Nesting Ecology of Great Blue Herons At Three Previously Unreported Sites in Wake, Franklin, and Johnston Counties, North Carolina

Eloise F. Potter
9433 Baker Road
Zebulon, NC 27597

Nell P. Barkley
3105 Hickory Road
Raleigh, NC 27616

Steve Brown
Natural Resources Section
U.S. Corps of Engineers
Wilmington, NC 28402

Robert Alderink
North Carolina State
Museum of Natural Sciences
P.O. Box 29555
Raleigh, NC 27626

On 20 March 1996 Alderink informed Potter that the Great Blue Herons (*Ardea herodias*) had returned to their nesting site on Buffalo Creek at US 64-Business, about a half mile (1 km) west of Wendell, Wake County, N.C. He indicated that he had seen herons at the site during the past two nesting seasons. Subsequent field work by Potter and Barkley revealed a second heronry on Moccasin Creek. Moccasin Creek marks the Franklin-Wake county line at the Zebulon Country Club. In the spring of 1996, Alderink, Potter, and Barkley did not know that Brown was observing activities at a third heronry situated on Little River in northern Johnston County. All three sites are within 5.5 miles (9 km) of the junction of NC 96 and NC 97 within the town of Zebulon in eastern Wake County (Fig. 1). All three streams drain into the Neuse River.

Although Potter had seen Great Blue Herons, usually single birds, in eastern Wake County and adjacent Franklin County on numerous occasions between late March and late June during the previous 22 years and suspected local breeding, she never found a nest before 1996.

During the 1975 and 1976 breeding seasons, Soots and Parnell (1979) made an aerial survey of inland heronries in the North Carolina coastal plain east of Interstate 95. They found no heronries along the Neuse River (which drains most of Wake County) or the Tar River (which drains most of Franklin County). The inland heronries closest to eastern Wake County were at Goshen Creek [Swamp] in northeastern Duplin County and at the Roanoke River along the Halifax-Northampton county line. Goshen Creek flows into the Northeast

