COLONIZATION OF THE FINGER LAKES REGION OF NEW YORK STATE BY NESTING OSPREYS (*Pandion haliaetus carolinensis*)

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For the first time in well over two hundred years, if not more, Ospreys (*Pandion haliaetus carolinensis*) are colonizing the Finger Lakes in the heart of New York State (NYS) with Cayuga Lake at its core. Once-regular visitors to inland lakes and rivers throughout the state, Ospreys were predominately coastline dwellers and may not have bred this far inland prior to European colonization. Abundant along the seashore, records from 1800 cite Ospreys nesting in all five boroughs of New York City and Long Island (Buckley *et al.* 2018) but uncommon in the interior of NYS (DeKay 1844). Eaton (1910) reported Osprey colonies around Long Island, where 95% of the population bred (Bierregaard *et al.* 2014). In the early 1900s, Gardiner's Island, just off Long Island, reported 300 nests—the largest Osprey colony recorded (Chapman 1908, Bull 1976). Scattered active nests were also recorded in the lower Hudson River near New York City (Buckley *et al.* 2018). Osprey colonies traditionally occurred in portions of the Adirondack Mountains "where it continues to breed but yearly becomes rarer and rarer on account of the relentless persecution of thoughtless tourists and campers" (Eaton 1910).

By the 1930s, Ospreys migrating across NYS declined due to habitat loss and "ruthless hunters who shoot at any large or unusual bird"; however, remnant populations continued to breed in the Adirondacks and flourish on Long Island, where 496 Osprey pairs were still present as of 1940 (Bull 1976). Rampant use of the pesticide DDT from the 1940s to 1972, however, caused drastic declines in Osprey populations along the east coast, nearly extirpating populations from Long Island (Ames 1966). DDT accumulation in the food chain caused thinning of raptor eggshells and breaking during incubation. Shooting, habitat destruction, and nest robbing also contributed to their demise (Poole 1989). By the mid-1970s, Osprey nest sites had declined 98% overall with only 74 active nests on Long Island (Spitzer and Poole 1980). Since the ban of the insecticide DDT in NYS in 1971, this once federally listed "endangered species" has made a spectacular comeback. Aided by human intervention, Osprey populations multiplied and expanded their range (Bierregaard *et al.* 2016). In 1983, the Osprey was down-listed to "threatened" status by the U.S. government.

During 1980–1987 and 1992–1994, the NYS Department of Environmental Conservation (NYSDEC) released young Long Island Ospreys near Lake Erie in Cattaraugus County, in southwestern NYS, leading to nine nesting pairs by 1998 (E. Levine, personal communication). Today, the NYSDEC Region 9 reports

slowly growing numbers of Osprey nests in the area around the Allegheny Reservoir and in the 65,000-acre Allegany State Park, near Salamanca, Cattaraugus County.

In 1994, 313 breeding pairs were reported statewide, with 247 pairs in Long Island, 54 active nests in the Adirondacks-St. Lawrence River valley, and 12 nesting pairs scattered elsewhere throughout NYS. Osprey populations were rebounding and expanding their range with at least 1.2 young per breeding pair produced statewide (Loucks 1998). By 1999, the remarkably adaptable Ospreys occupied 350 active nests on Long Island.

