

**San Diego Association of Governments**  
**Pallid Bat**  
**Final Report**  
**Project Period: February 21, 2017 to August 21, 2018**  
**SANDAG Contract Number: 5004950**

## **Executive Summary**

The Living Coast Discovery Center, in partnership with the U.S. Fish and Wildlife Service, Cabrillo National Monument, and the San Diego Natural History Museum conducted surveys to determine bat species composition on and around the Sweetwater Marsh Unit of the San Diego Bay National Wildlife Refuge. Strong historical research suggested that the pallid bat was likely utilizing Sweetwater Marsh for foraging and roosting at this time. The primary goals of this project were to establish permanent survey locations within Sweetwater Marsh, to contribute to the data collection in regional bat studies, and to establish a site-specific bat habitat threat reduction and management plan based on the survey results.

Five passive AnaBat Express detectors were installed on Sweetwater Marsh with permission from U.S. Fish and Wildlife Service and run for 10 nights each month for a 12 month period. Data was collected and analyzed by San Diego Natural History Museum to determine species of bats present on Sweetwater Marsh. After a full year of monitoring bat echolocation calls at LCDR the pallid bat was not detected during this study, however there were at least nine other bat species detected. This indicates the Living Coast Discovery Center and nearby USFWS land are providing useful foraging and perhaps some roosting habitat to bats, particularly to species migrating to and along the coasts of San Diego County.

This project has enabled the Living Coast to contribute to larger regional conservation efforts, working with USFWS to improve the management of Sweetwater Marsh to mitigate environmental threat to the pallid bat, and contribute to the general public's awareness of local MSP species in San Diego.

Based on a full year of monitoring bat echolocation calls at the Living Coast, Beth Sabiston and Drew Stokes developed the site-specific bat habitat threat reduction and management recommendation plan. This plan will be submitted to U.S. Fish and Wildlife Service, the landowners responsible for Sweetwater Marsh.

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## Project Background

This project addresses the pallid bat (*Antrozous pallidus*), a MSP species listed as SL (a species whose persistence is at the highest risk of loss within the MSP Area without immediate action). Records identify Sweetwater Marsh as a former roosting site for a pallid bat colony throughout most of the 20th century, likely up until the 1980's. Additionally, in May of 2015 a single pallid bat was identified roosting under a covered porch less than one kilometer from Sweetwater Marsh (D. Stokes, personal communication, June 1, 2016).

Surveying for bat species composition is a necessary initial and on-going component of any threat reduction and management plan and will have a lasting impact on the surrounding area. Once the species at Sweetwater Marsh are determined, the analyzed data will contribute to a site-specific bat habitat threat reduction and management plan, developed in collaboration with project partners and submitted to landowners for plan development and implementation.

The Living Coast Discovery Center, in partnership with the U.S. Fish and Wildlife Service, Cabrillo National Monument, and the San Diego Natural History Museum has conducted surveys to determine bat species composition on and around the Sweetwater Marsh Unit of the San Diego Bay National Wildlife Refuge.

## Project Goals

The primary goals of this project are to establish permanent survey locations within Sweetwater Marsh, to contribute to the data collection in regional bat studies, and to establish a site-specific bat habitat threat reduction and management plan based on the survey results.

1. Five passive AnaBat Express **detectors will be installed** on Sweetwater Marsh with permission from U.S. Fish and Wildlife Service and will run simultaneously with other data collection sites throughout the region, in collaboration with Cabrillo National Monument. Based on previous site surveys, we expect to find significant presence of not only the pallid bat but many other important bat species.
2. **Data collected will be analyzed** by San Diego Natural History Museum to determine species of bats present on Sweetwater Marsh in order to remain consistent with other regional studies.
3. Analyzed data, including species identified, will contribute to a **site-specific bat habitat threat reduction and management recommendation**, developed in collaboration with project partners and submitted to landowners for plan development. Recommendations will be tied to objectives articulated in the MSP 2014-2018 Implementation Priorities and include land management actions such as clearing invasive plant species, providing additional man made roosting sites, preserving existing roosting sites and the conservation of open water sources where the pallid bat forages.

## Work Performed by Task

### Task 1 - Partner Meeting

*Budget: \$280.00*

*Spent: \$280.00*

*Match for Task: \$0.00*

Beth Sabiston (Living Coast Discovery Center) met with Drew Stokes (San Diego Natural History Museum), the lead of the pallid bat monitoring project to discuss the plan of action between project partners. They confirmed the project assignments and developed a timeline which was followed throughout the project. A list of supplies to purchase before installation was also discussed.

### Task 2 – Locations Identified

*Budget: \$1,120.00*

*Spent: \$1,120.00*

*Match for Task: \$0.00*

Beth Sabiston and Drew Stokes determined the locations to install the five AnaBat Express detectors on Sweetwater Marsh. These locations were selected strategically for the maximum coverage of the property. A detailed property map follows this report and includes the locations.

