



**Use of Estuarine, Intertidal, and Subtidal Habitats by Seabirds Within the MLPA
South Coast Study Region**

Final Plan of Work

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PLAN OF WORK

Our overarching goal is to create a baseline characterization of how seabirds are using coastal habitats within the SCSR. We will create this baseline within the context of a BACI monitoring design so that it will serve as a comparison to future monitoring efforts. We will collect new data at impact (inside MPA) and control sites throughout the SCSR. Our final report will combine newly collected data with available information in an effort to characterize the state of seabird populations before and during the initial years of MPA implementation.

MPAs and Control Sites to Be Monitored

Proposed MPA and Control Sites

Figure 1 shows the sites we propose to survey for baseline data collection. It is important to recognize that much of the southern California mainland coast is private property. This will make access to many mainland sites challenging. Thus, the sites shown in Figure 1 are general areas that we propose to work in. Detailed site locations will be determined based on the types of access we obtain within these areas.

We are proposing work in eight MPAs. Four of these MPAs will be surveyed for Least Tern diet while the remaining four will be surveyed for foraging, roosting, and breeding activity of all other species. The MPAs selected for Least Tern diet are Campus Point SMCA, Bolsa Bay and Bolsa Chica Basin SMCAs, Batiquitos Lagoon SMCA, and Tijuana River Mouth SMCA. The control sites for Least Tern diet will be Venice Beach, Port of L.A., Point Mugu, and Camp Pendleton. The MPAs selected for foraging and transect surveys are Gull Island SMR, Painted Cave SMCA, Point Dume SMR/SMCA, and Point Vicente/Abalone Cove SMCAs. We will have one control site for each of these MPAs. The control sites will be accessible areas adjacent to the MPA that contain similar habitat.

Overlap With Other Baseline Monitoring Studies

Our proposal is part of an integrative multi-project proposal entitled 'Integrative Assessment of baseline ecological and socioeconomic conditions and initial changes within the South Coast MPA region'. The principal investigators of the integrative proposal are Blanchette and Caselle. We anticipate overlap in data collection with four other projects within the integrative proposal: 1) Blanchette et al., rocky intertidal monitoring, 2) Caselle and Pondella, kelp and shallow rock monitoring, and 3) Freiwald et al., citizen science kelp and rocky reef monitoring. Data collected by Blanchette et al. will compliment data we collect on Black Oystercatchers during our transect surveys. Data collected by Caselle and Pondella and Freiwald et al. will compliment data we collect on pursuit diving seabirds during our foraging and transect surveys.

Data Collection

Analysis of Least Tern Diet

PRBO has been studying Least Tern diet at the Purisima Point colony since 2001. We have developed techniques for analyzing fecal samples based on Robinette (2003).

Fecal pellets are collected from adult and chick roosting sites within the breeding colony. The fecal pellets are sorted to obtain undigested hard parts (e.g., scales, otoliths) which we use to determine the type of prey consumed.

We will collect diet samples from each of the colonies identified above during two periods of the breeding season: once during the courtship and egg laying period (April-May) and once during the chick rearing period (June-July). We will collect a minimum of 50 samples per period for each of the colonies. We will sort each sample in 60% isopropyl alcohol and identify all fish scales and otoliths found in the sample to the lowest taxonomic order. From our experience, the scales and otoliths of certain fish groups do not pass through Least Tern digestive system. We therefore use other identifiable parts to detect the presence of these groups. We will detect larval fish in the samples by the presence of small, undeveloped vertebrae, and sculpins (Family Cottidae) by the presence of preopercle spines. For each diet sample, we will record the number of identifiable hard parts observed for each taxonomic group. We will summarize data from each colony as percent occurrence -- the percent of the total number of samples that contained identifiable hard parts from a particular taxonomic group.