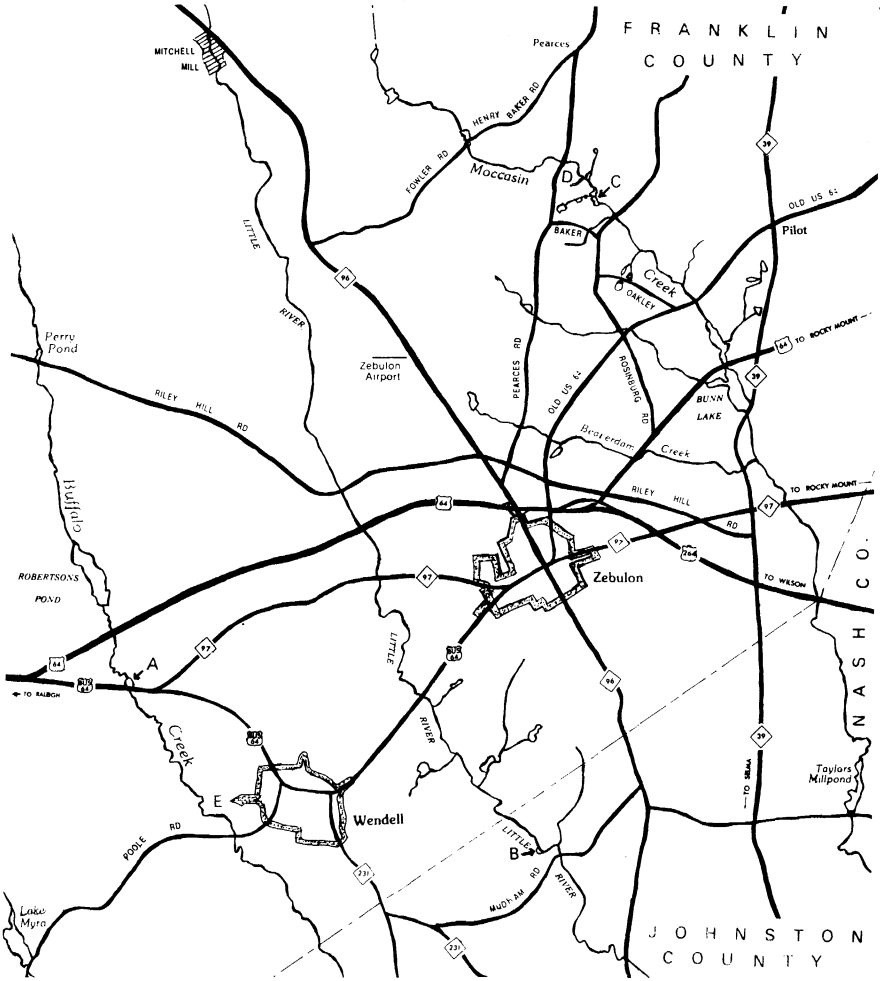

Fig. 1. Map shows eastern Wake County and adjacent portions of Franklin, Nash, and Johnston counties. Points of particular interest are the heronry on Buffalo Creek (A), the heronry on Little River (B), the heronry on Moccasin Creek (C), the entrance to the Zebulon Country Club (D), and the Wendell Park (E). Hatching in the upper left corner of the map indicates the approximate boundaries of the Mitchell Mill Natural Area. North is toward the top of the map.

Cape Fear River. Measured in a straight line, those two heronries are approximately 55 to 60 miles (90 to 95 km) from the Wendell-Zebulon area of Wake County.

The inland heronries were surveyed in 1996, with coverage again confined to the area east of I-95, according to David H. Allen, Coastal Non-game Project Leader, N.C. Wildlife Resources Commission. Allen (personal communication) stated that his agency has obtained no evidence of Great Blue Herons breeding at any of the major reservoirs in the Raleigh area, including Jordan and Falls of the Neuse.

Buffalo Creek Heronry

Buffalo Creek rises in eastern Wake County and flows southeast into Johnston County, where it is impounded to form Wendell Lake, and joins Little River north of Micro and west of Beulahtown. Little River is a tributary of the Neuse River.

The Buffalo Creek heronry is downstream from Robertsons Pond, which is noted for its stand of Bald Cypress (*Taxodium distichum*). When Jesse Perry, N.C. State Museum of Natural Sciences, heard about the heronry on Buffalo Creek, he told Potter that, during a springtime canoe trip several years ago, he saw what appeared to be abandoned Great Blue Heron nests in the headwaters of Robertsons Pond.

Cypress trees occur along Buffalo Creek all the way from Robertsons Pond to the heronry at US 64-Business and farther downstream at least to Poole Road, 2.6 miles (4 km) south of the heronry. The cause of the extensive flooding of bottomland woods at the nesting site and on the downstream side of US 64-Business has not been determined. Because there is no known manmade dam in the area, the authors assume that a dam constructed by Beavers (*Castor canadensis*) is the cause of the flooding and subsequent tree mortality that created conditions suitable for establishment of the heronry.

In the late afternoon of 20 March 1996, Potter and Alderink visited the Buffalo Creek site and saw three nests. One adult was in the vicinity of the colony.

On 13 April 1996 Potter and Barkley carefully surveyed the Buffalo Creek heronry, using binoculars and a 30X telescope. They located 10 nests. An adult was standing on one nest, and incubating birds were sitting low in seven nests. Two nests were unoccupied.

On 27 April, eight of the ten nests were still occupied, but the status of the two lowest nests could not be determined because of dense foliage. Two nests had well-feathered young, one had downy young, one had a standing adult

feeding chicks too small to raise their heads above the rim of the nest, and two had adults sitting high on the nest as if brooding chicks.

Young in eight nests at Buffalo Creek were in various stages of development on 4 May. The two most advanced broods had feathers on the crown beginning to lie flat and cover part of the nape, which showed no remnants of down. Those birds appeared to have hatched at least a week earlier than the largest young seen at Moccasin Creek on 4 May.

Because of heavy traffic on the highway and thick foliage obscuring some nests, Potter and Barkley decided to concentrate on observing the heronry on Moccasin Creek for the duration of the nesting season. No serious attempt was made to locate additional heron nesting sites along Buffalo Creek.

Little River Heronry

Little River rises in the vicinity of Moores Pond in northeast Franklin County and flows southeast through eastern Wake County and central Johnston County to join the Neuse just west of Goldsboro in Wayne County. There are three manmade dams on Little River in eastern Wake County: Mitchell Mill, now within the Mitchell Mill Natural Area; the reservoir at the Zebulon Water Plant on the north side of NC 97; and Tarpley Mill on the south side of US 64-Business between Wendell and Zebulon. Extensive flooding and numerous standing dead trees can be seen along Little River from US 64. Potter and Barkley found abundant evidence of additional beaver activity along Little River and many of its tributaries in Wake County between US 64 and the north side of US 401.

During the 1994 breeding season, Brown found six Great Blue Heron nests in a beaver pond about 2,400 feet (740 m) upstream from the Mudham Road bridge across Little River in northern Johnston County. The distance given represents the run of the stream. The straight-line distance, which cuts across a peninsula of high ground, is approximately half as far. Brown counted six occupied nests at Little River in 1995 and again in 1996.