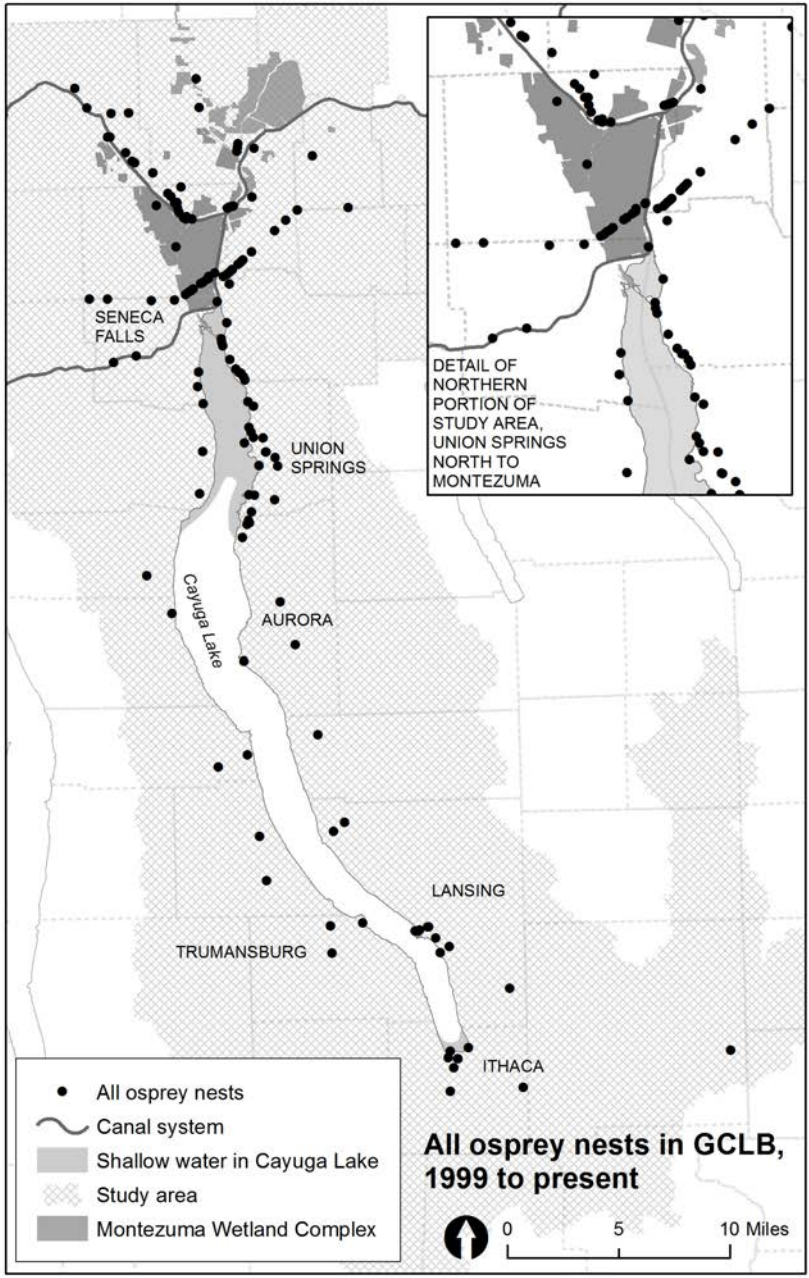
This paper focuses on the Osprey colonization of the Greater Cayuga Lake Basin (GCLB) during 2013–2019 (see Map 1). The GCLB is located in Cayuga, Seneca, and Tompkins Counties in NYS's southern tier Finger Lakes Region and includes the Cayuga Lake Basin and much of the Montezuma National Wildlife Refuge Wetland Complex (MNWR). The 50,000-acre (202.2 km^2) MNWR complex is a mix of state and federal wetland reserve situated on the north end of 40-mile-long (64 km) Cayuga Lake and is a well-known stopping point for migratory birds. The refuge complex is composed of swamps, pools, and channels and is criss-crossed by the Seneca River and Erie Canal.

METHODS

The size of the Osprey breeding population and their breeding success were ascertained by recording the location and status of all nests in the GCLB visible from public roads or with landowner permission on private roads. This was achieved by driving all roads within three miles of Cayuga Lake each year with the aid of six diligent assistants and crowd sourcing using the Cayuga Bird Club, Northern New York Audubon Society, Eaton Bird Society, Roger Tory Peterson Institute Ornithological Club, and eBird. At least a dozen other active and successful nests located on private property were excluded owing to access and surveying difficulties.

Nest status was recorded as failed, inactive, active, or successful. Failed nests are those that did not produce viable eggs or chicks owing to infertility, disturbed courting, foul weather, or predation (Poole 1989). Inactive nests include those that are presently not in use and new nesting platforms that have not yet been claimed (Postupalsky 1974). An active nest is one that contains viable eggs or young chicks and a successful nest is one that produces fledgling young.

In this study, nests were monitored using 8.5 x 42 binoculars and a spotting scope (25–60 x 65) from a distance of 50–500 feet (15.2–152.4 km), often using the car as a blind. Nests were observed for up to 20 minutes per visit from 20 March, when the first nesting Ospreys returned to the region, through August. The Osprey's habit of breeding in the open on elevated substrates within three miles from their food source generally makes nests easy to locate and monitor, providing a reliable measure of breeding success (Poole 1989).



Map 1. Map of the Greater Cayuga Lake Basin with the nests notated. Ospreys fish primarily on the shallow water shelves (3–5 feet deep) at the ends of the lake.

RESULTS AND DISCUSSION

Recent History of the GCLB—Following writings of DeKay (1844) as well as Reed and Wright (1909), the documentation of Osprey in NYS picks up again in 1950 within the quarterly reports in *Kingbird* authored by a series of ornithologists with the heaviest lifting done by Sally Hoyt-Spofford, Dorothy W. McIlroy, and William E. Benning. By 1950 the damage by DDT was already apparent in the statistics. Allusions to "scattered reports" of single Ospreys in the GCLB number routinely 0–3 from 1950–1978. The seasonality of the sightings—spring and fall—led researchers to suggest they were migrants. In 1979, three sightings were accompanied by the decidedly exciting first appearance of a nesting Osprey pair in Tschache Pool (MNWR staff Nick Vermeulen, personal communication). The nest afforded two fledges in 1980 (Benning 1980) and three in 1981 (Benning 1981). Catastrophic weather disruptions in the mid 1980s (Melin 1987) were followed by reports of persistent sightings in the late 1980s and a nest at MNWR in 1989 (Melin 1989).

The historical details become spartan until 1997, when three nests were noted at MNWR. The period 1999–2003 saw an increase in sightings (10–14 birds per season) at MNWR and a total of nine breeding pairs in the complex and just outside its borders on pylons and double-armed ("double buck") utility poles (Paul Bass, personal communication). Ironically, that is when the *Kingbird* reports on the GCLB and all of NYS Region 3 go silent. Meanwhile, the population began radiating to the east and west along utility pylon trails and colonizing the northeastern side of Cayuga Lake, nesting primarily on double-armed utility poles paralleling the shore of Cayuga Lake to Aurora, NY (see Map 1, and Figure 1, p. 266). Anecdotal reports from employees at Lansing's Milliken Power Station, 30 miles (48.2 km) southeast of MNWR on Cayuga Lake, recount an Osprey pair nesting on one of their massive pylons in 1999. This nest, which was lost in a winter storm after a few years, was the first successful nest near the southern end of Cayuga Lake (Milliken Power Station guard and Fritzie Blizzard, personal communications).

To encourage more Ospreys to populate the southern end of the lake, a group of volunteers constructed a nesting platform at Ithaca's Allan H. Treman State Marina Park in the summer of 2009, which was claimed by Ospreys three years later (Ithaca.com 2009). In 2010, an Osprey pair nested on a utility pole at the Cargill Salt mines in Lansing, four miles (6.4 km) northeast of Ithaca. The nest caught fire and was relocated by NYSEG (New York State Electric and Gas) workers to a new nesting platform (Paul Pardine of NYSEG, personal communication). In following years, NYSEG crews erected over a dozen platforms around the southern end of the lake, most of which are now occupied by Osprey breeding pairs.

In time, Ospreys began nesting on pylons and double-armed utility poles to the east and west of MNWR paralleling the Seneca River and Erie Canal. (See Map 1 insert.) The Osprey colony stretches for 16-miles (25.7 km) along the

northeastern shore from MNWR to Aurora, NY. There are now 144 active and unused Osprey nests in the GCLB, the latter offering potential breeding sites to a growing population. Figure 1 (p. 266) shows a typical mature Osprey nest built on a double-armed utility pole retrofitted with a nestbox riser. The double arms lend critical nest stability.

GCLB Population Trends—The GCLB population increased dramatically from nine active nests in 1999 to 101 active nests in 2019 (Table 1; Figure 2). Maps 2–5 trace the addition of new nests in the GCLB from 2013 to 2019 indicating the infilling of nests in the existing colony as well as new nests spreading radially.

Nest Act.	1999	2013	2014	2015	2016	2017	2018	2019
Successful	9	26	36	36	65	82	91	99
Failed*	0	6	6	4	0	0	2	2
Active	9	26	38	41	72	87	95	101
Inactive	0	2	4	15	26	35	33	32
Total Nests	9	34	48	60	98	122	130	135

*including newly started nests.

Table 1. Nest activity showing growth trends in the GCLB from 1999–2019.

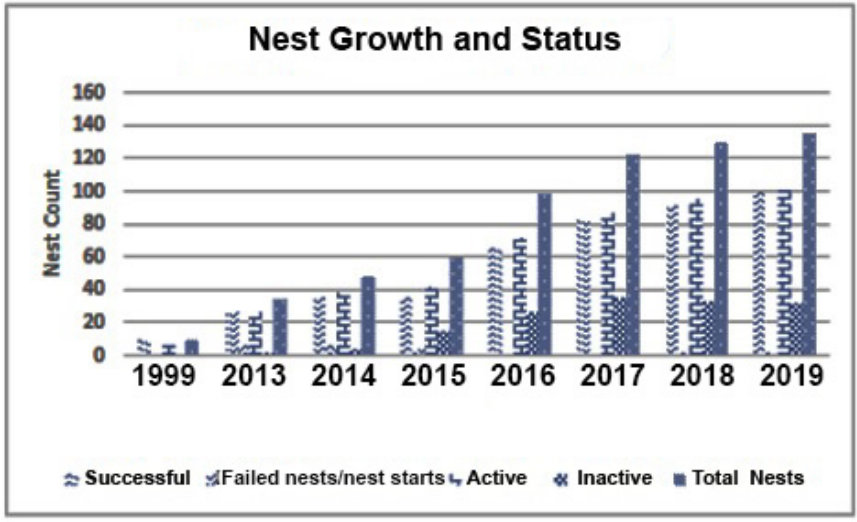
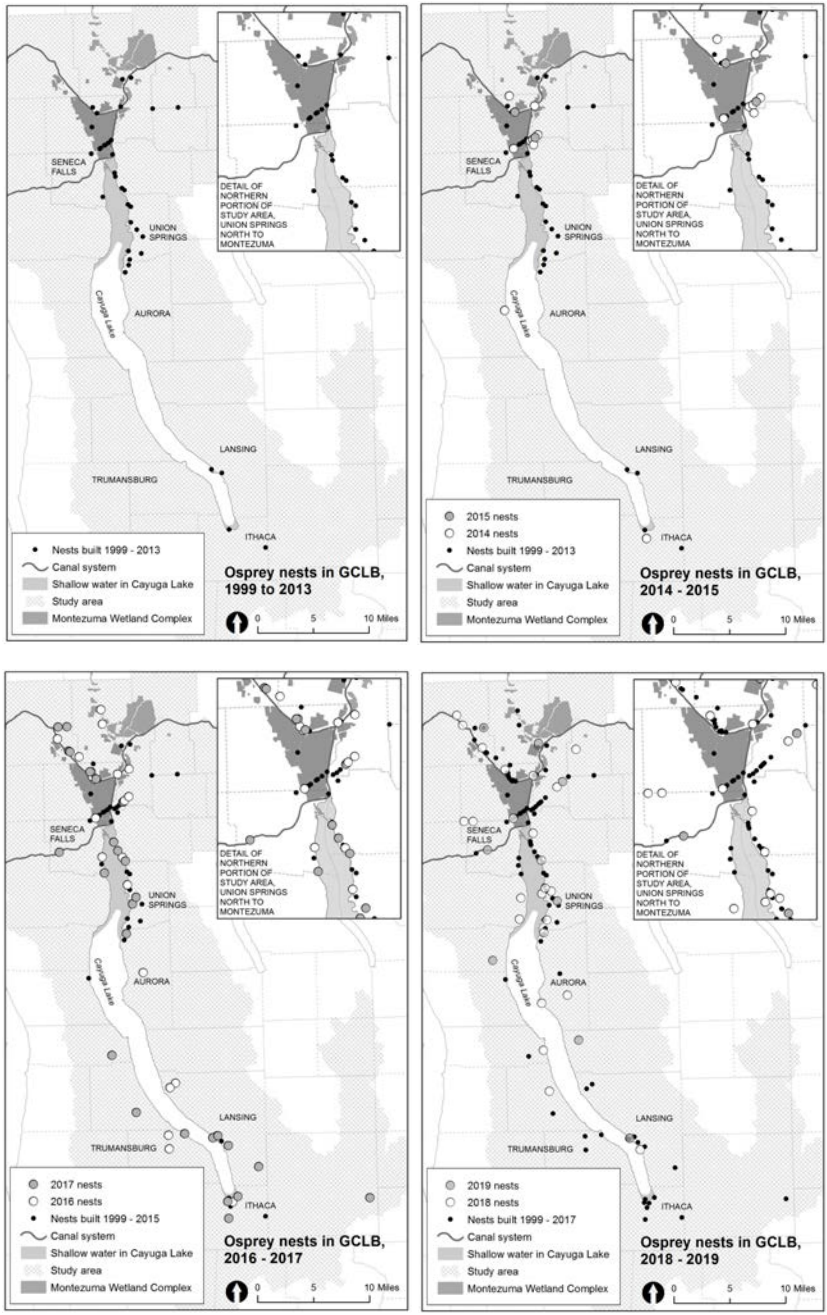