Nearshore Foraging Rates and Distribution

PRBO has been investigating the nearshore foraging distributions of seabirds and marine mammals inside and adjacent to the Vandenberg State Marine Reserve (VSMR) in central California since 2000. This study has shown consistent patterns in the foraging distributions of demersal fish predators over six years of study. Additionally, the spatial distribution of foraging predators reflected the spatial patterns of fish recruitment reported in Robinette et al. (2007). These results suggest that seabirds and marine mammals will not only benefit from increased fish production, but can potentially provide information on spatial variability in fish production.

We will use the methods developed by PRBO for monitoring foraging distributions around the VSMR. For each rocky coast MPA identified above, we will monitor the abundance of foraging seabirds at one site inside the MPA and one control site several km away from the MPA. Our objectives will be to 1) define within-season foraging trends and 2) determine if seabirds and marine mammals forage more inside or outside MPAs. We will conduct surveys from April through July in 2012 and 2013. We will survey each site once a week during one of the following time periods: 0600-0900, 0900-1200, 1200-1500, or 1500-1800, rotating sites among the four time periods per week to develop a complete 12-hour assessment of foraging activity. We will make observations from a single observation point, using binoculars and a 20-60x spotting scope to record the numbers foraging individuals for all species observed within a 1km radius (see Figure 2 for sampling scheme). We will record only those animals that are actively foraging. We will describe seasonal and spatial trends for individual species as well as for indices of species richness and diversity.

Transect Monitoring

The goals of transect monitoring are three-fold: 1) to document the size and distribution of annual breeding and roosting populations for each focal species within the SCCNC study area, 2) to identify nests that can be followed for estimating annual productivity, and 3) identify areas of dense breeding and roosting populations to monitor for

disturbance. We define a transect as a length of coastline that can be surveyed within a four-hour period. We will divide each transect into manageable counting blocks based on easily recognizable geographic features. We will define observation points along each transect. During a given survey, observers will travel to each observation point and view the counting blocks assigned to that observation point. Figure 3 shows an example of a transect that we established at Vandenberg Air Force Base, central California.

Beginning the week of April 1, we will conduct one transect survey per week at each of the areas identified above. Surveys will be conducted between the hours of 0600 and 1000 as this is the peak time for Pigeon Guillemot rafting activity and roosting activity by non-breeding birds. For each survey, we will begin at one end of the transect and visit each observation point. We will alternate starting points between the north and south ends of the transect on a weekly basis to minimize time bias on guillemot raft counts. From each observation point, we will scan the adjacent count blocks using binoculars and a spotting scope. We will record the number of nesting, roosting, and rafting (for guillemots only) birds observed within each counting block. We will do this for each of the focal species identified above. Additionally, we will use a detailed map of the study area to mark 1) individual rocks within a given counting block that have high abundances of breeding and/or roosting birds and 2) the specific location of Black Oystercatchers. The former information will be used to identify rocks for disturbance monitoring while the latter will be used to estimate territories of breeding oystercatcher pairs.

Nest Monitoring

The overarching goal of nest monitoring is to record annual nesting phenology and estimate annual colony productivity. Both phenology and productivity are good indicators of the underlying oceanographic conditions affecting annual population size. Recording phenology requires weekly checks on individual nests within a given colony. Productivity can be calculated as either 1) the number of fledglings produced per adult breeding pair or 2) the percentage of total eggs laid that hatched and successfully grew into fledglings. The first calculation requires only knowledge of the number of fledglings produced within a given nest. The second requires more detailed knowledge of how many eggs were laid, how many of those eggs hatched, and how many of those chicks fledged. For each focal area possible, we will follow 30 nests of each focal species.

We will identify monitorable nests during our transect surveys of each focal area. A monitorable nest is one for which eggs, chicks, and fledglings can be clearly viewed and enumerated without disturbing the nesting adults. Once nests are identified, they will be monitored every 7 days. During each monitoring visit, we will record 1) nest condition, 2) number of adults attending the nest and whether one is in incubating posture, 3) number of eggs, 4) number of chicks, 5) the feather condition of chicks, 6) number of fledglings and 7) if nest fails, the reason for nest failure.

Disturbance Monitoring

The goals of disturbance monitoring are 1) to identify human activities that cause disturbance, 2) to identify human activities that do not cause disturbance, 3) to estimate rates of human-caused disturbance at individual colonies, and 4) to estimate rates of natural (e.g., predator-caused) disturbance at individual colonies. Disturbance is defined as any event that results in one or more of the following:

- 1) Birds flushing (birds flying off the rock).
- 2) Birds displacing (moving from their nest or resting site).
- 3) Eggs or chicks being:
 - a. exposed (adult moves away from the egg or chick),
 - b. displaced (egg or chick moves from nest site), or
 - c. taken (egg/chick is depredated).
- 4) Birds becoming visibly agitated.

We will monitor for disturbances during all foraging, transect and nest monitoring surveys. At the beginning and end of each survey, we will record the number of breeding and roosting birds present for each species. Throughout each, we will record all land-based human activity and boat traffic within 1,500 feet, and aircraft flying at altitude of ≤ 1000 feet and within 1,500 horizontal feet of the colony, regardless of whether disturbance occurred or not. Additionally, we will record all natural events (e.g., predatory bird flying over, large waves crashing) that cause disturbance. If disturbance occurs, we will record the following information:

1. Number of nesting and roosting birds present for each species.
2. Number of birds disturbed and reaction type for each species.
3. Number of nests with eggs and chicks exposed for each species.
4. Source of disturbance.
5. Source altitude and distance from nesting area affected
6. Activity of disturbance source
7. Identification information (e.g., type of vessel or aircraft and any identifying information like license number).
8. Direction of travel/Duration
9. Photographic or video evidence

Baseline Characterization

We will produce our baseline characterization by combining newly collected data with information from other studies. To our knowledge, there are no studies investigating seabird diet, foraging rates, and rates of human disturbance within the SCSR. However, there are other programs that have investigated the annual breeding population size and productivity for many of our focal species. Least Tern annual breeding population and productivity are measured at most sites within the SCSR and those data are summarized in an annual report produced by California Department of Fish and Game. Additionally, seabird populations on Santa Barbara and Santa Cruz Islands have been monitored by the National Parks Service and the U.S. Geological Survey and we will request reports from those efforts.

Our baseline characterization will have two major components. First, we will use the information available in reports to characterize trends in annual breeding population size and productivity before MPA implementation. Second, we will use our newly collected data to characterize diet, foraging rates, roost utilization, and rates of human disturbance inside and outside of MPAs during the initial years of MPA implementation. We will also incorporate physical and biological oceanographic variables that have been shown to influence seabird population and productivity (e.g., sea surface temperature, regional fish larval abundance, Pacific Decadal Oscillation).

OUTCOMES AND DELIVERABLES

All data collected will be stored within PRBO's database. We will work with the Monitoring Enterprise as they develop their metadata standards. We will incorporate these standards into the data collected for this project. At the end of the baseline funding period, we will deliver all data and metadata to the Monitoring Enterprise.

We will produce an annual report at the beginning of 2013 to update Sea Grant and the Monitoring Enterprise on the status of our monitoring efforts. We will provide brief summaries of indicator metrics and our progress in baseline characterization. This report can also be used to keep policy-makers, managers, educators, and the general public engaged in the MLPA process and informed about the 'health' of seabird populations in the region.

We will produce a final report by June 30, 2014 that will outline 1) baseline seabird conditions within our defined study area and 2) recommendations for future long-term monitoring within the NCCSR.

PRBO Conservation Science maintains an informative website that is easily navigated (www.prbo.org). Pages on this website contain information on individual programs, access to downloadable reports, and educational information. We will maintain a page on seabird monitoring within the SCSR that describes the MPA network and summarizes key findings.

MILESTONES AND TIMELINES FOR DEVELOPMENT AND DELIVERY

This project will be conducted within a two-year time frame. The anticipated funding date stated in the request for proposals (July 2011) is at the end of the seabird breeding season. We will therefore not be able to begin fieldwork until 2012. We will conduct full field surveys in 2012 and 2013. Our final report will be completed by March 31, 2014.

