

**Protocol for Monitoring Colonial Waterbirds
at Michigan Islands National Wildlife Refuge (Lake Michigan, Summer 2014)**

Reporting Office: Seney National Wildlife Refuge (Michigan Islands National Wildlife Refuge)

Species: Herring Gulls (*Larus argentatus*), Ring-billed Gulls (*Larus delawarensis*), Great Blue Herons (*Ardea herodias*), Black-crowned Night Herons (*Nycticorax nycticorax*), Caspian Terns (*Hydroprogne caspia*), Double-crested Cormorants (*Phalacrocorax auritus*), and Common Terns (*Sterna hirundo*)

JUSTIFICATION AND OBJECTIVES

The Beaver Archipelago, located in Michigan waters of northern Lake Michigan, consists of about 10 main islands and numerous small islands. Within this archipelago, Gull Island (1.0 km²), Hat Island (0.05 km²), Pismire Island (0.02 km²), and Shoe Island (0.004 km²) are part of the Michigan Island NWR, a satellite refuge of Seney NWR. Seney NWR has worked in conjunction with colleagues from Central Michigan University for nearly a decade on the monitoring of colonial waterbirds on these islands. Breeding waterbirds nesting on these islands are monitored using a standard protocol developed for the Great Lakes Decadal Waterbird Census (Cuthbert & Wires 2008). Methods utilized on Refuge islands are highlighted below.

Islands are accessed during fair weather and safe lake conditions. Each species is counted using ground nest counts. The timing of the nest counts corresponds with peak incubation for each species and/or at a time that disturbance to breeding birds can be minimized. Herring Gulls (*Larus argentatus*) and Ring-billed Gulls (*Larus delawarensis*) are counted in mid to late May. Great Blue Herons (*Ardea herodias*), Black-crowned Night-herons (*Nycticorax nycticorax*), Caspian Terns (*Hydroprogne caspia*) and Double-crested Cormorants (*Phalacrocorax auritus*) are counted within the first 10 days of June. Common Terns (*Sterna hirundo*) rarely nest on Refuge islands in the Beaver Archipelago; however, on nearby islands, these birds are typically counted in mid-June. Due to remoteness and inaccessibility except under calm lake conditions, Gull Island nest counts are typically completed for all species during early June.

Nests considered to be occupied are counted. These are defined as nests with eggs and/or chicks, or any nest that shows evidence of use (such as fresh vegetation or new construction) during the current season. Ground nests are counted and marked using one half of a colored “popsicle” stick deposited directly in the nest. Different colored sticks are used for each species when multiple species are counted simultaneously. Sticks are placed in labeled bags and counted beforehand so that any remaining sticks can be counted and subtracted from the original number to provide a total nest count. Tree nests are counted using hand tallies by a single observer. Trees may be flagged after counting in complex habitats to ensure all tree nests are counted.

For ground-nesting species at some colonies, it is also desirable to document clutch size. At small, single species colonies, the clutch size of each nest can be recorded as nests are counted

and marked. This method provides not only an average clutch size, but also clutch size frequency at the colony. This technique has been used for the Caspian Tern colony on Hat Island and also the Herring Gull colony on Shoe Island. At larger colonies, such as the cormorant colony on Hat Island, this method can be used on a subset of nests within the colony to minimize disturbance time. When colonies are small, but dispersed over a larger area, the total number of eggs present at the colony can be hand-tallied while nests are marked to determine average clutch size. This technique has been used on Hat and Pismire Islands when counting Herring Gulls. Finally, when the colony is large and compact (such as that Ring-billed Gull colony on Pismire), a subset of nests can be hand-tallied to determine average clutch size. Although less information is gathered using hand tallies to document average clutch size, this methodology is most efficient (quickest and creates less disturbance) at gull colonies where it can be difficult for counters to speak to each other due to the loud nature of the birds.

STATISTICAL CONSIDERATIONS

None.

DATA COLLECTION PROCEDURES

Species	Eggs	Nests
American White Pelican	Very large; as big as a Canada Goose egg, avg length x breadth = 90 x 56.5 mm. Shell a uniform chalky dull white, rough to the touch. Commonly streaked red with blood when first laid, later becomes smooth and discolored from nest or parents' feet.	Shallow depression with low rim. Outside diameter up to 89 cm, usually 61 cm, height up to 30 cm usually about 20 cm. Very little nest material overall. Nest bottom and rim composed of gravel, soil or nearby vegetation. Vegetative insulation none to variable.
Double-crested Cormorant	Elongated. Range in length from 56.9–69 mm; width ranges from 35.7–41.1 mm. Shell very pale blue, unmarked, but pigmented layer often obscured by variable outer calcite cover that is initially white and very porous; later stained brown from feces and dirt. Calcite layer is chalky in texture, giving irregular surface	Nests frequently placed on ground and on top and mid-portions of trees, also on fallen logs/cedars. Characteristically include finger-sized sticks and bulky items collected from diverse locations, and some twigs and leafy stems broken from living plants. Usually have any combination of feathers, bones, rope, plastic, etc. Outside diameter 45-91 cm, height 10-43 cm. Ground nests used repeatedly may reach heights > 2m. Tree nests usually smaller than ground nests but have distinctly deep cup shape and are densely built. Tree nests and sticks they are constructed with almost always smaller than those of Great Blue Herons; however, size of nests and sticks used to build nests by these species overlap.

Great Blue Heron	Oval or elliptical. Length 51 – 77 mm, width 45 – 46.5 mm. Dull pale blue-green. Texture smooth or slightly rough.	Nests frequently occur on top and mid-portions of trees and are usually the largest nests built by Great Lakes colonial waterbird species. Nests consist of a platform of twigs with saucer-shaped interior lined with moss, leaves, grass or small twigs. Dimensions vary greatly, from flimsy new platforms of sticks just 0.5 m diameter to bulky older structures 0.9 to 1.2 m across. About 1 m deep in nests used several times.
Great Egret	Elliptical shape. Length 56-58 mm, width 40.5-41.3 mm. More intensely blue-green than Great Blue Herons. Non-glossy, smooth texture.	Nests frequently occur on top and mid-portions of trees and shrubs but also low portions. Compared to above species, Great Egret nests appear more flimsy; they are flatter and the least cup-shaped, often composed of fairly thin sticks, less densely built and are less distinctly shaped. Platform has width of 0.5 – 1 m, average depth about 10.5 cm. Never as dense as DCCO, usually closer to GBHE in diameter than DCCO, can sometimes see up through them as with a Mourning Dove.
Black-crowned Night-Heron	Oval. Length x breadth = 52.35 x 37.37. Eggs are pale greenish blue.	More inconspicuous than nests of above species, frequently occurring deep in foliage, and must often be searched for intensively. First clue to presence and nesting is often adults perched in trees or circling above colony. Often nests lower in trees than other species (commonly 6-15 feet above ground) or on fallen logs/cedars. Nest usually a platform of sticks of whatever trees are available. Nest can appear fairly flimsy, cup shallow, with contents visible from below, though sometimes appears sturdy. Nests usually smaller than those of above species, but some overlap with nests of Great Egrets and cormorants. Nests 30-45 cm width, 20 cm height. Nest twigs pencil-sized in diameter.
Herring Gull	Mostly ovoid shape. Typically 65-75 mm long, 45-55 mm wide. Usually light olive, buff or greenish, may vary from tan to deep brownish buff. Speckled, spotted, blotched black, dark brown, or dark olive.	Nest bottom and rim built on ground and lined with vegetation, feathers, plastic, etc, though some have no lining. Outer diameter averages 30 cm, depth 5-7 cm.

