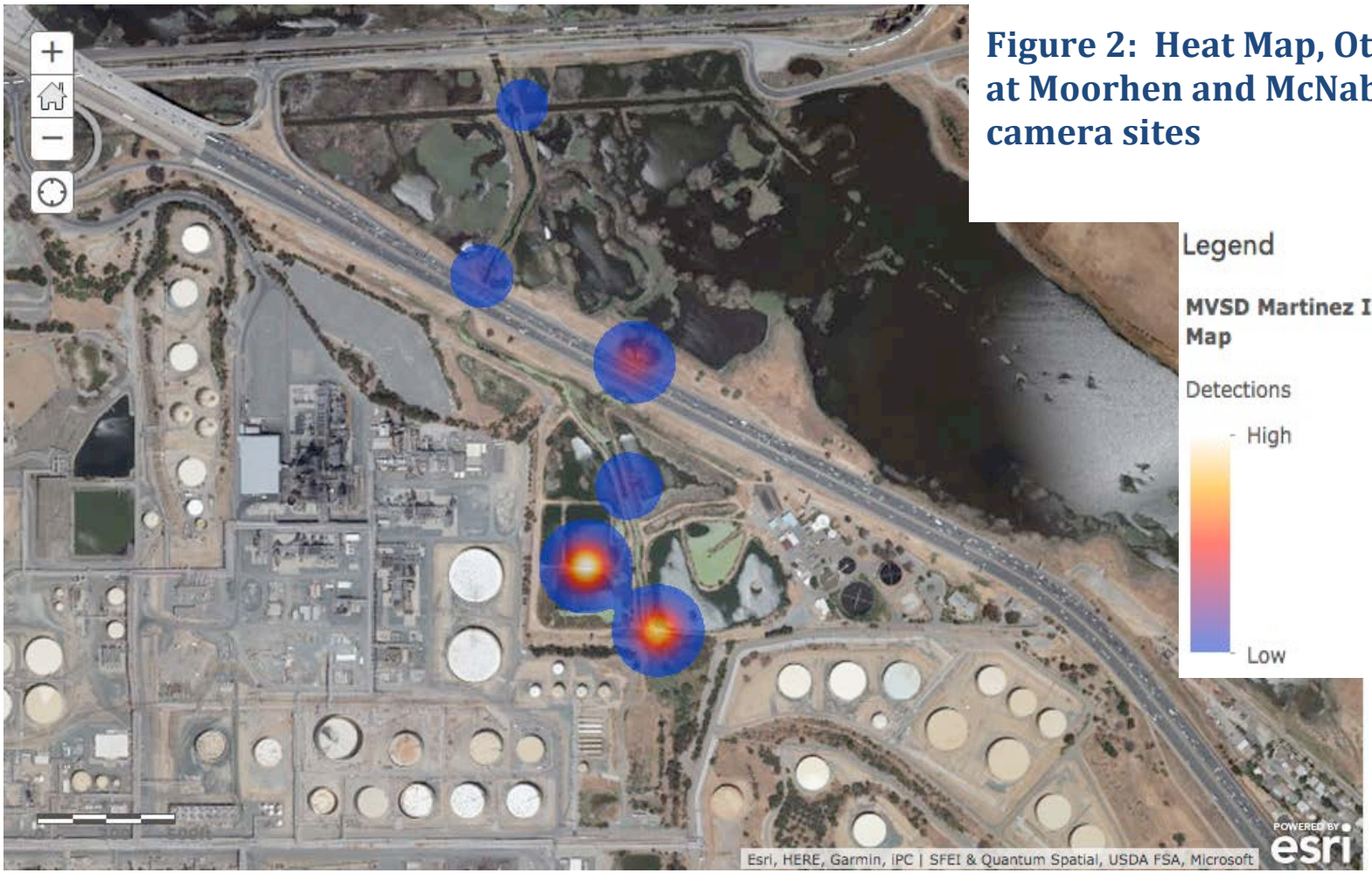


Figure 2: Heat Map, Otter Detections at Moorhen and McNabney Marsh camera sites

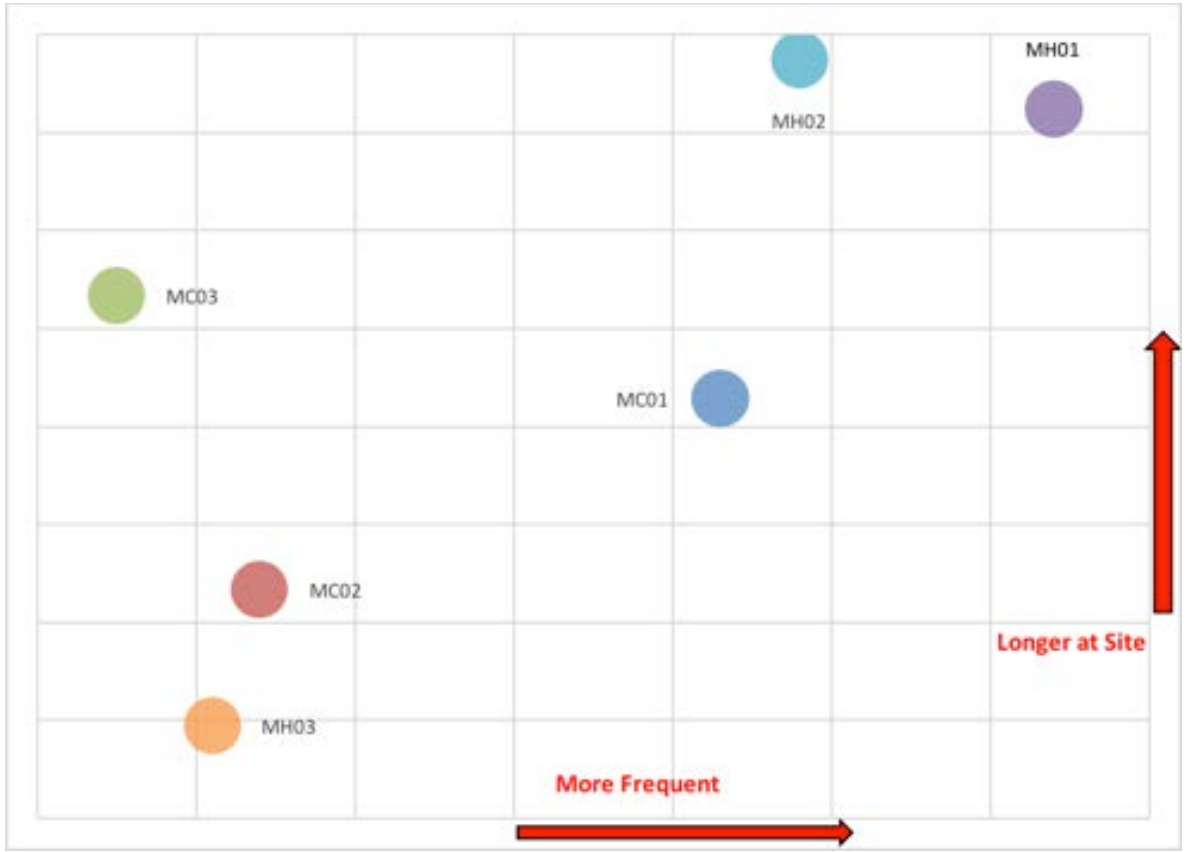
Discussion Finding #4

Median time between videos indicate that otters spend more time at MH01 and MH02 than at other cameras. In conjunction with the heat map, the data show otters are present at MH01 and MH02 on more days than at any other site. Further study will determine whether there are similarly intensively visited sites in McNabney Marsh.

