

# **WINTERING RAPTORS AND WATERBIRDS OF THE GREAT EGG HARBOR RIVER**

**ATLANTIC COUNTY, NJ**

**A Summary of the First Five Years of Study  
2003-2008**

*A Review of Status and Trends  
And Including Key Comparisons to the MULLICA RIVER  
and to Available Historical Data*

Prepared for:  
**The Great Egg Harbor River Council**



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*On the cover:*

An adult **Bald Eagle** in flight. Bald Eagles are a hallmark of the Great Egg Harbor River system, as breeders, migrants, and particularly as wintering birds.

(Photo by Clay Sutton)

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# **WINTERING RAPTORS AND WATERBIRDS**

## **ON THE GREAT EGG HARBOR RIVER**

**Atlantic County, NJ**

**2003-2008**

### **A FIVE-YEAR SYSTEMATIC STUDY of an Important Avian Wintering Area**

#### **EXECUTIVE SUMMARY**

In an effort to establish baseline data on winter raptor and waterbird use of the lower Great Egg Harbor River watershed, information that could eventually be used to determine status and trends in avian use and populations, a systematic study was begun during the winter of 2003-2004 and has continued through winter 2008-2009. For this five-year period, data was gathered at nine sites, for forty-five minutes per site, at a rate of approximately every two weeks during the period from the first week of December to the last week of March in order to assess winter populations and distribution of birds, primarily raptors, waterfowl, and other waterbirds.

Substantial use of the Great Egg Harbor River system was proven. Five years of systematic sampling determined raptor use of the Great Egg River and estuary to be highly significant and on par with the lower Maurice River (the only other southern New Jersey system for which substantial data exists). Waterfowl and waterbird use of the system was found to be well higher than that indicated by previously published historical and anecdotal accounts. This was particularly noteworthy on Great Egg Harbor Bay, where winter Brant, scaup, and diving duck numbers were found in concentrations previously unreported, and in numbers highly significant for the region. For four field seasons, comparative studies were conducted on the Mullica River as well, studies that demonstrated the Mullica to also be a river that sustains important avian ecovalues in winter.

In five years of systematic study, Great Egg Harbor River winter raptors and waterfowl were documented in numbers judged to be substantial and regionally significant to New Jersey and in the Mid-Atlantic states. Studies are ongoing; winter 2008-2009 marked the sixth season of survey efforts and the beginning of the planned second five-year block of studies.

## GREAT EGG HARBOR WINTER RAPTORS AND WATERBIRDS

### Background and Introduction

*“On the winding northern shore of Great Egg Harbor, on the edge of narrow passages of blue sea water, bordered by rushes or silver white sand, there was an old tavern, Beasley’s Tavern, still in existence a century and a half later, and it became one of (Alexander) Wilson’s refuges. Inland were slow-moving rivers that poured from swamps through large stands of dwarf pines, the air fragrant with their resinous scent mingled with the odor of the white sand and salt sea. Near Cape May and along the short Tuckahoe River that flowed into Egg Harbor were groves of swamp oaks and deep-shaded cedar swamps, where herons, egrets and bitterns nested.*

*In the early twilight the night herons flew toward the marshes, uttering their hoarse and hollow cries, and the bird life of the region, once the migrating geese departed, was not so much beautiful as it was eccentric, a florid example of rococo nature, long-legged creatures pacing endlessly along the shore, and shovel-mouthed sea birds scooping up their food over the waves. Wilson was surely a happy individual when he wrote (of Great Egg Harbor), something that could confidently be said of him at few times in his life.”*

Robert Cantwell, 1961, on Alexander Wilson’s 1811 journey to Great Egg Harbor  
From *Alexander Wilson: Naturalist and Pioneer*

The Great Egg Harbor River and Bay has long been known for its abundance of birds. The very names of the waterways were derived from the ability of first European settlers, and Native Americans before them, to gather eggs there - a major source of food during the bountiful nesting season. So too was Great Egg Harbor famous with some of our early and greatest ornithologists. Alexander Wilson, widely regarded as the father of American ornithology, studied extensively along the river and bay in the 1820s, and John James Audubon collected and painted at Great Egg Harbor in the 1830s. Audubon also recounted his adventures there, with birds and with much more of nature, in his famous journal where he offered an early and glowing testimonial:

*“To such naturalists as are qualified to observe many different objects at the same time, Great Egg Harbor would probably offer as ample a field as any part of our coast excepting the Florida Keys. Birds of many kinds are abundant, as are fishes and testaceous animals. The forests shelter many beautiful plants, and even on the dryest sandbar, you may see insects of the most brilliant tints.”*

John James Audubon  
From *Ornithological Biography*, Volume 3, 1835

The Great Egg Harbor River, including its important Tuckahoe River tributary, is one of New Jersey's great river and bay systems. The Great Egg easily rivals the Mullica River / Wading River complex, the Maurice River, and the Cohansey River as being among the largest and most important river and estuary systems in southern New Jersey. Despite a long history of settlement in the areas surrounding the river, and despite recent and substantial regional growth and development, much of the Great Egg Harbor River remains wild and scenic, and many areas would yet qualify as pristine under many standards of review. The Great Egg is certainly one of South Jersey's gems - in scenic vistas, natural resources, wildlife use, and recreation and ecotourism opportunities.