Moccasin Creek Heronry

Moccasin Creek rises in southwest Franklin County and flows southeast on the Franklin-Wake, Johnston-Nash, and Johnston-Wilson county lines until it joins Turkey Creek to form Contentnea Creek, which was impounded to form Buckhorn Reservoir. Below the reservoir Contentnea Creek flows southeastward into the Neuse River southeast of Grifton.

The Moccasin Creek area offers water birds an array of manmade impoundments and ponds built by Beavers. The largest body of open water along the creek is Bunn Lake, a Y-shaped impoundment 1.3 miles (2 km)

long. A former mill pond, the lake was reimpounded and enlarged about 1966. Downstream from Bunn Lake is Taylors Mill Pond, which was formed before the Civil War and is approximately a half mile (0.8 km) in length. Local sportsmen report extensive beaver activity along the creek between the two major impoundments (D. Mark Wilson, personal communication).

Above Bunn Lake, Moccasin Creek has been flooded by a series of beaver ponds stretching from the downstream side of the Old US 64 bridge northward to the swimming pool at the Zebulon Country Club. The golf course lies on both sides of Pearces Road about 4.5 miles (7 km) north of Zebulon.

Garland Price, head greens-keeper for the Zebulon Country Club and a lifetime local resident, reports that the first beaver pond known on Moccasin Creek in modern times was built in 1953 at the headwaters on the Percy Gay farm. By 1959 Beavers had moved downstream to the Henry K. Baker farm, where a manmade pond lies on the north side of Fowler-Henry Baker Road and a beaver pond lies immediately downstream on the south side of the road.

In 1963, while the golf course was under construction, Beavers built two small dams, one near the present site of the swimming pool and another about 0.5 mile (0.8 km) downstream, just below a large rock outcrop known locally as the Buzzard Rocks.

In 1967 Beavers constructed a major dam that backed water up to the 1963 dam at the swimming pool and to the golf-cart path between the No. 17 green and the No. 18 tee. The dam at the Buzzard Rocks was raised gradually to create a large pond that completely flooded the creek bed upstream to the 1967 dam (Price, personal communication). As recently as the spring of 1974 the swampy land at the base of the Buzzard Rocks remained heavily wooded, and no Great Blue Heron activity was noted by Potter and Davis (1974) during their visit to the area.

On 24 July 1975, Potter saw an adult Great Blue Heron flying diagonally across Moccasin Creek at Rosinburg Road. The bird carried unidentified prey in its bill and was headed toward the Buzzard Rocks. Potter found no nests at nearby wetlands she believed likely to provide suitable nest sites for large herons. At that time she was unaware of the beaver ponds adjacent to the Zebulon Country Club property, which she first visited in 1987.

Standing on the Buzzard Rocks today, one can look upstream to the heronry with the view obscured only by the row of pines growing on a ridge that projects into the pond from the Wake County side of the creek downstream from the nests. Common Cat-tails (*Typha latifolia*) and other perennial water plants grow profusely in the marsh near the base of the rocks. The heronry at the golf course appears to have been established as soon as enough of the dead trees in the beaver pond immediately upstream from the Buzzard Rocks had

fallen to permit the birds to fly to and from the nest trees. Whether that was in 1975 or later cannot be determined.

In the spring of 1996 the dam at the swimming pool was lengthened and raised. This deepened the pond but did not seem to increase its surface area significantly because of the surrounding steep hillsides. In May 1996, Potter and Barkley found a fairly new dam upstream (north) from the Rosinburg Road bridge. Trees standing in the water behind that dam had not yet died. Water from a dam on the south side of Rosinburg Road was backed up to the new dam. Enough trees had died and fallen between the new dam and the bridge to offer glimpses of cars traveling the highway, but the growth still appeared too dense for use as a nesting site by Great Blue Herons.

Tributaries to Moccasin Creek have been impounded near the golf course to form farm ponds, fishing ponds, and water hazards. During post-breeding dispersal and the winter months, Great Blue Herons frequent the manmade impoundments, but they do not provide suitable nesting sites.

On 14 April 1996, Potter followed the line of flight of an adult Great Blue Heron that was carrying a stick in its bill. At the pond upstream from the Buzzard Rocks, she found four active nests, three with incubating birds (Nests B, C-1, and C-2; see Table 1) and one with a standing bird in attendance (Nest A). The standing bird apparently had just added the stick to its nest. That nest probably contained newly hatched young, judging by the size of the chicks in it two weeks later.

All four nests were in tall dead trees standing in the pond. Nest B was built in a tree so near the east shore of the pond that it must certainly be on the Franklin County side of the former run of the creek. All of the other nests appear to be in Wake County.

No additional nesting sites were found along Moccasin Creek in 1996, but widespread evidence of beaver activity suggests that other heronries must exist on the creek or its tributaries—if not right now, then at some future time when a few more dead trees have fallen.

Care and Behavior of Young

Because of its small size and proximity to Potter's home, the Moccasin Creek heronry offered excellent opportunities to observe parental care and the development and behavior of the young. For example, the young from Nest A (see Table 1) had left the colony and those from Nest C-1 had not yet fledged when the three fledglings from Nest B were seen in the bushes and water near the base of that nest tree. The Nest C-1 young paid little or no attention to the Nest B fledglings. However, when two young from Nest C-1 were in approximately the same bushes and water, their nestmate, which had moved

to the vacant Nest C-2, watched their movements intently. For a time that bird crouched in the nest with its neck extended over the rim in the direction of the two young herons standing in the water below.

Because construction of Nest D did not begin until late May, the single surviving nestling from that brood was the only hatching-year Great Blue Heron left in the colony by 13 July. On that date Potter and Barkley found that all five nests had survived the wind and rain associated with the passing of Hurricane Bertha on 12 July. One nestling, with a white cheek and a dark, fuzzy crown, was seen in the new nest. The nestling was still present on 20 July and on 3, 10, 15, and 17 August. On the last date the young bird stood for the entire period of observation (0645-0745 h EDT). At 0715 h it made begging noises when a Great Blue Heron flew over trees along the west (Wake County) bank of the pond. Although no parent approached, the young bird moved to the highest part of the nest, as if expecting to be fed.

The young Great Blue Heron was still in Nest D on 20, 24, 26, and 28 August. On the 28th an adult perched in Nest C-2 (a short distance northeast of Nest D), and the young bird begged excitedly. The adult flew downstream without feeding the nestling, which immediately turned to face downstream.

On 29 August the young bird was perched on a limb near Nest D. It returned to the nest and began begging. An adult arrived, fed the nestling, and departed in the upstream direction, croaking as it flew. The nestling stood, silent and motionless, looking upstream.

At 1750 h on 30 August, the young Great Blue Heron poked its bill into the bottom of the nest, as if picking up remnants of food, and occasionally begged briefly. At 1820 h an adult arrived. The young bird flapped its wings, begged frantically, and attempted to feed from the adult's mouth. The parent apparently regurgitated food into the nest and flew upstream, croaking as it departed. The nestling pecked at the bottom of the nest and looked upstream. Just as the adult flew away, a Great Egret (*Ardea alba*) arrived from downstream and perched in a dead tree near Nest D. Neither the adult Great Blue Heron nor the nestling paid any attention to the visitor, which soon departed.

At 0900 h on 31 August the young heron began flapping its wings and making begging noises. An adult came to the nest from the downstream side. The two struggled, with the nestling attempting to feed from the adult's mouth and the adult trying to disgorge food into the nest. Mission accomplished, the adult flew away upstream. A second Great Blue Heron was in the area, but its presence did not stimulate begging behavior. During all the feeding observations at Moccasin Creek, the only young heard to beg were those about

to be fed by the arriving adult. Arriving adults usually perched in a nearby tree and moved to the nest only when ready, or nearly ready, to regurgitate food.

On 1 September the lone bird was still in Nest D. Standing on a stub just above Nest C-2 was a Great Blue Heron of unknown age. It flew downward, as if to forage for prey in the water below. The nestling paid no attention to it.

At 0745 h on 2 September the young bird was perched at the tip of a limb below the nest. It begged and flapped its wings. About 0810 h, it returned to the nest and begged more vigorously. It continued to alternate periods of resting and begging until 0905 h, when it moved to a limb above the nest on the downstream side of the tree. About 10 minutes later, the young bird flew to the top of a living pine tree in a row of pines about 60 feet (20 m) downstream from the nest tree. An adult immediately came to the nest from beyond the pines and perched facing the fledgling, which begged vigorously and continuously for about 10 minutes. No neck movements consistent with regurgitation were seen, and the adult did not disgorge food into the nest. At 0925 h the young bird flew back to the nest; the adult immediately departed, flying downward through the row of pine trees where the fledgling had been perched. The young bird begged several times, but was not seen to peck the bottom of the nest. By 0945 h the young bird had settled on the nest as if resting. Potter departed, believing that hunger would soon force the youngster to leave the nest for good.