Milestone Chart

MILESTONES CHART												
	2011			2012			2013			2014		
TASKS AND MILESTONES	J	A	SOND	J	F	MAM	J	A	SOND	J	F	MAM
1) Collect Least Tern diet samples.				■	■					■	■	
2) Analyze Least Tern diet samples.							■	■	■			
3) Conduct foraging and transect surveys.				■	■	■				■	■	■
4) Produce annual report.							■					
5) Compile reports from other studies.										■	■	■
6) Summarize data for final report.										■	■	■
7) Produce final report.												■

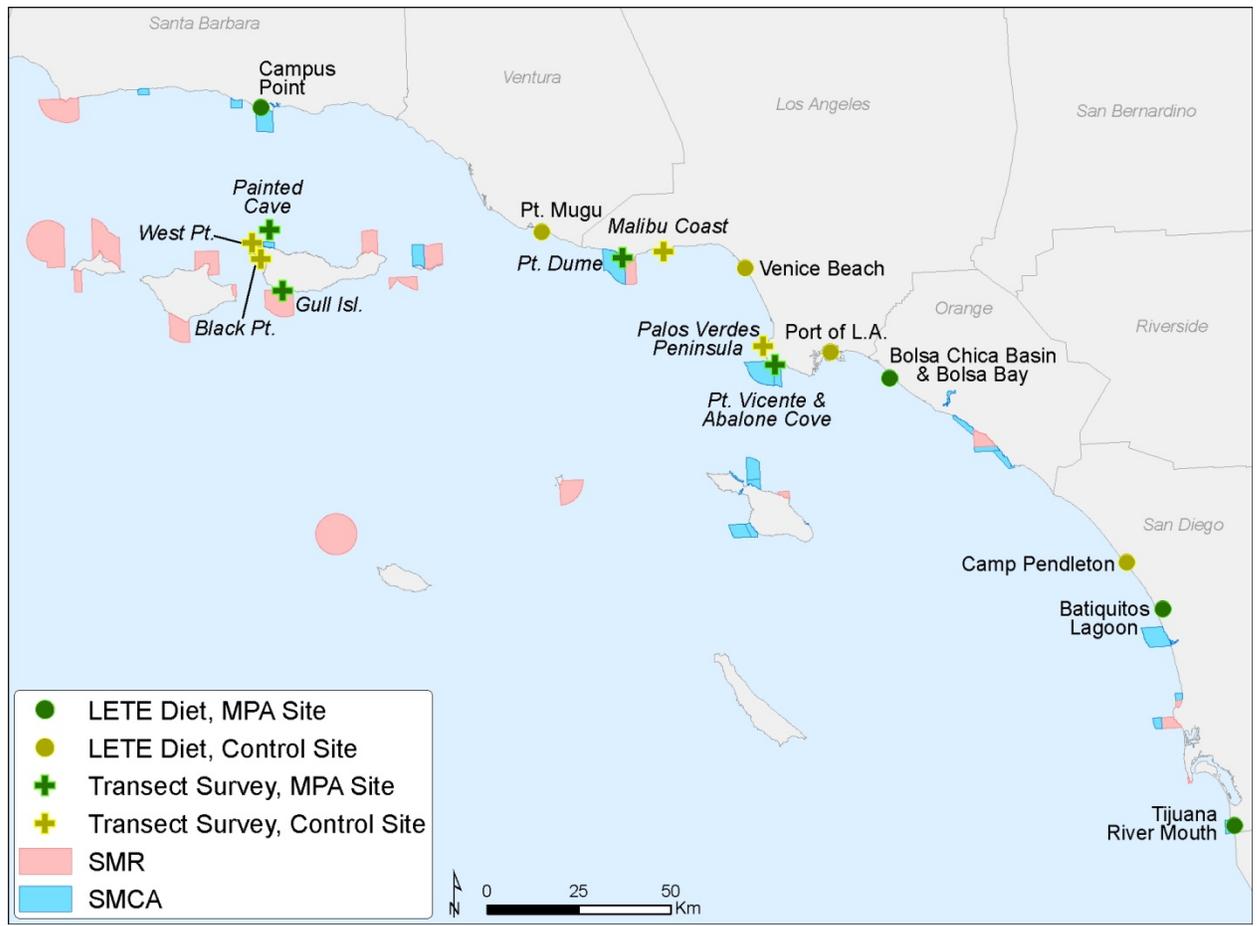


Figure 1. Map of proposed sites for seabird monitoring within the MLPA South Coast Study Region.

