

## Area-Search Protocol for Surveying Shorebirds in Coastal Environments

**PLEASE READ:** This protocol was developed for The Pacific Flyway Shorebird Survey ([www.prbo.org/pfss](http://www.prbo.org/pfss)) and Migratory Shorebird Project ([www.migratoryshorebirdproject.org](http://www.migratoryshorebirdproject.org)). The usefulness of data collected as part of these surveys requires that all observers closely follow the protocol outlined here. Please read the protocol and associated documents (area description(s), map(s), and data form(s) thoroughly before conducting a survey. If you have any questions, please contact your local site coordinator or Matt Reiter, [mreiter@pointblue.org](mailto:mreiter@pointblue.org). Thank you in advance for your hard work and enthusiasm for birds. **Note:** This protocol and other documents recommended below, shared by The Pacific Flyway Shorebird Survey and Migratory Shorebird Project, can be found here: <http://www.migratoryshorebirdproject.org/sharedresources>.

### PURPOSE

These surveys are designed to obtain data on annual variation, long-term trends, and habitat associations of wintering shorebirds in coastal estuaries. Currently, these data are combined annually with comparable data from other sites across the Pacific Coast of the Americas to assess spatial and temporal patterns of shorebird abundance at multiple scales from your survey area to the flyway.

### SURVEY DESIGN

Each survey consists of searching a set of pre-defined survey areas (preferably defined based on habitat) with specific boundaries within a coastal site (e.g. San Francisco Bay) during the same the same tidal conditions each year to obtain a “snap-shot” of shorebird use. Surveys are coordinated across a site at tidal conditions that allow all shorebirds within the survey area to be identified to species (i.e., birds are not too far away to be accurately counted; preferably <300m) but BEFORE birds move to high-tide roosting locations. The optimal tidal conditions that satisfy these criteria vary among coastal sites, but each survey of the same site should occur during the same tidal conditions each year. We recommend careful evaluation of the tidal conditions that will be optimal for conducting surveys before finalizing a protocol for long-term monitoring. Our works suggests surveying on a rising tide which pushes the birds closer to shore making them easier to count and identify.

### IMPORTANT THINGS TO REMEMBER

- **Plan Ahead:** Shorebird surveys of tidally influenced sites should occur within a relatively short time period (1-2 hours) when the tide is optimal and should be coordinated across the site. Because factors on the day of the count (e.g., wind, atmospheric pressure) may influence tidal height and timing, please try to be at your area slightly before the predicted start time to ensure adequate time to complete the survey.
- **Inclement Weather:** Surveys should not be conducted in weather with strong winds (>24 mph), heavy fog (<200m visibility), or steady rain. You will be notified if the count is canceled due to weather.
- **Observers:** Under most conditions, surveys should be conducted by one observer. Having multiple observers counting simultaneously may bias results. We recommend working in pairs where one person counts birds (Observer) and a second person records data (Data Recorder). In large areas or areas with large numbers of birds, additional observers should split the count effort (by species or sub-divided areas) to enable completion of the count in the allotted time window. All observers (people counting) and data reorders should be listed on the data sheet and entered into the California Avian Data Center (CADDC).

- **Pre-survey scouting:** We encourage you to visit your survey area prior to the day of the survey so you are certain how to easily access the area.
- **Datasheet:** Please refer to accompanying datasheet along with this protocol. Note that each survey consist of collecting bird observations and survey area characteristics.

### COLLECTING AND RECORDING BIRD OBSERVATIONS

Data should be recorded on a separate datasheet for each unique **Survey Area** as named on the survey area map. Begin each area-search survey by recording the **Start Time** (24-hr clock; e.g. 3PM = 1500), **Date** (mm/dd/yyyy), **Observer(s)** who counted birds (full name[s]), and **Data Recorder(s)** on the datasheet. Multiple observers should only be recorded if a survey area was split between two observers. When splitting a survey area do so in one of the following two ways. Two observers can count the same survey areas but count *different species* or two observers can count the same species in *different parts of the survey area*.