Feeding Territories

At the peak of the nesting season, no adults were seen foraging in the immediate vicinity of the nest sites at Buffalo Creek and Moccasin Creek. Only while the lone bird remained in Nest D on Moccasin Creek was an adult Great Blue Heron seen repeatedly at nearby water hazards. Birds of the year, however, did not frequent the water hazards. Apparently they moved to distant feeding areas once they were able to travel beyond the immediate vicinity of their respective nest trees. Such post-breeding dispersal is normal for the species.

Random observations indicate some of the places the breeding adults probably obtained food.

Buffalo Creek.—The density of vegetation upstream and downstream from the heronry prevented access along the run of the creek. Arriving adults flew low over clearings to the east and west of the colony before slipping through an opening at the edge of the swamp and flying to a perch. Departing birds flew low over the clearings before gaining altitude and heading for distant feeding sites.

Alderink saw adult Great Blues downstream from the Buffalo Creek site in the vicinity of the community park at the west end of Third Street in Wendell. A pasture lies between the park and the creek. A trail leads from the park to the edge of a swampy area along the east side of the creek. From the trail Alderink saw Great Blue Herons in flight, and one time a bird put down near the end of the trail, apparently in search of prey. On several occasions, while driving along Poole Road, Alderink saw a Great Blue Heron wading in water up to its belly at Lake Myra, about 6 miles (10 km) southwest of the Buffalo Creek heronry. Lake Myra is on Marks Creek, which flows into the Neuse River northeast of Clayton in Johnston County.

Potter saw Great Blue Herons standing along several waterways during the nesting season. Those sightings combined with the lines of flight for some individuals apparently moving to and from the Buffalo Creek colony across US 64 between Knightdale and Zebulon indicate that adults may have been foraging as far away as the ponds east of the Neuse River along Old Milburnie Road (Wake Co.). Others may have visited sites upstream along Buffalo Creek and along Little River between Wendell and Zebulon.

Little River.—Adults were often seen leaving and returning to nests still occupied by young. Almost always the flight paths were upstream along the river or downstream across the peninsula that lies between the beaver pond and Mudham Road. Some of the birds originally assumed to have come from the Buffalo Creek colony may well have come from the one on Little River, which was unknown to Potter and Alderink until after the end of the nesting season. The dam on Little River at the Zebulon Water Plant is only 4.6 air miles (7.5 km) upstream from the heronry.

Moccasin Creek.—While feeding young in the nest, adults invariably arrived and departed by flying upstream or downstream far enough so their lines of flight to and from feeding sites were not easily observed.

Adults moving to and from the Moccasin Creek colony appeared to be foraging at various points along Little River from Riley Hill Road as far north as the Mitchell Mill Natural Area and a manmade pond on Perry Creek at NC 96 (Wake Co.); along Beaverdam Creek and an unnamed creek, both tributaries to Moccasin Creek that lie between the golf course and Zebulon (Wake Co.); in the vicinity of Cedar Creek at NC 39 (Franklin Co.); on the Mort Harris farm at the headwaters of Jumping Run (Franklin Co.); along Crooked Creek at Old Bunn Road (Franklin Co.); and along Moccasin Creek south of Bunn Lake. All of the aforementioned sites are within 15 air miles (24 km) of the Moccasin Creek heronry, most are within 10 air miles (16 km), and several are within 5 air miles (8 km).

Range of Flight.—Palmer (1962) reports the air speed of cruising Great Blue Herons to range from 19 to 29 mph (30.5-47.0 km/h). At a relatively slow 20 mph, a bird could travel 5 miles (8 km) in 15 minutes, 10 miles (16 km) in 30 minutes, and 15 miles (24 km) in 45 minutes. The Old Milburnie Road site is about 6 air miles (less than 10 km) from the Buffalo Creek heronry. Some of the places mentioned as probable feeding sites for adults from the Moccasin Creek heronry fall within the 15-minute range (e.g. Beaverdam Creek). The two most distant sites, the pond on Perry Creek and the Mort Harris farm, are well with the 45-minute range at approximately 11 and 12 miles (18 and 20 km), respectively.

Feeding singly at widely dispersed sites and avoiding straight-line flight paths between nests and feeding sites appear to be effective strategies for concealing nesting activities even when the colony is close to a busy highway (Buffalo Creek and Little River), human dwellings (Moccasin Creek and Little River), or recreation areas (Buffalo Creek and Moccasin Creek).

Roosting

Adult Great Blue Herons did not appear to roost at the Moccasin Creek nesting site. Price and several golfers (personal communications) mentioned seeing the birds frequently in the vicinity of the No. 5 fairway, which is across Pearces Road from the nesting site. When Potter and Barkley visited that area well after sunrise, they saw no herons and judged the habitat to be unsuitable for nesting and unlikely to be good for feeding. It seems likely that the herons roosted there.