Site	Days Detected	% of All Days
MC01	43	30%
MC02	14	10%
MC03	5	3%
MH01	64	45%
MH02	48	34%
MH03	11	8%

Behaviors observed include:

- Socializing,
- Scent-marking,
- Urinating/defecating,
- Entering and leaving the ponds,
- Mating



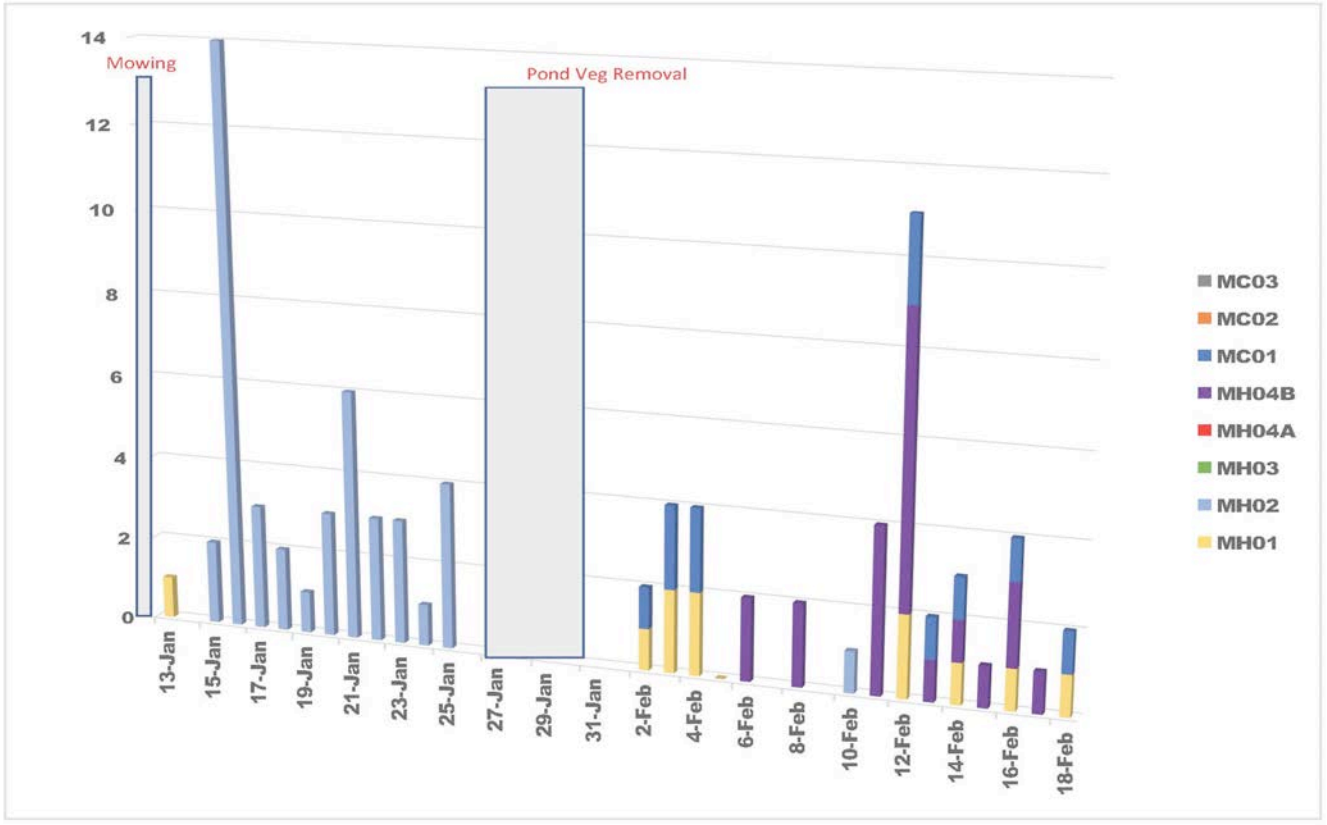
Discussion Finding #5

On January 13, 2017, the Moorhen Marsh levees were mowed. On January 25, 2017 vegetation removal began on Ponds E, D and C, (in that order) and proceeded through January 29, 2017. Work proceeded more or less from Pond E through Pond C, through January 29, but was not a strictly linear process. On January 29, the last day of vegetation removal, work continued in each pond. Cameras MH01, MH02 and MH03 remained in place during the vegetation removal, and one roaming camera, MH04, was deployed.

Please see Figure 1 for roaming camera sites MH04A and MH04B.

Cameras MC02 and MC03 had been removed due to risk of inundation by January 14, 2017 and were not replaced during the course of this study period.