Then move around, as needed, to count and identify to species all shorebirds and raptors (hawks, falcons, owls, and vultures) using the survey area as defined on your map. This includes birds that enter or leave the survey area during the survey. For a shorebird to be considered “using” the survey area, it needs to be on the ground within the defined survey area for at least part of the time it takes to do the survey. Thus, shorebirds that fly over the survey area but do not land in it should **NOT** be counted. For a raptor to be considered “using” the survey area, it can be in, perched adjacent to, or flying over the survey area. Keep track of bird movements and do not double-count birds if they leave and then re-enter the survey area. Record numbers of each **species** seen in the **tally** column (see the Shared Survey Resources at [www.migratoryshorebirdproject.org/sharedresources](http://www.migratoryshorebirdproject.org/sharedresources) for recording tips).

Once the area has been thoroughly searched and all shorebird and raptors recorded, the count is considered complete. At that point, the **End Time** should be noted on the datasheet and thereafter **NO** additional birds should be recorded for that survey area. The total number of each species observed during the count of each survey area should be entered into the **Total** column.

Coastal area-search surveys must be completed within the allotted time as indicated by your project leader (usually 1-2hours). Please make sure to pace yourself accordingly, whether you are surveying one large survey area or multiple smaller survey areas, so that you finish on time. Site coordinators should match the number of observers with the size of the survey area and the expected number of birds in that area, so that the count can be completed within the optimal tidal window. If, after scouting your site, you have concerns about finishing on time, please contact your site coordinator.

### Counting Methods

It usually will be possible to make exact counts of small groups of birds (<50 individuals), but estimation may be needed for larger flocks. It also may not be possible to identify a few or, sometimes, even large numbers of shorebirds because of poor lighting, quick or distant views, similarity of species, or other factors. Try to count or estimate numbers by whatever technique works best as listed here in order of preference (also see tips on how to estimate flock size on the Shared Survey Resources page at [www.migratoryshorebirdproject.org/sharedresources](http://www.migratoryshorebirdproject.org/sharedresources)):

1. Identify species and their abundance (i.e., 148 Western Sandpipers, 153 Dunlin, 308 Least Sandpipers)

2. Estimate the proportion of species in flock and use the proportions and total flock size to calculate the total of each species (i.e., 600 birds: 25% Western, 25% Dunlin, 50% Least = 150 Western, 150 Dunlin, and 300 Least). **Note:** only do this calculation if you are confident the proportions are accurate. Please use a mixed-species code if necessary (see next bullet).
3. Estimate size of flock and species present (i.e., 600 birds, composed of Western Sandpipers, Least Sandpipers and Dunlin in unknown proportions). Please see the species list at the end of the protocol for commonly observed mixed-species flocks.

Following bird observations fill out the remainder of the datasheet completely, including **Survey Area Characteristics** (see below). Please collect survey area characteristics and fill out a datasheet **even if no birds were detected**. These data will help us determine the total effort expended during each survey and knowing that zero birds were observed are important data for determining the characteristics that influence bird use.

### COLLECTING AND RECORDING SURVEY AREA CHARACTERISTICS

To understand what habitats shorebird use and why, this protocol includes the collection of weather and habitat characteristics for each survey area. Because the survey may take over an hour and cover a large area, we recommend keeping notes on weather and survey area characteristics while counting the birds. The map of the survey area can be a useful place for tracking survey area characteristics during your survey. At the end of the survey, summarize the survey area characteristics observed and record the information on the datasheet using the criteria below. If weather characteristics shift during the course of the survey, record the average characteristic observed.