Despite its well-established reputation for substantial wildlife populations and avian-use, prior to 2003-2004 surprisingly little systematic ornithological data had been gathered on the Great Egg Harbor or Tuckahoe Rivers. Most published avian use data was anecdotal at best -- chance sightings or non-systematic surveys (such as Christmas Bird Counts). State and federal waterfowl counts documented substantial use, yet were conducted infrequently and with results generally unavailable to the public. In short, available records hinted at exceptional bird use of the area, but unfortunately offered biologists or planners little definitive data or mapping for resource management, land use planning options, decision-making, and protection strategies.

Compared to the long-term in-depth studies on Cumberland County's Maurice River, and to lesser yet substantial data on the Cohansey River, little was known of raptor (hawk and eagle) and waterbird use of the Great Egg system. Herein "waterbirds" are defined largely as waterfowl (ducks and geese), wading birds (herons, egrets, and ibis), and shorebirds (sandpipers and plovers). In studies dating back to 1987, the Maurice and the Cohansey Rivers have been intensively studied as compared to the Great Egg Harbor and Tuckahoe River system.

In winter, 2003-2004, a systematic survey of Great Egg Harbor River avian resources was initiated by the Great Egg Harbor Watershed Association. While ornithological findings for that single season were significant in their own right, most importantly the establishment of a systematic survey methodology, route, and data collection mechanism could allow for comparisons over time. Because this single-season effort did not allow for any assessment of long term status and trends, a second winter season study was continued in 2004-2005. Although these first two seasons ostensibly provided a good baseline for future, identical systematic studies, there was no way of knowing whether the results were truly representative, or whether they represented average, "good," or even "bad" years for winter bird-use. Under the auspices of the Great Egg Harbor Watershed Association, and funded by grants from the National Park Services Wild and Scenic River program, these winter raptor and waterbird studies continued through 2007-2008, generating five seasons of survey data. (And indeed, studies were continued in 2008-2009 as part of a planned second segment of five-year studies).

## GOALS AND OBJECTIVES

Beginning in winter 2003-2004, a winter raptor and waterbird survey was funded and initiated by the Great Egg Harbor Watershed Association. These studies continued for five years through winter 2007-2008, and are reported on herein. In the mid-Atlantic region, winter is an exceptional time for bird-use, particularly raptor and waterfowl use of regional river and coastal wetlands habitats. Vast river and bay systems attract and support both a wide variety and large numbers of winter birds - birds which have migrated in autumn from regions farther north and west, including high Arctic regions, to feed in milder, ice-free river and bay habitats. Winter is key time of bird-use in southern New Jersey and a crucial time in the life cycle and survival of all Mid-Atlantic region hawks, eagles, and waterfowl.

Although important avian use of the Great Egg occurs on a year-bound basis, the suspected importance of the area as a key wintering area called for systematic surveys to be conducted during the highly important winter season - at a time when raptor and waterfowl numbers are at their seasonal highest in the region. The goals of this Great Egg Harbor raptor and waterfowl survey, as determined in concert with the Great Egg Harbor Watershed Association, were as follows:

**1. The establishment of an avian data base which, over time, can be used to determine status and trends in bird populations and bird use** - such baseline data would be of particular importance as land use changes accelerate in the watershed.

**2. The determination of key use areas by birds** - possible eventual habitat rankings could be of real value in directing resource protection and acquisition prioritization, as well as wildlife management needs.

**3. Submission of rare, threatened and endangered species records** to the Endangered and Nongame Species Project (ENSP) of the NJDEP Division of Fish and Wildlife. By submission of copies of these ongoing reports, including mapping, findings of this study will supplement and aid ENSP's Landscape Project, upcoming proposed Habitat Rules, Wildlife Incentive Programs, and other Department programs in protecting key Great Egg region habitats.

**4. Bring recognition and publicity to the considerable avian resources** of the Great Egg watershed. While there was considerable anecdotal information on the area's bird life, no systematic raptor or waterbird studies had been carried out prior to 2003-2004 on the Great Egg (excepting the DFW's twice-annual waterfowl counts). The lack of Great Egg data on winter raptors, a hallmark feature of South Jersey river systems, was noteworthy in its absence prior to 2003 - far less was known about the Great Egg Harbor River than was known about the Maurice River, Cohansey River, or even the nearby Mullica River to the north.

**5. The key objective of the survey efforts is to discover and provide cornerstone avian resource data to be used in river management and protection.** Baseline knowledge backed by strong systematic data can play a crucial role in decision making, land-use planning, and resource management on the great Egg Harbor River. Long-term monitoring, leading to a true understanding of avian status and trends over time (and in relation to a rapidly changing landscape), should play an important part in planning and protection for the Scenic and Recreational Great Egg Harbor River.