Great Black-backed Gull	Mostly ovoid shape. Range in length from 73-86.5 mm; width ranges from 51-57.5 mm. Color pale olive, buff, or greenish, may vary from tan to deep brownish buff. They are speckled, spotted, blotched blackish brown, olive, or olive brown.	Nest bottom and rim built on ground and lined with vegetation, feathers, plastic, etc, though some have no lining. Outer diameter 20-56 cm, outer depth 5-12 cm.
Ring-billed Gull	Oval shape. Range in length from 50-65.9 mm; width ranges from 36.0-45.9 mm. This species has greatest range of egg colors and patterns. Colors include gray, olive green, brown and even light blue. Usually have many splotches, irregular shaped; splotch cover ranges from black and brown to rust. Blue-ish, more elongated than Caspian Tern.	Nests often flatter and closer to ground than above gull species; some poorly constructed with almost no nest material. Outer diameter 25-63 cm, cup depth 5 cm.
Caspian Tern	Oval shape similar to gull eggs. Range in length from 60–70 mm; width ranges from 45–50 mm. Color varies from pinkish or pale warm buff to very light buff; sparingly marked with small dark brown or black spots and speckles, or sometimes with large spots or irregular blotches. RBGU and CATE can be quite difficult to distinguish.	Depression may be lined with dried vegetation, small pebbles, debris. Sometimes nest rim contains shells and is built up like a gull nest. Some nests are piled masses of wood and stick debris; others appear primitive, with eggs lying on shells or in slight hollows. Average external diameter 19.5 cm; depth 4.5 cm.
Common Tern	Sub elliptical. Typical average dimensions 42 mm × 30.5 mm. Color cream, buff, or medium brown, sometimes tinged with green or olive; finely marked with streaks, spots, blotches, or fine lines of black, brown, or gray. A miniature RBGU egg.	Nest often begins by scraping hollow in substrate or by seeking natural depression or groove in rock, concrete or wood substrates. Usually constructed of dead vegetation, sometimes shell fragments, stones, etc. Nests on piers or breakwaters may have no nest material except concrete. Nest dimensions widely variable depending on substrate.

Suggestions for minimizing mortality of eggs and chicks. Counters should minimize the amount of time spent in the colony, especially in mixed species ground colonies where gulls are present. In these circumstances, eggs and chicks are highly vulnerable to gull predation. At sites where gull predation is anticipated to be high, researchers may want to consider aerial photography, an aerial count or counting at night to avoid nest mortality.

Temperature / environment effects. In general, it is not advisable to count nests in temperature extremes, bright sunlight or rain. Heat stress in eggs above normal incubation temperature can be lethal; cormorant eggs exposed to sun can heat as fast as $0.36^{\circ}\text{C}/\text{min}$. Most chicks cannot thermoregulate for the first two weeks. Because they have no down feathers at hatching, cormorants and pelicans are especially vulnerable. For example, small cormorant chicks become comatose at low temperatures of $60\text{--}66^{\circ}\text{F}$. When exposed to bright sun, young cormorant chicks may die in as little as 11 minutes. If weather extremes are unavoidable or counts must be made when young chicks are present, we recommend aerial photography, if possible.

DATA ANALYSIS AND REPORTING

Data are collected by Central Michigan University staff under a Special Use Permit and provided to Seney NWR staff as part of reporting requirements. Data may be shared with Regional colleagues as well.

MANAGEMENT ACTION THRESHOLDS

Data may be used in the ongoing management of Double-crested Cormorant colonies on Gull, Pismire, and Shoe Islands. No management should occur on Hat Island.

DATA STORAGE PROCEDURES

A database (Excel file) should be kept and updated at the refuge each year.

SPECIAL CONSIDERATION

As indicated in Habitat Management Plan for these islands, Wilderness Areas exist and should be managed as such. Also, Hat Island requires special consideration due to the Caspian Tern colony.

LITERATURE USED

Cuthbert, F.J., and L.R. Wires. 2008. Long-term monitoring of colonial waterbird populations in the U.S. Great Lakes: improving the scientific basis for conservation and management year 1 and 2 (2007-2008) Progress Report. Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota - Twin Cities, Minnesota, USA.

EFFORT AND COSTS

If done by refuge staff, this would require multiple visits per field season at ~\$1,000 per trip (truck/boat gas, staff time, etc.). Fortunately, the refuge works with colleagues at Central Michigan University (Dr. Nancy Seefelt) who conducts most monitoring.