*See Appendix 1: AnaBat Express Detector Locations, Sweetwater Marsh, Chula Vista*

### Task 3 – Detectors Installed

*Budget: \$5,750.00*

*Spent: \$5,706.57*

*Match for Task: \$0.00*

Beth Sabiston purchased five AnaBat Express detectors with inbuilt GPS and Tenergy rechargeable batteries and stations. The equipment was installed at the five locations outlined above.

Throughout the project, the Living Coast provided monthly maintenance by changing batteries, retrieving SD cards with collected data, and restarting the GPS location program.

### Task 4 – Data Collection

*Budget: \$840.00*

*Spent: \$840.00*

*Match for Task: \$0.00*

Data was collected using the Anabat detectors beginning in May 2017. Data continued to be collected during 10 consecutive days each month through April 2018. The SD cards which contain the data was retrieved by the Living Coast in collaboration with partner sites and delivered to Drew Stokes for analysis.



Task 3: Beth Sabiston changing AnaBat detector batteries. April 2018, Sweetwater Marsh

### **Task 5 – Data Analysis**

*Budget: \$840.00*

*Spent: \$840.00*

*Match for Task: \$0.00*

Data that was collected by the Living Coast was analyzed by Drew Stokes. The result of this monthly data analysis is included in this report.

*See Appendix 2: Data Analysis Results*

### **Task 6 – Plan Recommendation**

*Budget: \$5,300.00*

*Spent: \$5,355.08*

*Match for Task: \$0.00*

Based on a full year of monitoring bat echolocation calls at the Living Coast, Beth Sabiston and Drew Stokes developed the site-specific bat habitat threat reduction and management recommendation plan. This plan will be submitted to U.S. Fish and Wildlife Service, the landowners responsible for Sweetwater Marsh. Based on recommendations in the plan, additional materials were purchased to enhance roosting habitat in the form of artificial bat houses. Six black and six brown BCI bat houses were purchased, along with mounting lumber posts.

### **Task N – Administrative**

*Budget: \$1,680.00*

*Spent: \$1,680.00*

*Match for Task: \$0.00*

The staff at Living Coast Discovery Center provided

administrative support for this project.

SANDAG's TransNet Environmental Mitigation Program grant was recognized on Bat Appreciation Day on April 17, 2017.

The project was highlighted as one of the collaborative research initiatives in the Living Coast's 2016-17 annual report.

*See Appendix 4: Bat Appreciation Day and Annual Report*



**Task 3: Beth conducting AnaBat detector maintenance. April 2018, Sweetwater Marsh**

## Conclusions

The Living Coast Discovery Center's project goal was to verify the presence of the now coastally rare pallid bat (*Antrozous pallidus*) on Sweetwater Marsh and nearby USFWS property where it once occurred historically. Despite an intensive acoustic survey effort, there were no pallid bat detections and therefore the conclusion is the species no longer occurs here regularly, though it may disperse here sporadically from existing populations on the Otay River, Tijuana River, and perhaps the upper Sweetwater River watersheds. Periodic inspection of structures on the property looking for roosting bats during the day and at night may result in increased likelihood of pallid bat detections if the species does ever occur on the property. The results of this study further indicate the rarity of this once common bat species in coastal San Diego County and emphasize the need for conservation efforts where the species does still occur to prevent further decline. While the pallid bat was not detected during this study, there were detections of at least nine other bat species indicating the Living Coast Discovery Center and nearby USFWS land are providing useful foraging and perhaps some roosting habitat to bats, particularly to species migrating to and along the coasts of San Diego County. Continued monitoring at the Living Coast Discover Center may reveal occasional pallid bat detections, provide detections of other bat species not yet found here, and further reveal seasonal and migratory patterns of bats in the region. Site-specific management recommendations are provided in Appendix III below.

## Appendix 1

### AnaBat Express Detector Locations Sweetwater Marsh, Chula Vista

LCDC1

Near freeway 5,  
along brush  
where insects  
would attract bat  
activity



LCDC2

Along the coast,  
near a cement  
building which  
would create a  
feeding platform



LCDC3

Behind U.S. Fish  
and Wildlife  
building, near old  
cement kelp  
basins which  
create a feeding  
platform



LCDC4

Near Palm trees  
for roosting



LCDC5

Near the San  
Diego watershed  
which acts as a  
“bat freeway” for  
species migrating  
to the coast to  
feed at night