## METHODOLOGY

For five full winter seasons, from the inaugural 2003-2004 study and continuing through the 2007-2008 season, raptor and waterbird surveys on the Great Egg Harbor River were conducted systematically between the first week of December and the fourth week of March. An average of nine surveys were conducted each field season, at roughly the rate of once every two weeks during this winter period. It should be noted that early December sees some late “fall” migration into the South Jersey region, and that March is a time of substantial spring migration build-up, particularly in waterfowl numbers.

Two observers working in concert, Clay Sutton and James Dowdell, spent 45 minutes apiece at each of nine sampling sites. All raptors and waterbirds were tallied at each site, whether in flight or sitting (perched or on the water). All hawks and eagles were searched for in accordance with Sutton and Sutton (1996). Raptors were identified, aged, and sexed in accordance with Dunne, Sibley, and Sutton (1986), Clark and Wheeler (1987), and Wheeler and Clark (1995). Waterbirds were found and identified in accordance with Sibley (2000), Sutton, *et al.*, (2004), and, additionally, the two authors’ many years of extensive field experience throughout southern New Jersey and elsewhere.

Additional birds, most often raptors, observed *between* official count sites were recorded if, *and only if*, the observers were confident they had not previously been counted. For example, a low-flying Cooper’s Hawk dashing across the road would be added to the count if it had not been observed at the previous site. While the nine sampling sites were generally far enough apart to preclude “double-counting,” the observers used extreme care to avoid recounting the same bird or birds. For example, eagles range widely up and down the river; a Bald Eagle roosting at Lake Lenape may range east to Tuckahoe WMA or farther. A “new” eagle would only be counted when direction of flight, age, plumage, or circumstance (such as concurrent sightings) would allow the observers to confidently assess that it could not possibly have been counted previously. Waterfowl counts are also largely conservative; unless flushed by hunters, boats, or raptors, many ducks consistently remained out of sight in creek beds or guts. Also many distant ducks were often largely unseen due to heat waves, haze, rough water, or distance from the observers. Due to such constraints, counts of raptors, particularly vultures, are thought to be conservative as well. As discussed below, the Great Egg river basin is a very large area, extremely wide in the lower portions. Counts are representative, but by no means exhaustive or complete. Total birds present are most always certainly higher than those counted and recorded.

The nine count locations, the official “Point Count” methodology sampling sites, are shown on **Map 1**. Some sites did have supplemental count locations (labeled A, B, and C on our field maps, but not on Map 1) to allow for all areas to be seen and thereby most birds counted. For example, the Tuckahoe WMA site, Site 9, southeast of Tuckahoe has three impoundment pools, and not all pools can be viewed or counted from the same immediate location. Therefore, the Site 9 count is a composite of tallies taken at three separate locations, but only one final tally is given for the site on the daily and summary data sheets. In this case, the 45 minutes are expended at the three stops put together. Only by using such supplemental viewing locations



could all birds, particularly waterbirds, be reasonably and reliably tallied to the greatest extent possible.

In order to avoid time-of-day bias in the sampling technique, the route was reversed on each subsequent sampling date, run “upriver” and then “downriver” on alternate sampling days. The nine sites ultimately settled upon as a reasonable and “doable” sampling route are as follows, (starting on the lower estuary and working upriver):

- (1) Longport Bridge Fishing Pier. This site allowed counting of the lower portion of Great Egg Harbor Bay and the Rainbow Channel/Rainbow Island area.
- (2) John F. Kennedy Park in Somers Point. Allowed counting of the bay east of the Garden State parkway Bridge. An alternate site was employed here; the foot of the Route 9 Bridge over Great Egg Harbor bay (north end) allowed the bay west of the bridges to be seen and censused.
- (3) Jeffers Landing, including a supplemental site on Job’s Point Road.
- (4) English Creek Landing, at Wharf Road.
- (5) The “Upper” tidal river. The principal count location was from the Shady River Marina on Route 559. A supplemental site used (if and when waterfowl, primarily geese, were noted to be present) was “the bulkhead” in Mays Landing just south of Route 40.
- (6) Lake Lenape. Observations were conducted from the berm adjacent to the spillway in Mays Landing.
- (7) Gibson Landing, at the end of Gibson’s Creek Road in the Corbin City unit of Tuckahoe WMA.
- (8) The observation tower on the dikes of the Corbin City unit of the Tuckahoe WMA. Here supplemental observation points were used in order to observe and count all of the various nooks and crannies of the several impoundments.
- (9) The Tuckahoe unit of the Tuckahoe WMA, including three supplemental stops which allowed all three impoundments to be viewed and counted. Particularly Site 9 allowed those raptors and waterfowl using the lower Tuckahoe River tributary to the Great Egg Harbor River basin to be included in survey results. This site was in Cape May County; all others were in Atlantic County, NJ.

To the greatest extent practicable, all counts were conducted in good weather. The observers carefully selected sampling days which were sunny and breezy, conditions which

readily facilitate raptor hunting and movement along the river. