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## **River Otter (*Lontra canadensis*) Monitoring Report 2018 Marin County, California**

**The River Otter Ecology Project  
PO Box 103, Forest Knolls, CA 94933**

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## Background

While records on river otters in the San Francisco Bay Area are sparse, existing information indicates that river otters had been extirpated from much, if not all, of Marin County by the 1930's when both Grinnell and trapping records indicate no coastal river otters in Marin and southward. Beginning in 1989, river otters were noticed in coastal Marin County, particularly in Rodeo Lagoon, Walker Creek, and Lagunitas Creek.

As apex predators using variety of terrestrial and aquatic habitat types, river otters are sentinel indicators of watershed function and health (Larivière and Walton 1998). They predate a wide variety of native and non-native species in freshwater and marine environments (Penland and Black 2009, Garwood and others 2013). They are susceptible to parasites such as *Cryptosporidium* and *Giardia* spp. (Gaydos and others 2007), and *Vibrio* spp. (Bouley and others 2015), and they may bioaccumulate environmental contaminants such as mercury, metals, organochlorines, and hydrocarbons (Francis and others 1994, Halbrook and others 1996, Bowyer and others 2003). Furthermore, understanding river otter ecology and population status is a critical element of ecosystem management (Bowen 1997, Kruuk 2006, Ben-David and Golden 2009). River otters transport aquatic nutrients to land (Ben-David and others 2004); transmit trophic effects (Crait and Ben-David 2007); and affect the composition and abundance of prey species via trophic subsidy (Garwood and others 2013).

Beginning in 2012, River Otter Ecology Project launched the first study to document current recovering populations of river otters in the nine counties surrounding San Francisco Bay (Bouley and others 2015) using camera traps and Otter Spotter (a community science initiative to collect river otter sightings). At the same time, we commenced a long-term monitoring project to study the status and ecology of river otter populations at 14 focal study sites in Marin County.

As Melquist and others have noted, long-term monitoring of river otter populations can help us understand and plan for water quality conditions and other factors that affect all species, and remain critical issues in the San Francisco Bay Area. River otters' ecological status and population trends can be significant indicators of progress in improving water quality and recovering habitat and ecosystem function. Restoration projects may also benefit from an understanding of river otter population trends. In our study area in Marin County, for example, the National Park service has in recent years undertaken three large restoration efforts: at Rodeo Lagoon; Muir Beach; and Giacomini Wetlands. Gauging the progress of those efforts can benefit from understanding the interactive effects of river otter populations and the restoration efforts, and their mutual success. Restoration projects in the wider SF Bay Area can similarly benefit.

Lastly, study of population trends in river otters as they recolonize areas from which they were absent can help to elucidate the spatial, environmental, and anthropogenic factors that influence their habitat choices and ecological success (Barbosa and others 2001, Weinberger and others 2016). Although sensitive to habitat disturbance, river otters are also highly adaptable to human presence on the landscape.

This report includes results from both health and population trend studies during 2018 and mentions concurrent research projects underway.

## Study Area

Beginning in 2012, ROEP identified a study area consisting of approximately 225 linear km of coastline, stream, and reservoir spanning an area from the Golden Gate north, through Tomales Bay, including Lagunitas Creek and its tributaries and reservoirs, and parts of the shoreline of San Pablo Bay. We surveyed for active river otter latrines and movement corridors, which indicated ongoing presence of otters. The study area includes land within the Golden Gate National Recreation Area, Point Reyes National Seashore, California State Parks, Marin Municipal Water District and Las Gallinas Valley Sanitary District, and Marin County Parks. We include yearly surveys on additional stretches of shoreline within the study area. Please see Figure 1.