Figure 4: Otter Detections by Site after Vegetation Removal



Pre-mowing and vegetation-removal, the otters visited MH01 and MH02 often, but not always regularly. In late September into early October, there was a gap of 10 days when the otters were not seen at MH01. There was a gap of nearly a month when the otters were not seen at MH02, from 10/12/16 to 11/9/16. At MH03, one of our least-visited cameras, there was a gap of 50 days when the otters were not seen.

After mowing, with the exception of one day, the otters were seen ONLY at MH02, not at the other Moorhen sites, nor, of note, at MC01, the culvert exit into McNabney. The Peyton Slough camera, MC02, had been removed due to inundation at that time, and the otters may have chosen the Slough exit into McNabney rather than the Culvert exit due to high water. MC01 was replaced on 1/30/17.

Once vegetation pulling began, otters were no longer seen at MH02, with the exception of one day. Beginning on 2/2/16, otters were seen at MH01, MC01 (culvert), and MH04B. The mowing and vegetation removal affected the otters' pathways through the marsh, but did not appear to cause them to leave the area thus far.

McNabney Marsh Culvert Camera

Scat patterns observed in Moorhen Marsh show the otters have changed their pathways through the marsh since the vegetation removal. However, they haven't yet re-established new corridors. The otters appear to be moving from Peyton Slough into Pond A, sometimes passing MH01, but not always. There is likely another way they're entering the Shell Property, which we haven't yet discovered. Before vegetation removal, the otters spent time socializing and scent marking on the levees. They are using Ponds C and D to some extent, but not as much as they did previously.

In addition to pond vegetation cutting, unusually heavy rainfall raised the pond levels in Moorhen and McNabney Marshes and Peyton Slough, and Shell Martinez Refinery storm water releases increased water levels in Peyton Slough and McNabney Marsh. Without a baseline understanding of normal otter use of the slough and marshes, we cannot ascertain the effect of unusually high water levels on otter usage.

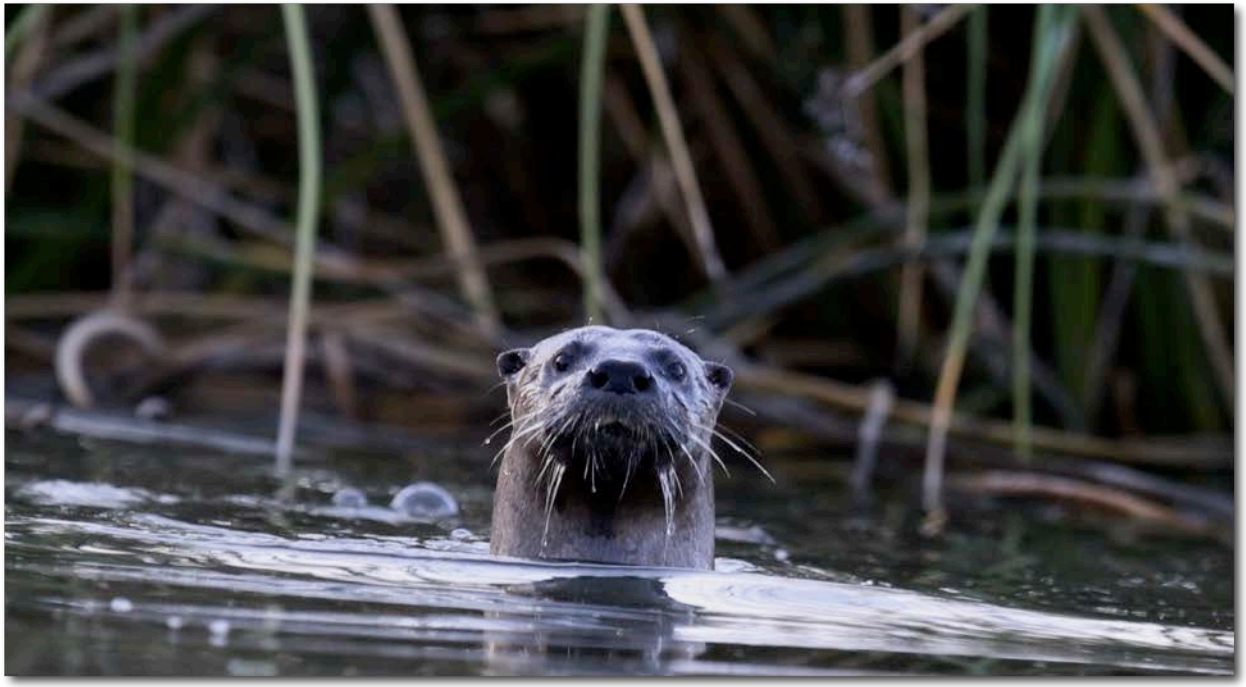
Moorhen Marsh Camera

Discussion Findings #6 and #7: Birth and Mortality

Two otters were killed by car strike, and reported to ROEP on January 20, 2017. One of the two otters was sexed as male; we do not know the sex of the other. It is not unusual for otters to move away from water to explore, particularly in the winter when young are dispersing from their family groups, and during heavy rains when ditches and ephemeral streams fill, providing pathways between watersheds.

Another otter carcass was discovered in the central bore of the culvert (MC01) on 1/28/17 by Karen James (ROEP contractor). Cause of death was undetermined as the carcass was old and dessicated. We surmise the otter was flushed through the bore during high waters due to rain and Shell Martinez Refinery storm water release.

A pregnant otter was seen moving through MH01 on 2/12/17. Otter birthing season is approximately between February 15 and May. Two otters were seen on video engaging in mating behavior on 2/13/17 (see video link at end of report). Mating usually occurs 2-4 weeks post-partum in otters. It is possible that there is already a natal den in the area, in addition to a pregnant otter. Future videos will reveal more information about pup numbers, emergence and survival.