Figure 2. Nest growth trends in the GCLB from 1999–2019.



Maps 2–5. GCLB Osprey nests during four periods: 1999–2013, 2014–2015, 2016–2017, and 2018–2019.

An explosive population growth since 2013 is, in part, due to NYSEG's installation of numerous nesting platforms in the southern end of the lake and risers throughout the basin, which relocate nests posing fire hazards safely above electrified lines. The population at the northern end of Cayuga Lake, where at least 65% of the total nests exist, is expanding southward down the eastern shore for a distance of at least 16 miles (25.5 km) to the Village of Aurora and inland. These nests are up to three miles (4.8 km) inland where double-armed utility poles surround open fields (Maps 2–5). Breeding Ospreys now nest up to 10 miles (16 km) north of MNWR along the Seneca River and westward along the Erie Canal for at least 14 miles (22.5 km). Nests are also located on utility pylon trails marching eastward over the hills for up to nine miles (14.5 km).

The population at the southern end of the lake (11.5% of the total nests) increased as NYSEG erected more nesting platforms. Contemporaneously, new pairs began nesting around the lake, primarily on double-armed utility poles. Twice Osprey pairs attempted nesting on racks of athletic field lights, requiring relocation, as did a pair building along the Ithaca airport runway. Seventeen percent of the total nests are on the east side of the lake near Lansing, NY, and 6.5% of the nests are on the west side near Taughannock Park.

Walsh (2013) reported a 35-year Rhode Island study (1977–2012) showing an Osprey population grew 11.6-fold from 11 to 128 active nests (7% per year) while averaging 1.9 young per active nest. In a 15-year northern California study (1992–2006) breeding success averaged 1.44 young per active nest as the population grew 4.4-fold from 7 to 31 nests (11% per year; Anderson *et al.* 2008). The lower productivity per nest with a higher growth rate of the population in California suggests either a greater survival rate or a higher probability that the California Ospreys returned to the founding population. Both might coincide with the relatively small California population in the expansion phase.