Figure 1: Study Area, 2018



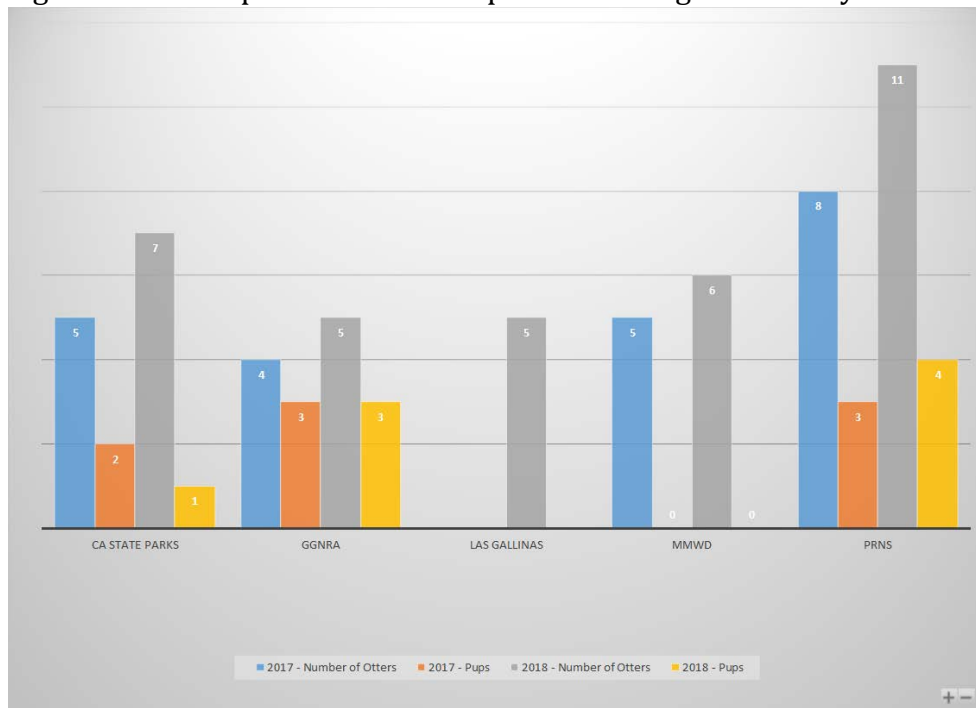
## Population Trends

We determined the minimum population at each Focal Study Site (FSS) as the largest grouping of river otters observed together at any one time at that location over the course of a calendar year (Bouley and others 2015). From the camera data for each FSS, we extracted the maximum group size appearing on a single video. From ArcMap, we extracted all Otter Spotter reports in the vicinity of that location for the same year. If a mapped Otter Spotter submission reported a larger group size, we based the minimum population at that site on that report, otherwise we used the camera data.

Figure Two: Population data 2016 - 2018

Study Site	Landowner	2016 Otters	2017 Otters	2018 Otters	2016 Pups	2017 Pups	2018 Pups
Abbotts Lagoon	PRNS	6	3	5	2	2	3
Northern Tomales Bay	PRNS	9	8	11	3	2	2
Giacomini Wetlands	PRNS	9	5	7	0	1	0
Rodeo Lagoon	GGNRA	4	4	5	0	3	3
Redwood Creek / Muir Beach	GGNRA	1	1	2	0	0	0
Tennessee Valley Lagoon	GGNRA	1	1	1	0	0	0
Drakes Bay	PRNS	7	8	7	5	3	3
Bass Lake	PRNS	4	0	5	0	0	1
MMWD Reservoirs	MMWD	7	5	6	2	0	0
Middle Lagunitas	CA State Parks	9	5	7	2	2	1
Las Gallinas	LGVSD	6	5	5	2	0	0
Drakes Estero	PRNS	4	4	7	2	2	0
<b>TOTALS</b>		<b>67</b>	<b>49</b>	<b>68</b>	<b>18</b>	<b>15</b>	<b>13</b>

Figure Three: Population data comparison among Focal Study Sites





Otter population numbers at focal study sites vary. River otters do not breed in their first year, and males may not breed until their 4<sup>th</sup> or 5<sup>th</sup> year. (Reed-Smith, 2012) Additionally, the numbers of otters counted are not precise due to camera trapping methods. Otter numbers are meant to be indicative of trends rather than actual population counts. Some variability is expected, and population trends are further explored in a statistical analysis (publication in preparation).