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

## Appendix 2

### Data Analysis Results

**Table 1- Calls per species**

Common name	Species	4-letter code	No. of passes
Mexican free-tailed bat	<i>Tadarida brasiliensis</i>	TABR	3970
Pocketed free-tailed bat*	<i>Nyctinomops femorosaccus</i> *	NYFE	290
Hoary bat	<i>Lasiurus cinereus</i>	LACI	202
Yuma myotis	<i>Myotis yumanensis</i>	MYYU	195
Western mastiff bat*	<i>Eumops perotis</i> *	EUPE	72
Western red bat*	<i>Lasiurus blossevillii</i> *	LABL	40
Big brown bat	<i>Eptesicus fuscus</i>	EPFU	20
Western yellow bat*	<i>Lasiurus xanthinus</i> *	LAXA	15
Canyon bat	<i>Parastrellus hesperus</i>	PAHE	2
		<i>Total =</i>	4806

\* bats designated as species of special concern by the California Department of Fish and Wildlife (July 2018)

**Table 2: Bat calls per month**

Month	No. of bat passes
May 2017	275
June 2017	120
July 2017	98
August 2017	328
September 2017	3524
October 2017	152
November 2017	114
December 2017	6
January 2018	53
February 2018	7
March 2018	37
April 2018	92
<i>Total =</i>	4806

**Table 3: Call per AnaBat station**

Anabat station	Latitude (wgs84)	Longitude (wgs84)	No. of bat passes
LCDCAB1_Sweetwater River Mouth*	32.64352	-117.10348	268
LCDCAB2_Northwest Corner	32.64023	-117.11378	656
LCDCAB3_Kelp Basin	32.64023	-117.11378	1967
LCDCAB4_Palm Trees	32.63662	-117.10238	1479
LCDCAB5_Vendor Pond	32.63941	-117.11026	436
		<i>Total =</i>	4806

\* reduced bat recordings due to frequent electronic and acoustic interference from nearby trolley line and insect noise

## Appendix 3

### Plan Recommendation

#### Bat Habitat Threat Reduction Plan at Sweetwater Marsh

#### Living Coast Discovery Center

After a year-long acoustic survey effort by the Living Coast Discovery Center and project partners, there were no pallid bat detections at Sweetwater Marsh. However, the data analyses did confirm the presence of several bats designated as species of special concern by the California Department of Fish and Wildlife including the pocketed free-tailed bat, Western mastiff bat, Western red bat and Western yellow bat. The monitoring that began in April 2017 has provided some information about the bats in the region; however, additional collection is needed to provide sufficient data for such a rare species.

Additional research is needed to identify the species located on Sweetwater Marsh and implement site-specific threat management. The impending Chula Vista Bayfront development project increases the urgency to study the pre-development status and distribution of species that appear to have suffered population declines and are vulnerable to extirpation. Bats are vulnerable due to destruction of roosts (e.g., construction of water projects and transportation routes) or catastrophic events at roosts (e.g., fire, human disturbance) that adversely affect a large number of individuals at once. This pre-development data will be used to compare the effects and trends the Chula Vista Bayfront development will have on migratory patterns of regional bats. These findings will also enable the Living Coast to contribute to larger regional conservation efforts.

The Living Coast will continue to work alongside San Diego Natural History Museum to collect and analyze data onsite. This partnership will contribute to regional studies to determine species of bats present on Sweetwater Marsh. Based on the data collected since April 2017, the Living Coast will make the following recommendations to U.S. Fish and Wildlife Service, the landowners responsible for the management of Sweetwater Marsh.

After a full year of monitoring bat echolocation calls at the Living Coast there are two areas where detectors were deployed that showed the most significant amounts of bat foraging activity: the kelp basin area behind the USFWS offices and the palm trees located towards the east side of the Living Coast property. These areas should be protected or enhanced to preserve their value to the regional bat population.

1. The kelp basin area is likely attractive to insects and therefore attracts foraging bats in turn. These basins also potentially hold fresh water which could provide drinking opportunities for bats at least seasonally, and also likely increases the insect activity. Any impacts to or loss of this particular area/habitat should be minimized if possible to help reduce threats to bats in the area. This area could potentially be enhanced if the basins were modified to hold more fresh water from rainfall, providing a longer term reliable freshwater source for bats and other wildlife.

2. The palm trees potentially provide roosting habitat for various bat species and undoubtedly increase foraging opportunities for bats by providing vertical structure in a generally flat environment. Vertical structure such as the palm trees may increase foraging opportunities for bats because insects are drawn up into airspace suitable for foraging bats. In absence of native trees and other vegetation providing vertical structure on the Living Coast property the palm trees are likely important habitat features for bats. While non-native palm trees are often cut down as part of habitat restoration projects it is recommended that these palm trees are left intact in the absence of native trees in the area. Removal of the palm trees could negatively impact both roosting and foraging bats.

Roosting habitat is generally lacking in the Living Coast area but there are several buildings and other structures that may provide suitable roosts for bats. To date, no bats have been found roosting in any structures on the property but there is always a chance roosting bats have gone undetected and/or bats may use structures in the future. It is recommended that a bat roost survey/assessment is conducted at any structure that may be modified or significantly impacted (e.g. torn down).

