

Project ColonyWatch

Census of Colorado breeding sites of colonially-nesting water birds

Scope -- All nesting sites of the following species will be surveyed: Eared Grebe, Western Grebe, Clark's Grebe, American White Pelican, Double-crested Cormorant, Great Blue Heron, Great Egret, Snowy Egret, Cattle Egret, Black-crowned Night Heron, White-faced Ibis, Franklin's Gull, California Gull, Forster's Tern, and Black Tern.

Protocols -- Counts conducted by ColonyWatchers will be in accordance with guidelines suggested in the 13 February 2003 draft, *Breeding Season Population Census Techniques for Seabirds and Colonial Waterbirds throughout North America* (henceforth, NACWCP 2003), which was produced by the monitoring committee for the North American Colonial Waterbird Conservation Plan.

This manual recommends direct counts of the total number of nests whenever possible, especially for studies conducted at local scales involving a small number of colonies and at all colonies hosting small numbers of breeding pairs. This parameter provides a more reliable estimate of the total nesting effort for the year than the total number of adults, as that number contains both breeding and non-breeding birds.

Direct nest counts from the perimeter of each colony will be conducted for Great Blue Heron, Great Egret, Double-crested Cormorant, and for the portion of the Black-crowned Night Heron population that nests in riparian or shoreline trees. The tree-nesting species generally begin nesting before the trees are fully leaved out, providing an opportunity to obtain accurate counts of active nests. Although the preferred method for monitoring colonies in trees and large shrubs is to conduct strip transects through the colony (NACWCP 2003), the presence of observers within the colony for a long period of time may produce excessive predation or abandonment of nests. We believe these strip transects are not necessary in our region, and we will conduct **perimeter counts** for these species. Perimeter counts are recommended for small colonies (<50 nests) of Great Blue Herons or other species that build conspicuous nests and return to the colonies before the nests are concealed by vegetation (NACWCP 2003). These conditions exist in a vast majority of Colorado's colonies of tree-nesting waterbirds; the state has few colonies that exceed 50 nests and these sites can be adequately viewed to allow accurate perimeter counts.

If good vantage points are available, if all nests are readily visible, and if the colony contains fewer than 200 pairs, complete nest counts from the perimeter of ground nesting colonial water birds—American White Pelican, Double-crested Cormorant, and California Gull in Colorado—are recommended. Systematic **ground surveys** are recommended for ground nesting species in colonies with fewer than approximately 200-300 pairs (NACWCP 2003). The entire colony is surveyed and each nest marked with spray paint or by some other means to avoid omission or double counts. For large colonies, generally those in excess of 1,000 pairs, complete nest counts are not feasible without causing unacceptable levels of disturbance to the nesting birds. In these situations, a sampling methodology is recommended to estimate of the population size. The sampling procedures require developing nest density estimates in a portion of the colony, and using these densities to extrapolate to the total number of nesting pairs at the

site. Juvenile birds of these species are readily identified, and RMBO experience suggests that it is possible to conduct effective perimeter counts of juveniles before they are capable of sustained flight (pelicans) and/or flush counts shortly thereafter (gulls). These counts are much less intrusive and disruptive to the colonies, so we have chosen to use juveniles of the year as the count parameter, and to use these much less disruptive parameter counts.

Many of Colorado's Black-crowned Night Heron colonies and all of the Snowy Egret, Cattle Egret, and White-faced Ibis colonies are in wetlands (most commonly bulrush islands) that cannot be surveyed effectively from the perimeter. The dense vegetation hides most nests from the perimeter and is impenetrable on the ground. Since observer movement in wetland habitats is constrained, strip transects have a high potential for causing nest failure or abandonment. Aerial surveys are effective for light-colored birds in such circumstances, but darker birds such as the Night Heron and Ibis are poorly sampled by this technique (NACWCP 2003). In these situations, flight-line counts provide the most practical method for developing an index to population size (Erwin 1981). Given the uncertain relationship between flight-line counts and the number of nesting pairs in a colony, the ability of this method to detect population trends is uncertain and may vary from colony to colony (Erwin and Ogden 1981). The number of adults observed flying from the colony is used as an index to overall population size. This parameter may include both breeding adults and nonbreeders, and the proportion of nonbreeders may vary between surveys; therefore, flight-line counts provide only an index to population size and are not directly comparable to estimates of total population size derived from other methods (NACWCP 2003).