**Wind speed (Wind):** *Do not conduct surveys when wind speed is consistently >24 mph (category 5 below). Remember, at large coastal estuaries with a coordinator, you will be notified if the survey is cancelled.*

0 – calm (<1 mph): smoke rises vertically; mirror-like surface to water

1 – light air (1 – 3 mph): smoke drifts; scaly ripples on water, no foam crests

2 – light breeze (4 – 7 mph): felt on face, leaves rustle; small wavelets, crests glassy, no white caps

3 – gentle breeze (8 – 12 mph): leaves and small twigs in constant motion; large wavelets, crests begin breaking, scattered white caps

4 – moderate breeze (13 – 18 mph): dust, leaves, and loose paper rise up; small branches move; small waves 1-4 ft., numerous white caps

5 – fresh breeze (19 – 24 mph): small trees sway; moderate waves, 4-8 ft., many whitecaps and some spray

6 – strong breeze (25 – 30 mph): large branches in motion; larger waves, 8-13 ft., white caps common, more spray

**Cloud cover (Cloud):** *Indicate the percent of sky covered by clouds*

Enter numeric percentage (0 – 100)

**Precipitation (Precip):** *Ideally, surveys should not be conducted in steady rain. But if the survey is conducted despite steady rain at your survey area or rain starts when in the field, please record 3 as the code.*

0 – none

1 – light intermittent; mist, sprinkle, drizzle

2 – fog

3 – steady rain

## CHARACTERISTICS

When recording Cover Type, record the dominant Cover Types (**Type**) present at the time of the survey throughout the entire survey area, not just habitat types being used by shorebirds.

**Cover Type (Type):** Document the cover type(s) that is **dominant** in the survey area. In other words, record the one or two cover types **that each comprise at least 40% of the survey area**; if no cover type meets this criterion, leave blank and describe the composition of the cover types in the notes section of the survey datasheet.

- 1 – **Wetland:** open freshwater with tules, cattails, and some grasses and sedges.
- 2 – **Rice:** flooded or dry field with clearly defined internal levees; if dry, the field may be tilled or have standing stubble.
- 3 – **Pasture:** predominantly grasses; if irrigated it will be green year round.
- 4 – **Hay:** various types of grass/herbs mowed and cured for fodder.
- 5 – **Irrigated Row Crop:** likely dirt field with raised beds or with standing stubble (e.g. corn, tomatoes)
- 6 – **Winter Crop:** emergent green vegetation from tilled soil (e.g. winter wheat)
- 7 – **Freshwater Lake/Pond:** large body of freshwater including reservoirs
- 8 – **Evaporation Pond:** settling pond constructed to collect agricultural wastewater
- 9 – **Wastewater Pond:** pond associated with wastewater from sewage or other industrial operations
- 10 – **Orchard:** trees (e.g. almonds, apples etc.)
- 11 – **Forest:** extensive woody vegetation, non-agricultural (e.g. willows in riparian)
- 12 – **Developed:** houses, cemetery, parking lot, other human-made structures etc.
- 13 – **Salt Pond:** shallow, artificial pods of water (without vegetation) associated with salt production. This includes the levee around the salt pond.
- 14 – **Tidal Salt Marsh:** coastal marsh (with vegetation) inundated by high tides
- 15 – **Tidal Mud Flat:** areas of mud, sand, or gravel (generally lacking vegetation) alternately exposed and inundated by tides. If mudflats are covered with water at the time of the survey, the cover type should be considered “Bay/Ocean” (see 19 below).
- 16 – **Beach:** sandy shoreline; sand can be coarse or fine grain and composed of multiple substrates
- 17 – **Rocky Shoreline:** (includes riprap—embankments lined with rocks or broken concrete).
- 18 – **Agriculture Field** (non-orchard) includes categories 3, 4, 5 and 6 from above. Use this category only when unable to determine a more specific field type.
- 19 – **Bay/Ocean:** open water within a tidal system. Includes waters over subtidal areas, water covering tidal flats at time of survey, and the ocean.
- 20 – **Diked Salt Marsh:** muted (not completely open) or non-tidal (entirely closed) salt marsh that usually includes some salt marsh vegetation. Muted tidal areas have a narrow break in the dike (or tidal culvert or gate) allowing tidal flow to slowly enter and leave the diked area delaying the high and low tides relative to the adjacent portions of the bay. This type includes salt ponds recently restored to tidal action and coastal estuaries that are separated from the ocean by natural barriers.
- 21 – **Levee**
- 22 – **Islands**
- 23 – **Lagoon:** saline, alkaline, or fresh water pools separated from a main body of water by a shoal; pooled water may be from waves washing over shoreline berms, waters stranded by declining lake levels, or water from drains or streams that pools up behind beaches or other shoreline features. Lagoon shorelines may be barren or may support marsh plants or trees.
- 24 – **Saline Lake:** landlocked lake with high concentrations of mineral salts (saline or alkaline).
- 25 – **Mangrove:** tidal area on coast with mangrove trees
- 26 – **Shrimp Farm:** manmade ponds used for cultivation of shrimp. These may or may not be flooded.
- 99 – **Other:** describe in notes