In comparison to these studies, the GCLB had a seven-year average growth of 2.03 young per active nest. The overall population grew 11-fold from 9 to 101 active nests in 20 years (1999–2019, Table 1), which corresponds to an implicit annualized growth rate of 12% per year. Although the data on the GCLB population was not recorded from 1999–2013, the carefully monitored populations in the GCLB from 2013–2019 grew a striking 21% annually, which is exceedingly high when compared with the Rhode Island and California populations. The number of GCLB young fledged also grew 21% annualized.

Factors Driving Population Expansion—This rapid population expansion in the GCLB appears to have been driven by ample fisheries and abundant safe nesting substrates ringing the lake.

Ample Food Availability: Cayuga Lake and its tributaries sport 90 species of fish. The lake is stocked annually with nutrient-packed, high-protein Osprey favorites such as lake trout (*Salvelinus namaycush*), brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), and Atlantic salmon (*Salmo salar*) (Carlson *et al.* 2016). Also on the Osprey menu are the plentiful large-mouth and

small-mouth bass (*Micropterus salmonides* and *Micropterus dolomieu*), brown bullheads (*Ameiurus nebulosus*), yellow perch (*Perca flavescens*), suckers (*Catostomus commersonii*), carp (*Cyprinidae spp.*), and various *Centrarchidae* sunfish (Froese and Pauly 2018).

Accessible Littoral Zones: Because of their buoyancy, Osprey can only catch fish within three feet of the water's surface (Poole 1989), classified as the littoral zone. The north end of Cayuga Lake near MNWR has 5,800 acres of weedy littoral zone where Ospreys fish. On the lake's south end, a much smaller shelf extends northward from Ithaca for 0.25 miles (0.4 km). Sediments also build up at the mouths of Cayuga's major tributaries, such as Taughannock and Salmon Creeks, forming limited littoral zones where the Osprey fish.

Ample Safe Nesting Habitat: In 1974, Bull reported Ospreys nesting on a radio tower and an abandoned chimney on Long Island (Bull 1974). Fifty years later, the US Osprey population has made a remarkable shift from nesting mostly in trees to nesting predominantly on more stable artificial substrates (Bierregaard *et al.* 2016). Contrasting with Ospreys in the Adirondack Mountains, no nests in the GCLB have been found in trees despite the existence of a few appropriate flat-topped white pines around the lake. All recorded Osprey nests in the GCLB have been found on artificial substrates (Figure 3). These include double-armed utility poles retrofitted with nestboxes, pylons, communication towers, nesting platforms, grain elevators, athletic lights, channel markers, water towers, and in one instance on a telephone pole with no other means of support (Cornell and Edelstein 2020). The lack of tree nests can be construed as a preference for nesting on sturdy structures that may present supernormal stimuli.

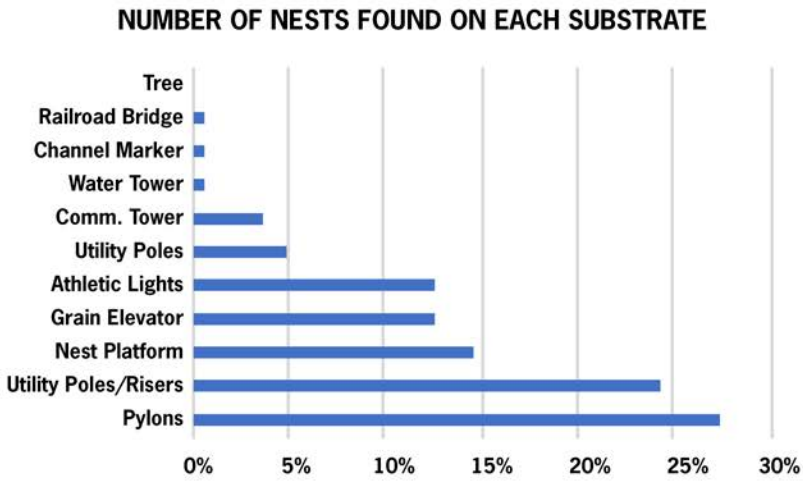


Figure 3. Nesting preferences per substrate in the GCLB. (Data in Table 1.)