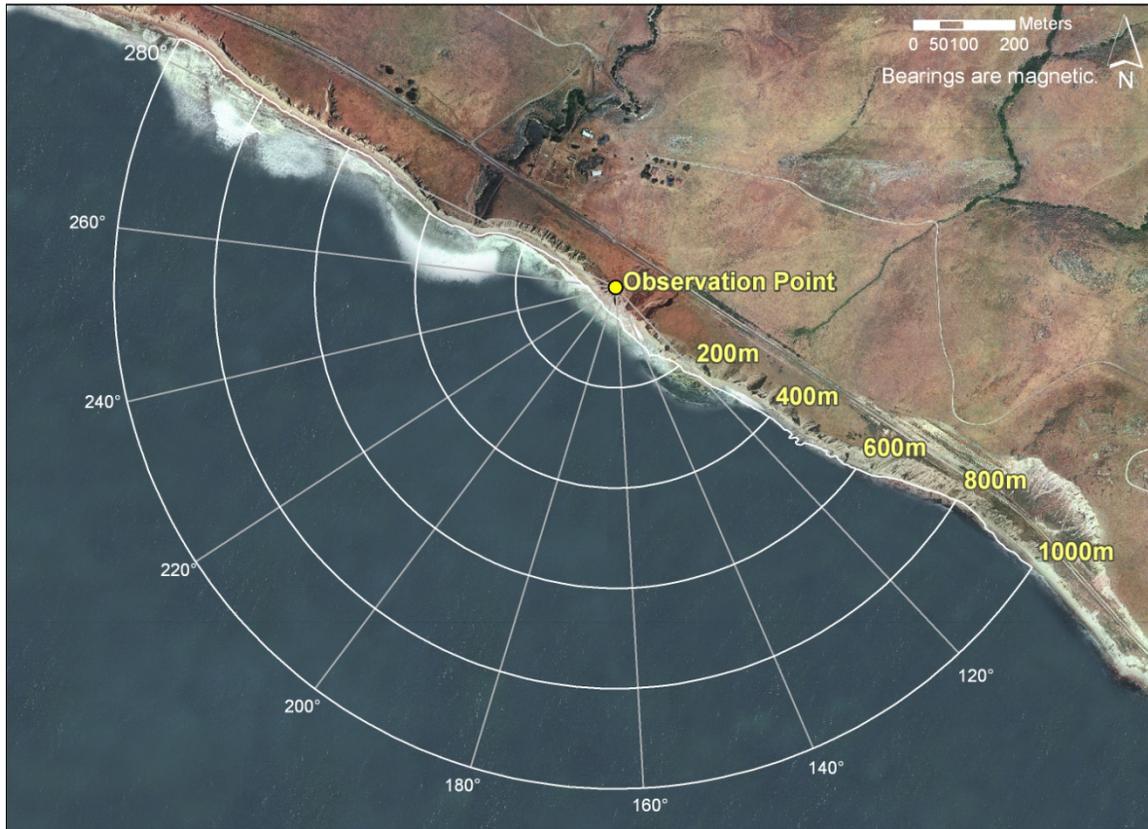


Figure 2. Foraging observation scheme adopted from PRBO's Vandenberg Seabird Program. Observations will be made within a 1km radius of the observation point.