**Tidal Conditions (Tide):** Each coastal site should be surveyed under the same tidal conditions each year. However these may vary due to weather conditions. Please record your best assessment of the tidal conditions at your survey area.

- 1 – high
- 2 – almost high, and rising
- 3 – almost high, and falling
- 4 – half tide, rising
- 5 – half tide falling
- 6 – almost low, rising
- 7 – almost low, falling
- 8 – low
- 9 – not observed, not applicable, or observations made during more than one of these periods.

**Area Surveyed (Visible Area):** Because wintering shorebirds can only be detected through visual observation, visual obstructions (e.g. levee, tall vegetation, distance) may limit your ability to see some portions of the survey, it is important to record the percent of the survey area you could see and subsequently count. If you cannot see over (e.g. vegetation >5ft tall) or through vegetation it is blocking part of the survey area and should be accounted for by reducing the Visible Area. However do not reduce the visible area if there is short vegetation that does not block your overall view of the survey area.

Enter data as numeric percentage: (0–100) -or- U: Unknown/Cannot Determine

**Percent Flooded, Percent Bare Ground, Percent Vegetated**

*\*The following 3 variables (PercFlood, PercBare, PercVeg) often will sum to 100% but do not have to.*

When estimating proportions of these variables, it may be useful to mentally divide the visible portion of the survey area into a grid to better visualize the extent of each. Another option is to sketch the extent of the flooded, vegetated, and bare areas on your map. If tracking on your map, do this based on what you see on the ground during the survey, as things may have changed since the aerial photo was taken, or it may have been taken at a different tide than that on the survey date.

**Percent Flooded (PercFlood):** Percent of visible area with open standing water; encompasses the sum of flooded fresh or brackish areas, salt ponds, and open bay waters, including tidally inundated areas at the time of the survey.

Enter numeric percentage: (0 – 100) -OR- U: Cannot Determine

**Percent Bare Ground (PercBare):** Percent of visible area with open dirt or mud at the time of the survey.

Enter numeric percentage: (0 – 100) -OR- U: Cannot Determine

**Percent Vegetated (Perc Veg):** Percent of visible area with vegetation at the time of the survey.

Enter numeric percentage: (0 – 100) -OR- U: Cannot Determine

**Vegetation Height (VegHt):** Visual estimate of the average vegetation height in the visible survey area. If the survey area is flooded, estimate the height of the vegetation emerging from the water.

- |                |                 |
|----------------|-----------------|
| 0: Bare        | 3: >12 – 18 in. |
| 1: 1 – 6 in.   | 4: >18 – 24 in. |
| 2: >6 – 12 in. | 5: >24 in.      |

**Notes:** Record any additional details about factors that may have influenced the accuracy of your count in the notes section of the datasheet. Such factors might include intense disturbance by raptors or large mammals (coyotes, dogs), machinery, crop dusters flying overhead, etc.

**WHAT TO TAKE IN THE FIELD**

Survey Area Map(s)	Scope and tripod
Protocol & Species list	Watch
Datasheets	Sunscreen
Permit and keys (if applicable)	Water
Pencils or Permanent Ink Pen	Field guide
Binoculars	Clip Board

**DATA ENTRY**

Data should be entered directly into the appropriate project in California Avian Data Center (CADC; [www.prbo.org/cadc](http://www.prbo.org/cadc)) within a few days of the survey. If you have not registered for a CADC account please see the CADC protocol in the Shared Survey Resources Page at [www.migratoryshorebirdproject.org/sharedresources](http://www.migratoryshorebirdproject.org/sharedresources)) for instructions on how to register with CADC and enter data.