Colorado has a small number (<5 total) of small Franklin's Gull, Forster's Tern, and Black Tern colonies. These birds nest in emergent vegetation—cattails and bulrushes—which makes it impossible to directly count the nests from the perimeter. These colonies can be surveyed using **flush counts** without undue levels of disturbance (NACWCP 2003). During the nesting period these birds react aggressively to near approach of the nests by potential predators (e.g. field biologists), circling overhead, calling loudly, and occasionally diving at the intruders. At small colonies, this behavior makes it relatively easy to count flying birds. The total number of adults in the colony is the parameter for this type of count. Flush counts are also effective at smaller Black-crowned Night-Heron colonies. These counts are conducted late in the incubation period or early in the brooding period. A single observer approaches the colony to flush all birds present, retreats to a position where he can see the birds returning, and counts the birds as they enter the colony. If possible, a second observer should conduct independent count simultaneously.

A nest-attendance index developed by comparing counts of apparently occupied nest sites with flush counts from a small number of tern colonies indicates that three flying birds are equivalent to two breeding pairs (Bullock and Gomersall 1981). ColonyWatch surveyors at Walden Reservoir in mid July of 1999 and 2000 followed flush counts of Franklin's Gulls and Forster's Terns with searches through the small patch of cattails where the birds nested. No active nests were found, as the youngsters were quite mobile although most were as yet flightless. We are certain that all of the colony's adults were in the air above the observers and three flying adults could have been equivalent to no more than 1 1/2 breeding pairs. Therefore, we believe that the

timing of these counts should be after the young have left the nest and before they are fully capable of flight (mid July in Colorado), rather than during the incubation period as the North American Monitoring Manual recommends. Because the colonies in Colorado are small, counts can be conducted with fewer than the five observers (two will suffice) recommended by the North American manual.

A. Perimeter counts -- Perimeter counts will be conducted from boats or from pre-determined points around the perimeter of a colony. The number and location of survey points will vary from colony to colony depending upon vegetation structure and density, colony size and shape, types of species breeding in the colony, and possibly other factors. The points will be located at sufficient intervals around the colony to allow for counting the maximum number of nests while minimizing the risk of double-counting nests. Survey locations should be located at positions that allow birds to be counted without disturbing them from the colony. These points should provide view of unique landmarks within the colony that can be used to establish which nests to count from each point. The number of nest visible from each point will be counted. Enough points should be established to count all of the nests in the colony. The survey points will be noted and recorded for use in subsequent counts; however, changes in colony size, nest location, and/or vegetation structure may require adjustments in the locations of the perimeter survey locations in order to count a comparable proportion of the breeding population of each species present in the colony.

Nests with incubating or brooding adults and nests which are being otherwise tended to by adults, such being constructed or repaired, will be deemed active. Each nest in the colony must be carefully inspected for activity. Many nests of these species may persist into the following year but not be re-used. Although the monitoring parameter for these counts is the number of active nests, we will count all nest structures. These counts may reveal information year-to-year shifts in the population. Some colonies receive long-term monitoring by volunteers. At these colonies counts of juveniles will provide some information about nest success, and these counts will also be collected.

A double-observer approach to determine detection probabilities will be used at larger colonies where undercounting is deemed a significant risk. One observer will verbally count the nests for each species that are visible from each survey point. A second observer will independently conduct counts and record nests that were missed by the first observer. Where there are multiple survey points, the observers will trade roles between points in order to obtain detection probabilities for each observer.

