

SOP: Field Methods for Waterbird Survey at Modoc National Wildlife Refuge

Updated: March 3, 2025

Primary usage: Refuge lead and surveyors to implement waterbird ground count surveys.

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Overview

This SOP is a step down from the Pacific Southwest Waterbirds Survey Protocol Framework ([ServCat 161689](#)). Significant components of these methods are adapted from SOP 2 of the Integrated Waterbird Management and Monitoring Initiative Protocol (Loges et al. 2021; [ServCat 135419](#)).

Follow these instructions for preparing and conducting waterbird counts and assessing site conditions for each management unit at time of survey. Associated data collection sheets can be found in Supplemental Materials ([ServCat 163436](#)).

Measurements

The following measurements should be recorded at each survey location:

- Counts of waterbirds by species (see Refuge Species List; [ServCat 163433](#))
- Primary observer name (first and last name)
- Management unit and subunit name
- Date observations were made (MM/DD/YYYY)
- % flooded
- % mudflat
- % frozen/snow
- Dead birds

Equipment

- Government issued vehicle
- Good optical equipment, including a spotting scope and binoculars (min spec: 8x30mm; recommended spec: 10x42mm)
- Map of the project and unit boundaries
- Waterbird Data Sheet ([ServCat 163436](#))

- Clipboard and writing utensil
- Tablet with Survey123 and the most recent updated to AnserForm, the Waterbird Data Entry Tool, downloaded
- Field guide for waterbird identification (recommendation: Merlin Application on mobile device)

Survey Schedule

Waterbird surveys should ideally be conducted twice per month throughout the Spring (January 1 – May 31) and Fall (August 1 – December 31) migration periods (see Element 2: Survey timing and schedule). For the months of December and January at least once per month is sufficient since there are more over-wintering birds than migrants. If staff availability and time are limited, the surveys could be conducted at least once per month.

Surveys should occur during the first half of the day between opening of business (08:00) and 13:30. Exact start time is dependent on weather conditions for the given day. This survey covers multiple units throughout the main body of Modoc NWR (see Appendix C for list of units). Due to the number of units monitored, this survey should ideally take two consecutive mornings. Due to site conditions or the waterfowl hunting season, the survey can be separated by a day (i.e., Monday morning and Wednesday morning). It is best to avoid performing the survey on a Friday and Monday if possible. It is currently easiest to survey the portion of the Refuge that is east of county road 115 one morning and the portion on the west side of county road 115 another morning. It is good practice to change the order of surveys by choosing different starting units on each visit (wherever possible). If birds are observed moving from one unit to another, include waterbirds in the estimate for only the first unit in which they were encountered. Waterbirds observed outside the unit boundaries during flood events or as flyovers should not be included in survey unit observations.

NOTE: During the waterfowl hunting season it is important to avoid conflict with hunting interests. Conflict can be minimized when surveying units open to hunting by surveying outside of the Refuge's hunt days. Currently Modoc's hunt days are Tuesday, Thursday, and Saturday.

Appropriate Weather

Surveys during inclement weather should be avoided. Whenever possible, do not survey waterbirds in fog, rain, snow, or strong winds (≥ 25 mph). If you have already started the survey and precipitation starts to occur, use your best judgement to determine whether you should stop, wait it out, or continue the survey.

Subunit Names

See Appendix C for a list of subunit with names ([ServCat 163430](#)).

Site conditions

The surveyor will record water habitat classes for flooded area, mudflat area, and frozen area (Cowardin et al. 1979). Percents should be estimated to the nearest 10%. The percent covers for these three classes are considered mutually exclusive, so percent cover estimates across all habitat classes must sum to $\leq 100\%$. Vegetation is not included in this survey; any density of vegetation

can fall under these classifications. The classes are defined in Table SOP 1.1; more details on how to estimate percent cover for each class are described below. Site conditions are assessed for the entire unit, including upland area. For example, if the wetland area is flooded, but wetland area of the unit is only 50% then the unit would be recorded as 50% flooded.

Table SOP 1.1. Glossary of site conditions measured in the waterbird surveys.

Term	Definition
Flooded	Area that has flowing or standing water ≥ 1 " in depth.
Mudflat	Area of exposed land surface that is moist or damp. These areas tend to have darker colored soil than dry areas.
Frozen/Snow	Area that isn't easily accessible to waterbirds due to ice and snow. A wetland may be flooded, but if that water is a sheet of ice, it is considered frozen.

Percent Flooded

Flooded in this case is qualitatively assessed by estimating the percentage of the entire unit, not just what is defined as the wetland portion for that year. Some units will have areas of sage-steppe or other uplands, and thus will not reach 100% on most years.

Percent Mudflat

Mudflats can be identified by color; mudflats will have darker coloration than dry areas as the soil is moist. Cracking in the soil is not an indication of dry soil versus mudflat. Mudflat only applies to wetlands; mudflat should be NA for all wet meadow subunits.

Percent Frozen/Snow

Across the entire survey unit, visually estimate and record the percent of the water surface that is covered by ice/snow. Sheet water present on thawing ice should be treated as ice. Frost on vegetation is not considered frozen, but skim ice that will melt throughout the day is considered if present at time of survey.

Counting and estimating waterbird numbers

Counts of individual waterbirds (see Species List; [ServCat 163433](#)) are recorded by species on the Waterbird Count datasheet ([ServCat 163436](#)) or directly entered to AnserForm on a mobile device following *SOP: Entry and Editing Using AnserForm* ([ServCat 161692](#))¹. The following methods are from IWMM, adapted to fit Region 8 needs ([ServCat 135419](#)):

Be careful not to count individual waterbirds more than once. When in doubt about whether an individual waterbird was already seen, err on the side of not double-counting and assume it was already counted. If you find that no waterbirds are present, still record site condition information. In these cases, [AnserForm] will automatically fill in zeros for bird counts, adding information that is vital for analysis.

Visually scan the wetland systematically, enumerating birds by species using [the Refuge Species List ([ServCat 163433](#))]. When many birds are present], it is often more practical

¹ Typically 6-10 units at Modoc are recorded on paper, and the remaining units are entered directly into AnserForm. Units recorded on paper are entered into AnserForm in the office as soon as possible (often within the same day).

to estimate numbers. Estimating numbers may also be necessary if waterbirds move around the wetland or are in very tightly packed flocks.

To count waterbirds in a flock, first estimate a 'block' of waterbirds (e.g., 5, 10, 20, 50, 100, 500, 1000 waterbirds) depending on the total number of waterbirds in the flock and the size of the waterbirds. To do this, count a small number of waterbirds (e.g., 10) to gain a sense of what a group of 10 waterbirds "looks like." Then count by 10s to 50s or 100 waterbirds to gain a sense of what 50 or 100 waterbirds "looks like." The block is then used as a model to measure the remainder of the flock. In the example below (Figure SOP 1.1), we use 'blocks' of 20 birds to arrive at an estimate of 320 waterbirds.

In some instances, it might not be possible to get an accurate count of each species in a mixed waterfowl flock, particularly if the flock contains similar species. In such cases, try to estimate the percentage of the flock belonging to each species by "sub-sampling." To do this, choose several subsets of waterfowl across the flock, then count and identify all individuals within those subsets. Then use these estimates to provide an extrapolated estimate of numbers of each species in the entire flock. When using this method, be mindful of the fact that species may not be distributed evenly among the flock, so carry out several sub-samples. As an example, in the raft of ducks in Figure SOP 1.1, you might count the waterbirds in 3 subsamples of 20 waterbirds, identifying 12, 10 and 14 Redheads among them. These 36 Redheads represent 60% of the 60 waterbirds in those 3 subsamples - extrapolating this to the whole flock (previously estimated to be 320 waterfowl) would produce an estimate of 192 Redheads.

SURVEY TIP: If you are surveying units with large numbers of waterbirds, it is often best to count in teams of two, one person counting while the other records the numbers on the field sheet [or mobile device].

Subsets may be hard to define, especially if the waterfowl are constantly moving around. If this is the case, estimate the total raft size and then estimate the proportion of each species in the raft. Use the proportions to calculate the total of each species (ex. 600 birds: 25% Cinnamon Teal, 25% Rudy Ducks, 50% Mallards = 150 Cinnamon Teal, 150 Rudy Ducks, and 300 Mallards). If birds are disturbed when arriving at a subunit, wait for birds to settle (i.e., stop flushing) before beginning counts.

This survey includes options for unknown waterfowl. These are to be used when it is unreasonable to accurately identify the waterfowl down to species. This can happen due to poor lighting, quick or distant views, similarity of species, or other factors. Use these options as sparingly as possible and try to narrow the options down to the guild level. For example, there is a flock of waterfowl containing 50 ducks, but they are back lit by the sun and only dark silhouettes are visible. Watch the flock and their behavior. This may provide enough information to classify the unknown ducks as unknown dabblers or unknown divers.

At minimum, the entire unit should be glanced over with a scope. The surveyor should attempt to look through any vegetation and low visibility areas with a scope. Most of the effort should be in the open water. It is important that all areas of the unit are observed because Greater Sandhill

Cranes can be found in vegetated areas. Dead birds may also be found in lower visibility areas, so a complete search is critical.

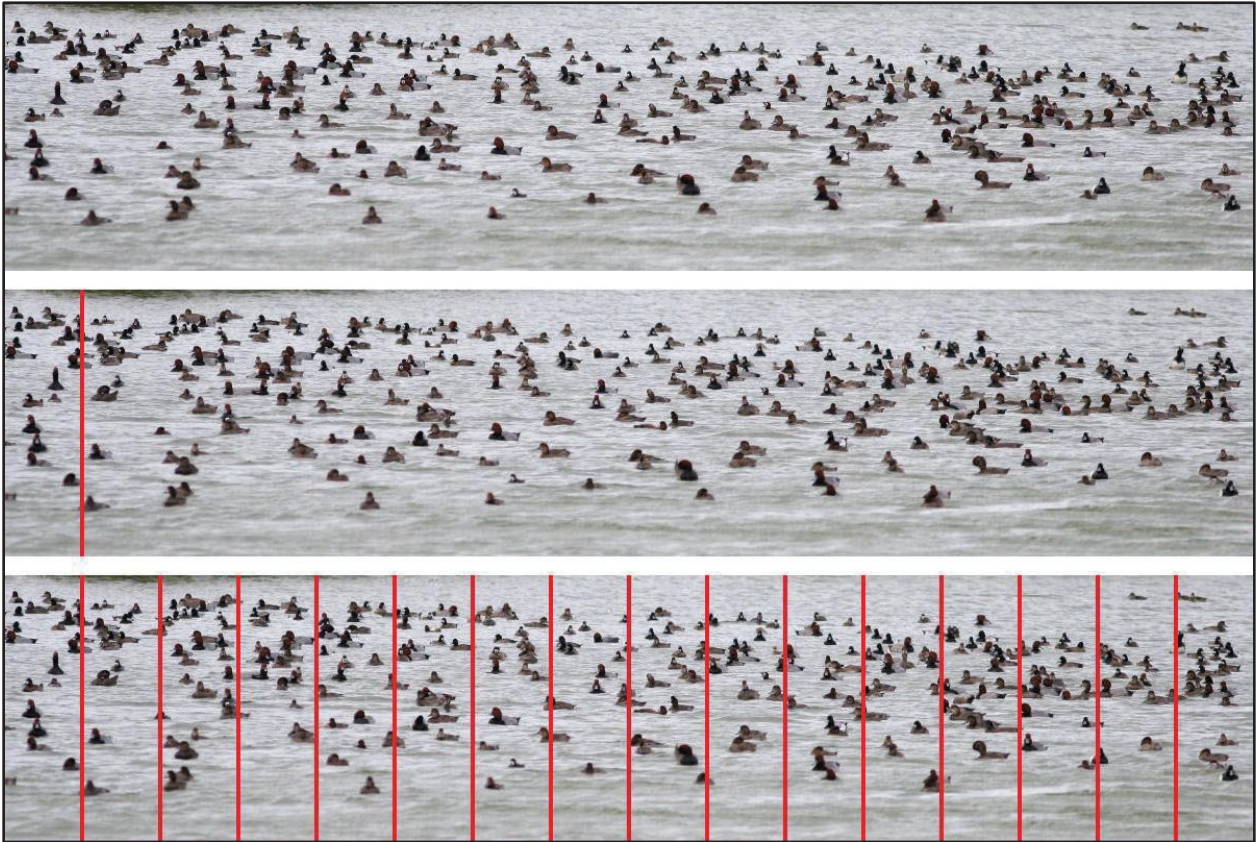


Figure SOP 1.1. Estimating flock size for a raft of ducks. Count members within a visualized group, for example 20 individuals, then see how many groups there are in the flock. In this example 16 groups x 20 individuals/group = 320 individuals in the flock. Figure from IWMM (Loges et al. 2021; [ServCat 135419](#)).

Training

First-time surveyors should review the Protocol Framework ([ServCat 161690](#)) and the SSP ([ServCat 163430](#)).

Inexperienced waterbird counters are advised to practice their counting and estimation techniques before participating in the survey. This can be done in the field or at a desktop computer using resources such as the Aerial Observer Training and Testing Resources tool for [estimating flock size](#) and the identification section of the [USFWS website](#). Field practice is preferential for training purposes.

Young waterbirds/broods

Do not include dependent young waterbirds in counts. For geese, swans and ducks, assume juveniles are independent when they can fly. Any juveniles that did not hatch in the immediate vicinity should be included in counts (e.g., juvenile swans migrating in family groups).

References

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