Figure Four: Otters by Focal Study Site, 2018

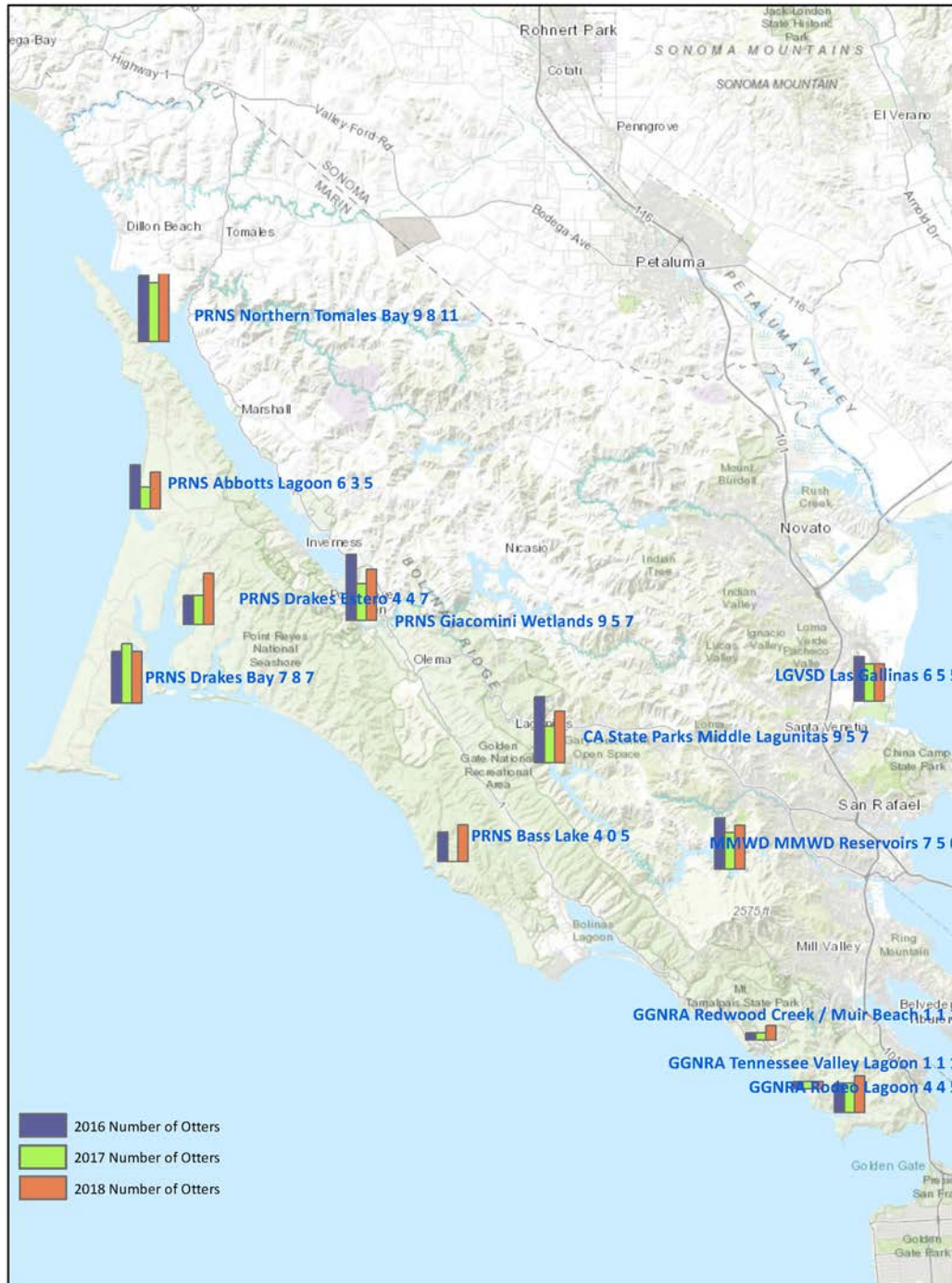


Figure Five: Otter Pups by focal study site, 2018



## Disease Monitoring results

Since 2013, in partnership with The Marine Mammal Center, ROEP has collected fecal samples to monitor for *Salmonella* and *Vibrio spp.* within our focal study areas.

No salmonella has been detected during the course of the study.

Four species of *Vibrio* have been detected, including:

*Vibrio alginoliticus*, *Vibrio parahaemolyticus*, *Vibrio cholera*, *Vibrio metschnikovii* and possible *Vibrio fluvialis*.

During 2018, no *Vibrio* or *Salmonella* species were isolated from tested samples.

Figure Six: Bacterial Study results, 2018





## Interesting Findings

- A mountain lion (*Panthera concolor*) was captured on a trail camera in the Marin reservoirs. We were able to determine it was a healthy male. He, or a close lookalike, was later captured on a camera trap at Audubon Canyon Ranch Martin Griffin Preserve in Bolinas. This was ROEP's first mountain lion capture.
- A spotted skunk (*Spilogale gracilis*) was captured on a trail camera at the pond at Tennessee Valley. This was ROEP's first spotted skunk capture.
- After the unexplained death of two otter pups at Abbott's Lagoon (PRNS) during 2017, coinciding with fishermen discovering and crowding an area the otters use to pass between the inner and outer lagoons to hunt, we worked with Point Reyes National Seashore to reduce people's presence on that part of the bank. While the cause of the pup mortalities is undetermined (we did not find the carcasses for necropsy), we observed both mother and young exhibiting stress while passing through, which was enough to trigger an intervention. In general people complied, and this year there were no problems seen and the young have survived.
- In partnership with CDFW, found/reported river otter carcasses are collected and necropsied. During 2018, necropsy on two otters hit by cars indicated traces of anticoagulant rodenticides. While the trace amounts were not enough to have killed the otters, who died from the car strike injuries, it leads to questions about how the otters ingested rodenticides and underlines the fact that AR rodenticide contact is nearly universal in wildlife.

"AR baits are palatable to and can be taken by species such as crabs and may also be transported through run-off into coastal waters where fragments are ingested by various marine species (Masuda et al. 2015; Pain et al. 2000 ; Pitt et al. 2015 ).

[Anticoagulant Rodenticides and Wildlife, van den Brink et al., Springer International Publishing, 2018]

- In 2018 we referred a river otter found disoriented and wandering, who subsequently died in veterinary care, to the Marine Mammal Center for necropsy. The diagnosis was squamous cell carcinoma, originating in the pleural membranes. Normally these cancers arise in the skin or upper digestive tract. This is rare and unusual, and only a few cases have ever been discovered in humans. None have been discovered in animals previously. (Van de Velde and others, 2019)

## Upcoming research results

- Prey Species Analysis of 550 samples from Tomales and Drake's Bays
- Statistical Study of 5 years of population monitoring



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