B. Flight-line counts. Survey locations for flight-line counts are established at positions that allow unobstructed views of birds flying between the colony and their foraging habitats. Flight directions are generally non-random, and the location of the counting points will be selected to detect the greatest number of birds entering or leaving the colony. A single observer may conduct counts if the departure route for the birds is predictable and all departing birds can be viewed from a single position. Multiple observers are required if flight-lines cannot be viewed from one point. Multiple observers should establish points for counting that will not duplicate counts of individual birds. Reference points in two different directions should be identified from each survey point, and only birds crossing the line between the observer and these reference points

should be counted. Counts are conducted for three hours, preferably during the incubation stage of nesting to reduce the variability associated with repeated visits to feed a brood of hungry young. Counts will begin as early in the day as light allows—generally 1/2 hour before sunrise. Timing of these surveys is critical for obtaining reasonable counts, and must be based on the local biology and patterns of movements for the species.

A double observer approach can be used to determine detection probabilities. One observer would verbally identify and count all individuals as they fly to/from the colony. The second observer would try to find individuals/flocks that are missed by the first observer, as well as check the identification and counts of birds reported. The observers would change roles half-way through the survey period in order to obtain detection probabilities for both observers.

C. Flush Counts. Franklin's Gulls and Forster's Terns. One observer will approach the colony until all of the adults have flushed from the colony. A second observer stationed at a distance will count the flying adults. Count should be completed as quickly as possible after the birds flush. Following the first count, the observers will reverse roles and repeat the count. If the two counts are within 10% of each other the two counts will be averaged. If the count have a greater than 10% disparity, further counts will be conducted until the observers are confident that accuracy is within the 10% range. The total number of adults present in the colony will be recorded. These counts will be conducted in mid July, after the young have left the nest but before they are capable of flight. The counts may be conducted at any time during daylight hours.

Black-crowned Night-Herons. One observer will approach the colony and flush all adults. As soon as all adults have left the colony, the observer will retreat to an inconspicuous spot, which provides a clear view of the nest site. Birds are then counted as they return to the site. These counts should be conducted late in the incubation or early in the brooding. If at all possible, two observers should conduct independent counts at this time.

D. Juvenile counts. American White Pelicans and California Gulls. Direct counts of juvenile birds are conducted simultaneously by at least two independent observers. If the two counts are within 10% of each other the two counts will be averaged. If the count have a greater than 10% disparity, further counts will be conducted until the observers are confident that accuracy is within the 10% range. The total number of juveniles present in the colony will be recorded. These counts will be conducted in mid July, after the young have left the nest but before they are capable of flight. The counts may be conducted at any time during daylight hours.

Species by species application of techniques are identified in the chart below. The # column indicates the approximate number of colonies nesting in Colorado most years.

Species	#	Habitat	Technique	Parameter
Eared Grebe	20	Emergent vegetation in lakes	Perimeter count	Active nests
Western Grebe	10	Emergent vegetation in lakes	Perimeter count	Active nests
Clark's Grebe	5	Emergent vegetation in lakes	Perimeter count	Active nests
American White Pelican	3	Islands in lakes	Perimeter count	Juveniles
Double-crested Cormorant	15	Islands and shoreline trees	Perimeter count	Active nests
Great Blue Heron	75	Riparian and shoreline trees	Perimeter count	Active nests
Great Egret	2	Riparian and shoreline trees	Perimeter count	Active nests
Snowy Egret	7	Marshes	Flight-line count	Adults
Cattle Egret	4	Marshes	Flight-line count	Adults
Black-crowned Night Heron	20	Riparian and shoreline trees Marshes	Perimeter count Flush count	Active nests Adults
White-faced Ibis	5	Marshes	Flight-line count	Adults
Franklin's Gull	1	Emergent vegetation on island	Flush count	Adults
California Gull	3	Islands in lakes	Direct count	Juveniles
Forster's Tern	3	Emergent vegetation on island	Flush count	Adults
Black Tern	?	Marshy ponds and lakes	Flush count	Adults