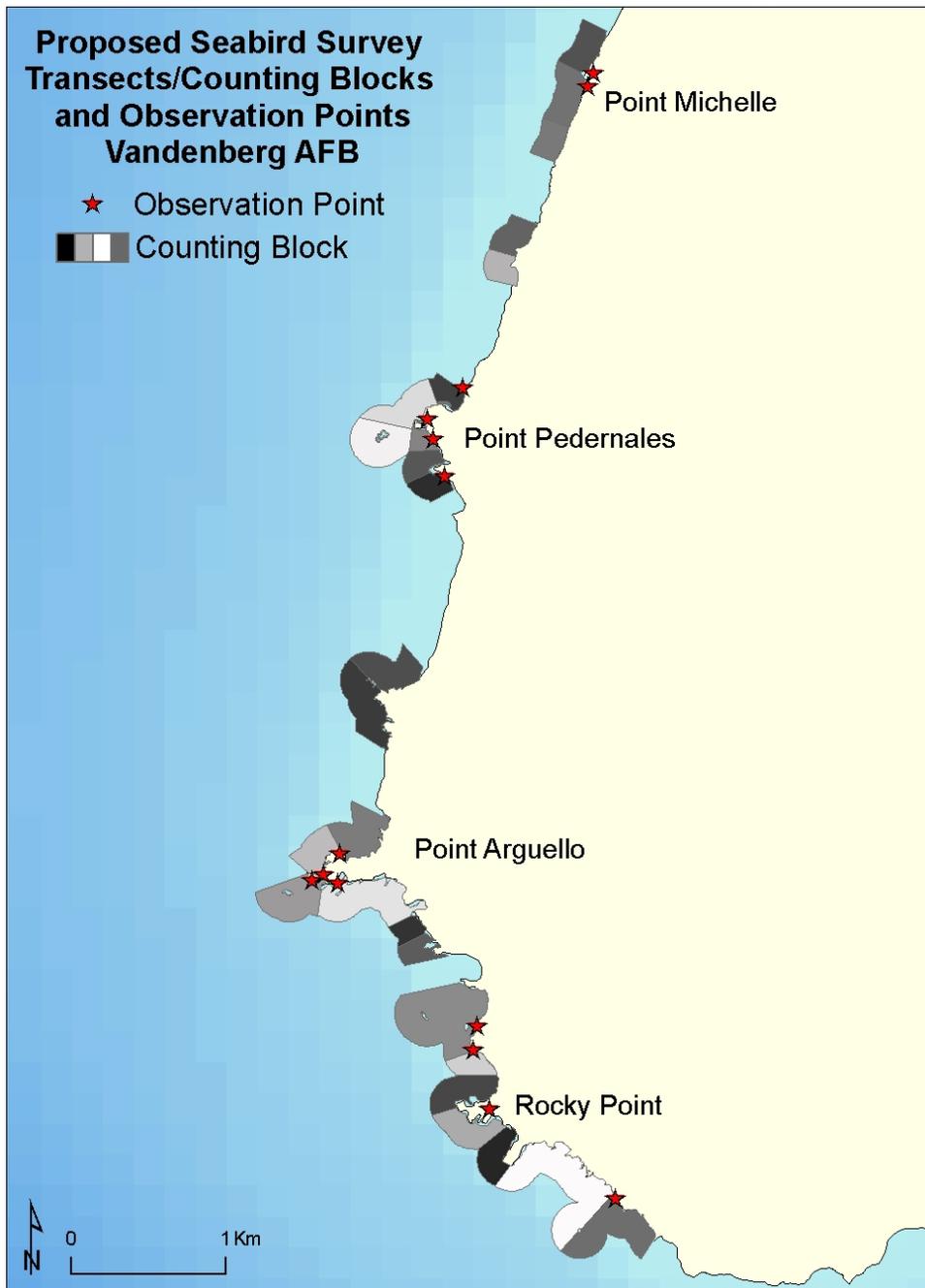


Figure 3. Transect established for monitoring breeding and roosting birds at Vandenberg Air Force Base, central California. Gaps in the transect represent sandy beach habitats that are not typically used by our focal species.

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APPENDIX