Artificial bat houses should be installed in areas near foraging habitat where roost sites are limited or where the long-term existence of roosts is uncertain (e.g. removal of palm trees during Bayfront development). The Living Coast purchased 12 BCI bat boxes to enhance and increase roosting habitats within the Living Coast property. Recommendations for these locations and installation can be provided at a later date by project partners when approved by USFWS.

Open water drinking habitats (e.g., ponds or artificial water impoundments) should be actively maintained in areas where there is little other surface water. Open fresh water sources are generally lacking on the Living Coast property. Anything to enhance fresh water sources should be considered. The areas where fresh water sources could possibly be enhanced include the kelp basins mentioned above and where the Sweetwater River flows into the marsh.

Another recommendation to consider is artificial lights may benefit certain foraging bats while being detrimental to others such as the gleaner species (i.e. pallid bat). In general, a reduction of artificial light sources that are on at night is recommended.

The Living Coast is working with USFWS to improve upon the management of Sweetwater Marsh to mitigate environmental threats to the regional bat population based on these recommendations. Additionally, through educational programs and exploration of the native pollinator garden, the Living Coast will generate a greater awareness of local bat species in San Diego.

# Appendix 4

## Bat Appreciation Day and Annual Report

### Bat Appreciation Day Blog / Social / E-Newsletter Post April 17, 2017

<p><b>Living Coast Blog</b> (Click image to view)</p>  <p><b>Pallid Bat</b> <i>Antrozous pallidus</i></p> <p>The pallid bat is believed to be the main pollinator for the local plant known as Shaw's agave. While during the day one may see bees and hummingbirds flying around the agave's flowers, it is the clumsy bat that will successfully pollinate the agave.</p>  	<p><b>Facebook</b> (Click image to view)</p>  <p>It's Bat Appreciation Day! 🦇 That's right, these guys get a whole day of appreciation, and rightfully so. Besides being the only flying mammal, bats play an important role in ecosystems by eating insects, spreading seeds, and pollinating! Learn how we're discovering which bats live on Sweetwater Marsh in our latest blog.</p> <p>Pallid bat monitoring at the Living Coast Discovery Center is supported by SANDAG as part of their TransNet Environmental Mitigation Program (EMP) land management grant program. #batappreciationday #backtonature</p>  <p><b>Recognizing Flying Mammals- Which Bats Are On Sweetwater Marsh?</b> Living Coast Discovery Center THELIVINGCOAST.ORG</p>
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<p><b>E-Newsletter</b> (Click image to view)</p>  <p><b>Back to Nature Featured Animal</b></p> <p><b>Pallid Bat</b> <i>Antrozous pallidus</i></p> <p>The pallid bat is believed to be the main pollinator for the local plant known as Shaw's agave. While during the day one may see bees and hummingbirds flying around the agave's flowers, it is the clumsy bat that will successfully pollinate the agave.</p>   <p><b>Soar Into Our Bat Research</b></p>	<p><b>Instagram</b> (Click image to view)</p>  <p>87 likes 2d</p> <p>thelivingcoast It's Bat Appreciation Day! 🦇 That's right, these guys get a whole day of appreciation, and rightfully so. Besides being the only flying mammal, bats play an important role in ecosystems by eating insects, spreading seeds, and pollinating! Learn how we're discovering which bats live on Sweetwater Marsh in our latest blog at <a href="http://www.thelivingcoast.org">www.thelivingcoast.org</a>. Pallid bat monitoring at the Living Coast Discovery Center is supported by SANDAG as part of their TransNet Environmental Mitigation Program (EMP) land management grant program. #batappreciationday #backtonature</p> <p>♥ Add a comment...</p>
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*San Diego Bay at Chula Vista*

[www.TheLivingCoast.org](http://www.TheLivingCoast.org)

# Annual Report

Fiscal Year 2016-2017



# The Living Coast Research Collaboration



## Burrowing Owl Study

In collaboration with San Diego Zoo Institute for Conservation Research, burrowing owls at the Living Coast participated in a research study testing the feasibility of using solar-powered satellite transmitters to learn more about the owl's life history and habitat needs as they apply to conservation of the species.

## Bat Monitoring and Threat Management Plan

The Living Coast Discovery Center, in partnership with U.S. Fish and Wildlife Service, Cabrillo National Monument, and San Diego Natural History Museum conducted surveys to determine bat species composition on and around the Sweetwater Marsh Unit of the San Diego Bay National Wildlife Refuge. The primary goals of this project are to establish permanent survey locations within Sweetwater Marsh, to contribute to the data collection in regional bat studies, and to establish a site-specific bat habitat threat reduction and management plan based on the survey results.