1. Eared, Western, and Clark's Grebes

Protocol: Counts will be conducted when the maximum number of birds is actively nesting. Colonies will be visited in the last two weeks of June and periodically thereafter as necessary to determine when this occurs. On the large lakes, counts will be conducted by two observers from a boat. At smaller lakes, counts may be conducted with spotting scopes from shore. Observers will count all nests that are under construction, nests with eggs, and nests tended by adults. Observers will also determine the maximum numbers of adults and juveniles seen in the colony. For Grebes the parameter for monitoring will be active nests. This number will be determined by the direct count of nests and juveniles. Because a large number of Western and Clark's Grebes present in Colorado during the nesting season are non-breeding birds, we will also track the number of adults present.

2. American White Pelican

Protocol: Pelicans nest on bare islands, do not build nest structures, and leave the flightless juveniles for long periods of time. Counts will be conducted when the young are large enough to be mobile but before they can fly—in July at most sites. Counts will be conducted by two observers using a boat. Both observers should count and recount

until the totals can be reconciled within established ranges of accuracy. The parameter for monitoring will be juvenile birds.

3. Double-crested Cormorant

Protocol: Where this species nests along with Great Blue Herons, counts should be conducted in the last week of April and the first week of May—before the cottonwood trees leaf out. Where they are nesting on the ground on islands, counts may be later and conducted in association with counts of gulls and pelicans. Nests that appear to have been used this year, occupied nests, and adults should be counted. To keep disturbance to a minimum, count from as far from the nest site as practicable while still getting accurate numbers.

4. Great Blue Heron

Protocol: Counts may be conducted in the last week of April and the first week of May—before the cottonwood trees leaf out. Nest platforms, occupied nests, and adults should be counted. To keep disturbance to a minimum, count from as far from the nest site as practicable while still getting accurate numbers. Observers who are monitoring heronries throughout the nesting season should also report numbers of juveniles.

5. Great Egret

Protocol: Counts may be conducted in the last week of April and the first week of May—before the cottonwood trees leaf out. Occupied nests and adults should be counted. To keep disturbance to a minimum, count from as far from the nest site as practicable while still getting accurate numbers.

6. Snowy Egret

Protocol: Counts should be conducted in late May through June.

7. Cattle Egret

Protocol: Counts should be conducted in late May through June.

8. Black-crowned Night-Heron

Protocol: At sites where this species is nesting in cottonwood groves along with Great Blue Herons and/or Double-crested Cormorants, perimeter counts will be conducted in late April and early May before the trees fully leaf out. Occupied nests and adults should be counted. To keep disturbance to a minimum, count from as far from the nest site as practicable while still getting accurate numbers. The parameter of monitoring at these sites will be active nests. Flight-line counts will be conducted at sites where nests are placed at low levels in marshy vegetation can be conducted in late May through June, during incubation and early brooding periods.

9. White-faced Ibis

Protocol: Flight-line counts will be conducted in late May through June, during incubation and early brooding periods.

10. Franklin's Gull

Protocol: Counts may be conducted in the last two weeks of June and the first three weeks of July. On the large lakes, counts will be conducted by two observers using a boat. Adults and juveniles will be counted.

11. California Gull

Protocol: Counts should be conducted in the last two weeks of June and the first three weeks of July. On the large lakes, counts will be conducted by two observers using a boat. Adults and juveniles will be counted.

12. Forster's Tern

Protocol: Counts may be conducted in the last two weeks of June and the first three weeks of July. On the large lakes, counts will be conducted by two observers using a boat. Adults and juveniles will be counted.

13. Black Tern

Protocol: Presence of Black Terns will be noted wherever they are sighted. Adults and juveniles will be counted. If appropriate sites are found, flush counts will be conducted in the last two weeks of June and the first three weeks of July.

Works Cited

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