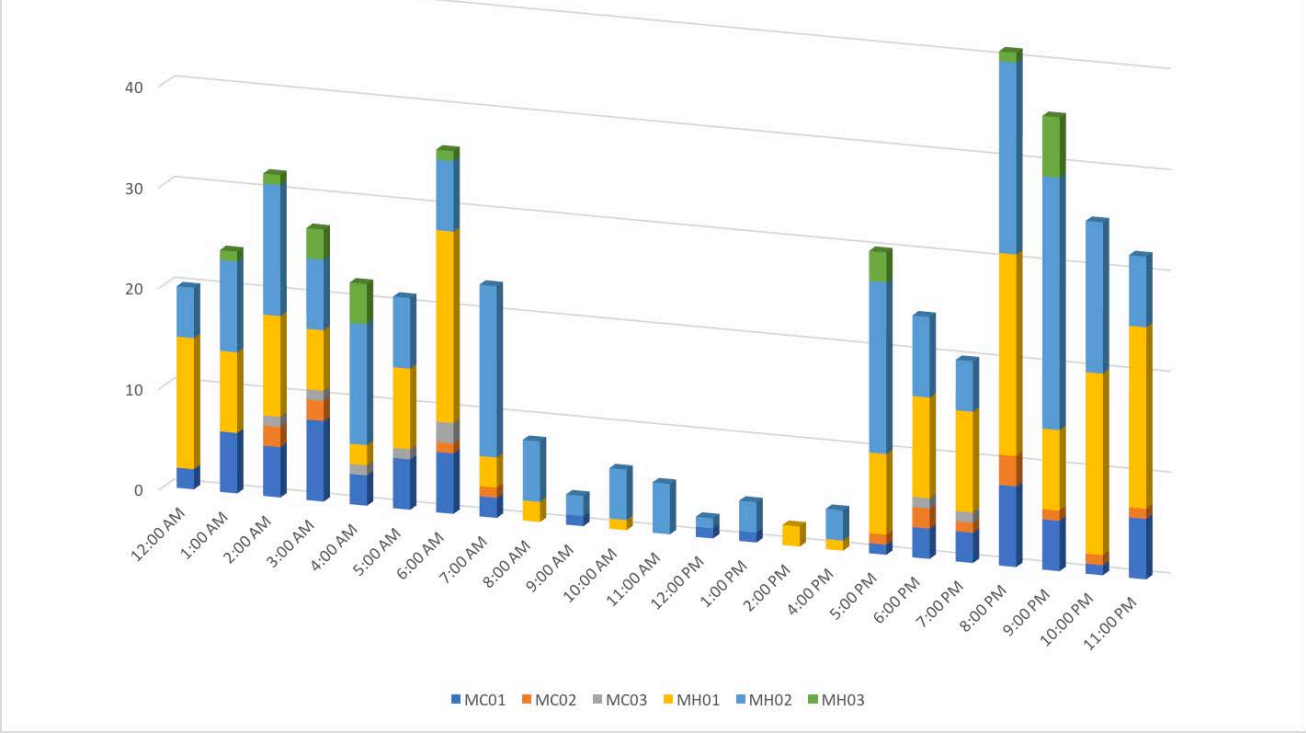
Other Findings

Site	Largest Group	Smallest Group
MC01	7	1
MC02	4	1
MC03	5	1
MH01	11	1
MH02	6	1
MH03	6	1

Figure 5: Largest and Smallest Groups Sizes by Site

Figure 6: Otter Detections by Site/Time of Day

The otters were most active between 5PM and 7AM. Activity times were relatively constant across camera sites. River otters are flexible in their activity times, reflected here.



Comparison with Las Gallinas Valley Sanitary District Monitoring Project

ROEP monitors the Las Gallinas Valley Sanitary District (LGVSD) ponds in San Rafael. The District's wastewater treatment and recycling facilities are located on over 400 acres on San Pablo Bay. The wastewater ponds comprise 3 ponds and 60 acres, and are surrounded by marshland, Miller Creek and San Pablo Bay. The first of the three main ponds has vegetated islands and is surrounded by cattails; the other two are empty and surrounded by riprap and walking paths. The pond lined by thick reeds and cattails, is a host to many species of migrant and resident birds. Notable birds in the area include least bittern, California black and Ridgways rails. The reclamation ponds are used daily by birders and other walkers.

ROEP has maintained 1-2 trail cameras at reclamation ponds at LGVSD since Fall 2015. Up to seven otters were seen together at the ponds in 2015 and 2016, including a female with two pups. The otters used den banks on the islands for resting areas, but natal dens in that area are unlikely due to high water in winter and spring. In 2016, observations of otters in large groups were confined to one group of 6 in December, 2016.

LGVSD is not being intensively monitored, as is MVSD; therefore comparisons are relative and our information is more limited at LGVSD. We monitor LGVSD for otter presence and abundance. Otter detections dropped in 2016, due partially to earth-moving work occurring at the vegetated pond, which is more often used by otters than the others. LGVSD intends to pull some or all of the cattails surrounding the pond in 2017. The otters have not been detected in LGVSD since December 2016 and the water level is currently too high for a trail camera.

River otters in LGVSD tend to move through the ponds fishing, and are active seasonally, with more sightings occurring in summer and fall than in winter and spring. This reflects the likelihood that females spend time nesting elsewhere in winter/spring, and mother/pup groups disperse and use the larger surrounding wetlands and particularly San Pablo Bay, for hunting.

ROEP will explore the possibility of increasing monitoring intensity of the LGVSD, which would be dependent upon the LGVSD interest level in the project.

Recommendations

1) Continue monitoring Moorhen and McNabney Marshes, with particular emphasis on:

- More detailed understanding of otter reaction to work in the reclamation ponds,
- Pup emergence, date, numbers and use of marshes,
- Females with young; sociability,
- Discovering otter use of McNabney Marsh,
- Seasonal variations in use of marshes.

2) Collect fecal samples for *Salmonella* and *Vibrio spp.* study in summer, 2017. This study is an ongoing partnership between ROEP and The Marine Mammal Center. ROEP has documented no *Salmonella,* and 4 species of *Vibrio* thus far.

3) Pups are born February 15 through approximately the end of April. We recommend consideration of denning season, February 15 through May when planning for the Moorhen Marsh Western Pond Turtle Habitat Enhancement Project. Construction for the project is scheduled for May through October 2017 and May through October 2018

Video Links

Pregnant Otter
Mating Otters
Large Group of Otters at Moorhen Marsh
Beaver