**SHOREBIRD SPECIES IDENTIFICATION**

View and download instructional shorebird identification materials from Shared Survey Resources here: [www.migratoryshorebirdproject.org/sharedresources](http://www.migratoryshorebirdproject.org/sharedresources).

## SHOREBIRD SURVEY SPECIES LIST

The following list contains the primary species of shorebirds, including mixed flocks, and diurnal raptors that may be seen in or around shallow-water habitats along the Pacific Coast of North America in winter. Note that some of these species may be rare or absent as you move north to south or from the coast to the interior. Also, this list is NOT comprehensive and, hence, we ask that you record all shorebirds and diurnal raptors that you identify. The California Avian Data Center (CADC) will allow you to look up the “Species Code” for species that are not listed here (please see the CADC data entry protocol for more information).

### SHOREBIRDS

Black-bellied Plover (BBPL)  
American Golden-Plover (AMGP)  
Pacific Golden-Plover (PAGP)  
Snowy Plover (SNPL)  
Semipalmated Plover (SEPL)  
Killdeer (KILL)  
Mountain Plover (MOPL)  
Black Oystercatcher (BLOY)  
Black-necked Stilt (BNST)  
American Avocet (AMAV)  
Spotted Sandpiper (SPSA)  
Solitary Sandpiper (SOSA)  
Wandering Tattler (WATA)  
Greater Yellowlegs (GRYE)  
Lesser Yellowlegs (LEYE)  
Greater/Lesser Yellowlegs (XYEL)  
Willet (WILL)  
Whimbrel (WHIM)  
Long-billed Curlew (LBCU)  
Whimbrel/Curlew (XNUM)  
Marbled Godwit (MAGO)  
Curlew/Godwit (XCGO)  
Whimbrel/Curlew/Godwit (XWCG)  
Godwit/ Whimbrel/Willet/Curlew (XWNG)  
Ruddy Turnstone (RUTU)  
Black Turnstone (BLTU)  
Surfbird (SURF)  
Red Knot (REKN)  
Sanderling (SAND)  
Semipalmated Sandpiper (SESA)  
Western Sandpiper (WESA)  
Least Sandpiper (LESA)  
Baird's Sandpiper (BASA)  
Pectoral Sandpiper (PESA)

Rock Sandpiper (ROSA)  
Dunlin (DUNL)  
Western/Least Sandpiper (XWLS)  
Western/Least/Dunlin (XWLD)  
Stilt Sandpiper (STSA)  
Ruff (RUFF)  
Short-billed Dowitcher (SBDO)  
Long-billed Dowitcher (LBDO)  
Short-billed/Long-billed Dowitcher (XDOW)  
Wilson's Snipe (WISN)  
Wilson's Phalarope (WIPH)  
Red-necked Phalarope (RNPH)  
Red Phalarope (REPH)  
Wilson's/Red-necked Phalarope (XWRP)  
Wilson's/Red-necked/Red Phalarope (XPHL)

### DIURNAL RAPTORS

Turkey Vulture (TUVU)  
Osprey (OSPR)  
White-tailed Kite (WTKI)  
Bald Eagle (BAEA)  
Northern Harrier (NOHA)  
Sharp-shinned Hawk (SSHA)  
Cooper's Hawk (COHA)  
Sharp-shinned/Cooper's (XSCH)  
Red-shouldered Hawk (RSHA)  
Swainson's Hawk (SWHA)  
Red-tailed Hawk (RTHA)  
Ferruginous Hawk (FEHA)  
Rough-legged Hawk (RLHA)  
Golden Eagle (GOEA)  
American Kestrel (AMKE)  
Merlin (MERL)  
Peregrine Falcon (PEFA)  
Prairie Falcon (PRFA)