Post-breeding Activities

Buffalo Creek.—Hurricane Fran struck central North Carolina the night of 5-6 September 1996. A post-Fran visit to Buffalo Creek in October revealed extensive damage, with some nest trees toppled and others stripped of lateral branches that formerly supported a nest. However, two substantial nests in large trees on the western edge of the site were damaged only slightly if at all, and several apparently suitable dead trees were still standing in the central part of the heronry. Of the two remaining nests, one was in a large dead tree and the other in a large living cypress.

Upon their arrival at Buffalo Creek on 28 November, Potter and Barkley flushed a Great Blue Heron that appeared to be foraging in water near the roadside. The bird flew to a perch toward the eastern edge of the nesting site, where there had been at least one active nest during the spring of 1996. Potter and Barkley immediately noticed a mass of sticks that appeared to be the foundation for a new nest between the perched heron and the nests that

survived the hurricane. The nesting material was so conspicuous that it could not have been overlooked during the previous visit. Scanning the heronry site with her binocular, Barkley located a second substantial nest in a living cypress. That nest probably was hidden by cypress foliage during the previous visit. All three large nests were so close together that they could be seen simultaneously in the field of the 30X telescope.

Little River.—None of the six nests or nest trees survived Hurricane Fran. Most of the overstory vegetation within the flood plain in the immediate vicinity of the heronry had already succumbed to persistent flooding and girdling by Beavers, and many of the remaining snags have now been delimbed, broken, or toppled by the hurricane. Few suitable replacement nest trees currently exist near the heronry. Although several sizable living hardwoods on the upland border of the beaver pond were also toppled by Hurricane Fran, the heronry is still shielded from view by the remaining trees on the upland slopes. When Brown visited the colony site the first weekend of January 1997, he found three Great Blue Herons present but did not see any evidence of nest construction.

Moccasin Creek.—During their first post-Fran visit to the Moccasin Creek heronry, Potter and Barkley found all nest trees still standing, but the Nest A tree no longer had the three stout limbs that formerly supported the nest. Four of the five nests had been blown away, leaving only Nest B to be refurbished in the coming breeding season.

On 18 November 1996 Potter, Barkley, and Mary P. Dieker, of Chicago, Illinois, visited the Moccasin Creek heronry. A new nest (C-2R) had been constructed to replace the one destroyed at the C-2 nest site. About the same size as the one it replaced, the new nest appeared to have a well-developed central depression; no nest lining could be detected. No Great Blues were seen at the heronry, in flight, or at nearby ponds on that date.

On 24 November Potter and Barkley noticed that Nest C-2R was somewhat bulkier than it had been on 18 November. The central depression was no longer visible. One Great Blue Heron was perched on a dead tree between the nest site and the Buzzard Rocks. Walking upstream, the observers flushed two Great Blues from a point near what had been the Wake County end of the 1967 beaver dam. Only short remnants of that dam had survived the flooding caused by Hurricane Fran. Continuing their route upstream from the heronry, Potter and Barkley flushed a fourth Great Blue that was standing beside a culvert running beneath the entrance road to the golf course. Whether

TABLE 1. Summary of development of young Great Blue Herons from

	14 APR	27 APR	4 MAY	25 MAY	1 JUN	8 JUN
Nest A (large, built in crotch)	Newly hatched young	3 active downy young	4 well-feathered young; short, erect feathers on crown; wisps of down on feathers of nape	4 young in nest	4 young in nest	4 young perched in or near nest
Nest B (large platform at top of tree	Adult incubating eggs	Adult brooding young	Adult brooding young	3 well-feathered young in nest	3 well-feathered young in nest	3 young ca. 1 week younger than ones in Nest A
Nest C-1 (upper of 2 small nests in same tree)	Adult incubating eggs	Adult brooding young	Adult brooding young	3 well-feathered young in nest	3 well-feathered young in nest	3 young ca. 2 weeks younger than those in Nest A
Nest C-2 (below C-1)	Adult incubating eggs	Adult brooding young	Adult brooding young	1 well-feathered young	1 well-feathered young	1 well-feathered young
Nest D (skimpy, loosely woven)				Pair building	Nest appeared incomplete	Adult incubating eggs

five nests on Moccasin Creek, Wake and Franklin counties, N.C., in 1996.

10 JUN	23 JUN	29 JUN	5 JUL	6 JUL	13 JUL	20 JUL - 2 SEP
4 young perched in or near nest	Nest empty					
3 young in nest	Nest empty	3 young in bushes near base of nest tree				
3 young in nest	3 young in nest	2 young in nest; 1 standing on Nest B	3 young still in or near nest; 2 flew to bushes in water near base of nest tree	1 young standing on Nest C-2, which had been enlarged by a spill from C-1		
1 young in nest	1 young in nest	Nest empty				
Adult incubating eggs	Adult incubating eggs	Adult incubating eggs	Adult standing on rim of nest and preening	Adult appeared to feed 2 newly hatched young	1 young with dark, fuzzy crown and white cheek	1 well-feathered young (See text for notes on care and behavior.)

the four birds seen actually represented four different individuals could not be determined, but there were certainly no fewer than three herons present.

Walking more or less the same route on 26 November, Potter flushed one Great Blue from the pond at the No. 18 tee. On 28 November, Potter and Barkley saw no herons at the golf course. However, they did find single Great Blues above the dam on Little River at NC 97 (Wake Co.), at a farm pond on Oakley Road (Wake Co.), and at a farm pond on Old US 64 southwest of Pilot (Franklin Co.). The last two sites are near the stretch of Moccasin Creek between the heronry and the headwaters of Bunn Lake, a distance of about 2 miles (3 km).

Notes on Other Species

Other birds found in association with the Great Blue Herons at Buffalo Creek (BC) and Moccasin Creek (MC) during the 1996 nesting season included Green Heron (*Butorides virescens*), Canada Goose (*Branta canadensis*, MC), Wood Duck (*Aix sponsa*), Red-shouldered Hawk (*Buteo lineatus*), Belted Kingfisher (*Ceryle alcyon*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Red-bellied Woodpecker (*M. carolinus*), Northern Flicker (*Colaptes auratus*), Pileated Woodpecker (*Dryocopus pileatus*), Acadian Flycatcher (*Empidonax virescens*), Great Crested Flycatcher (*Myiarchus crinitus*), Eastern Bluebird (*Sialia sialis*), European Starling (*Sturnus vulgaris*, BC), Prothonotary Warbler (*Protonotaria citrea*, MC), and Common Yellowthroat (*Geothlypis trichas*, BC).

A pair of Green Herons nested in a densely vegetated cove formed by two ridges projecting into the Moccasin Creek beaver pond occupied by the Great Blue Herons. The adult Green Herons foraged along the edges of the 7-acre pond adjacent to Potter's house in the dogleg of the No. 11 fairway. Once the young Green Herons were on the wing, the family party was seen at the pond regularly until time for the fall migration.

Discussion

The heronries in eastern Wake County on Buffalo Creek, on Moccasin Creek along the Franklin-Wake county line, and on Little River in northern Johnston County represent the first reported nesting by Great Blue Herons in the eastern piedmont of North Carolina. What appear to have been the first nesting sites in the western piedmont were discovered in 1991. James F. Parnell (1992) saw 18 to 20 active nests in a swamp east of Salisbury, near High Rock Lake, during an aerial search for eagle nests on 17 March 1991,

and Ken Knight (1992) saw at least four active nests at a beaver-pond complex near Clark Creek in western Cabarrus County during the 1991 nesting season.

Palmer (1962) makes no reference to Great Blue Herons rebuilding destroyed nests in autumn. Potter and Barkley believe their observations reported herein to be the first published account of such activity.

Much remains to be learned about Great Blue Herons in the Carolinas and throughout their range (Palmer 1962). There are no data on their use of beaver ponds in the 1800s, and Beavers had been extirpated from North Carolina by the early 1900s (Lee *et al.* 1982: 43). Reintroduction efforts, which began in Richmond County in 1938 and continued at various locations into the 1960s, have been so successful that Beavers are now considered pests in many areas.

In parts of the piedmont and the inner coastal plain, Beavers have created suitable nesting habitat for large herons where none existed 50 years ago. Assuming there will be no concerted effort to eradicate Beavers from central North Carolina, it seems inevitable that Great Blue Herons will continue to expand their breeding range in the piedmont and in the inner portions of the coastal plain. Inhabitants of new heronries may soon be joined by Great Egrets, which frequently nest in association with Great Blues in the coastal plain (Soots and Parnell 1979). Yellow-crowned Night-Herons (*Nyctanassa violacea*), Wood Ducks, and Red-headed Woodpeckers are other species that may benefit from the growing number of beaver ponds in the region.

It is hoped that the present paper will encourage bird students to document additional heronries and help improve our understanding of the life history of Great Blue Herons and of the nesting ecology of inland heron populations.