A concentration of pylons and double-armed utility poles along roadways proximate to water markedly influence the distribution and success of Osprey

nests in the GCLB. As already noted, all known nests in the GCLB are located within three miles (5 km) of Cayuga Lake or other nearby fish-filled waterbodies. For the purposes of this comparison, nests within 0.25 miles (0.4 km) of water are designated as "water" nests whereas those 0.25–3.0 miles (0.4–5 km) from water are designated as "inland" nests. Hagan and Walters (1990) noted significantly greater breeding success rates in coastal areas rather than in inland habitats. The potential advantages of nesting proximate to water include less energy consumption and the benefits for the young of watching the fishing process from the nest. Nonetheless, the reproductive rates of "inland" nests (2.3 ± 0.6) and "water" nests (2.4 ± 0.7) of the GCLB are statistically indistinguishable, most likely because of their small distances from water.

CONCLUSIONS

The Osprey population in the GCLB founded in the early 1980s has witnessed explosive growth since 2013 due to a number of favorable natural and human factors. The structural features of Cayuga Lake including ample shallow shelves offering a plentiful food supply was critical. One should not, however, overlook fortuitous human contributions, which include a large number of double-armed utility poles circumnavigating the lake and NYSEG's efforts to provide risers for problematic nests and erect dedicated nesting platforms in strategic locations.

Continued monitoring of the GCLB population expansion is important to ascertain if the Osprey population is in the early exponential portion of the growth curve where birth rates exceed mortality rates. It is also possible that resource depletion, increased predation, or diseases may cause birth rates to fall and mortality rates to climb. Eventually, as resources become more limited, the birth rates will equal the mortality rates and the population size will stabilize as it reaches the carrying capacity of the GCLB. A cycle of rising and falling birth and mortality rates would tend toward a static population.

The Osprey population is expanding beyond the GCLB boundaries with new nests being built westward following the Erie Canal system and in the area northwest of Seneca Lake. Attracted by fish at the plant's warm-water outfall, Ospreys have nested at the Greenidge Power plant on Seneca's west shore since 2005. As of 2019 there were at least eight breeding pairs at Greenidge nesting on pylons and ledges of the facility with an additional fifteen breeding pairs residing primarily on cell towers and pylons on the northwest shore of Seneca Lake.

Ospreys have been fishing at Owasco and Skaneateles Lakes to the east of Cayuga Lake, and there are two nests that are within reach of either lake. A proliferation of Ospreys throughout all eleven Finger Lakes is doubtful in the near future, however, as large Bald Eagle populations on some lakes, especially on Honeoye and Hemlock Lakes, might inhibit the Osprey's spread. Ironically, the resource that most limits the Ospreys from nesting around the other less-populated Finger Lakes appears to be the lack of double-armed residential utility poles.

Ospreys are extremely adaptable birds that will likely thrive despite predicted climate changes provided they find adequate fish and nesting substrates. Ospreys suffered widespread extirpation in the period 1940–1972 from DDT but rose like a phoenix. Now Ospreys are colonizing the Finger Lakes, possibly for the first time. Osprey are considered a sentinel species used to detect environmental stress in aquatic ecosystems such as chemical contaminants dangerous to humans. (Grove *et al.* 2009). These magnificent "fish hawks," once persecuted by thoughtless hunters and tourists, have now captured the hearts of residents and visitors to Cayuga Lake, who support their conservation and protection.

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Figure 1. Osprey nest box built on a double-armed utility pole in Cayuga Lake, Union Springs, NY. The double arms lend critical nest stability. © Candace Cornell. See article, pp. 210-220.

Birdsong Meadows Farm, Candor, *Tioga*, © Adam Troyer. Cows are rotationally grazed, benefitting both cows and grassland birds. See Patch Birding article pp. 224-227.