Acknowledgments

We are sincerely grateful to James F. Parnell, of the University of North Carolina at Wilmington, who read a previous draft and offered suggestions that substantially improved the presentation of data. We also appreciate the helpful information provided by David H. Allen, Coastal Non-game Project Leader, N.C. Wildlife Resources Commission, Pollocksville, N.C.; Jesse Perry, Director of Public Programs, N.C. State Museum of Natural Sciences, Raleigh; Garland Price, of the Zebulon Country Club staff; and D. Mark Wilson, publisher of *The Zebulon Record*. Price's personal knowledge of beaver activity on Moccasin Creek was essential to our understanding of events preceding the establishment of the heronry at the Zebulon Country Club. Field studies were facilitated by the many courtesies extended to the observers by the staff and the golfers during frequent visits to the heronry. Betty Baker kindly granted access to the beaver pond on her property. Christy Flint, N.C. State Museum of

Natural Sciences, contributed to the paper by putting Potter, Barkley, and Alderink in touch with Brown.

Literature Cited

Knight, K. 1992. Great Blue Heron *in* Briefs for the Files. Chat 56:38.

Lee, D. S., J. B. Funderburg Jr., and M. K. Clark. 1982. A Distributional Survey of North Carolina Mammals. Occasional Papers of the N.C. Biological Survey and the N.C. State Museum of Natural History, Raleigh.

Palmer, R. S. 1962. Handbook of North American Birds. Vol. 1, Loons through Flamingos. Yale University Press, New Haven and London.

Parnell, J. 1992. Great Blue Heron *in* Briefs for the Files. Chat 56:38.

Potter, E. F., and R. Davis. 1974. Hermit Thrush practices foot-patting feeding behavior. Chat 38:95.

Soots, R. F., Jr., and J. F. Parnell. 1979. Inland heronries of North Carolina. Chat 43:10-16.

Addenda

All three heronries were checked periodically from January through June 1997. Brown found no nests at the Little River site, but nesting took place on Buffalo Creek and Moccasin Creek.

Buffalo Creek. Alderink counted 11 active nests on 24 February 1997. Potter and Barkley visited the site the following day and counted 11 nests, including the three substantial nests that apparently survived Hurricane Fran and the one that was under construction on 28 November 1996. One of the 11 was still in the early stages of construction.

On 17 March Potter and Barkley counted 25 nests, all on the west side of the creek and nearly all in living cypress trees. Some nests were still under construction, but incubation had begun at several nests. Courtship feeding was seen once.

By 27 March the advanced growth of foliage made observation of the nests difficult. No new nests were found, and incubation was definitely under way on all of the 25 nests that could be seen well.

It seems possible that the birds displaced from the Little River site contributed to more than doubling the number of nests in the Buffalo Creek heronry. *Triangle Land Conservancy News* (Vol. 14, No. 1, March 1997) reports that TLC has obtained a conservation easement for a portion of the Buffalo Creek cypress stand that appears to encompass all, or at least most, of the heron nests.

Moccasin Creek. On 7 February 1997, two Great Blue Herons flew from the heronry and perched in trees near the Buzzard Rocks. On 25 February, Nest B had an adult in attendance but did not appear to have been enlarged. The replacement nest (C-2R), begun in November 1996, had been enlarged. At the tree that formerly held Nest D, a new nest (D-1) was in the early stages of construction on a limb below the site of the original nest. Adults were seen in the beaver pond near the swimming pool at the Zebulon County Club, in an area that soon would be hidden by leaves emerging on hardwood saplings. Nest D-1 was somewhat enlarged on 28 February.

On 12 March, a new nest (D-2) was under construction above the site of the original Nest D. On 17 March Nest D-2 was still under construction, and two adults were in attendance. One gathered twigs from pines on the ridge extending into the pond near the nest tree. Twigs were passed to the bird standing on the nest. The second bird worked them into the nest structure.

On 23 March incubation appeared to be under way at Nests B, C-2R, and D-1. A pair was in attendance at D-2, but their restless behavior suggested that incubation had not yet begun.

On 13 April one very small nestling was seen in Nest D-1; behavior at Nests B and C-2R suggested young had hatched. No activity was seen at Nest D-2.

On 4 May there were three young in Nest B, three in C-2R, and at least one in D-1; no activity was seen at D-2.

On 22 May there were three well-feathered young in Nest B, two in C-2R, and three in D-1. Two adults were in attendance at Nest D-2, but the contents of the nest, if any, could not be seen or heard.

29 May and 1 June there were two large, active young in Nest B, two in C-2R, and three in D-1. Incubation appeared to be under way at D-2, which subsequently failed. Young fledged from the other three nests by mid-June but returned to nests between feeding forays for a week or more.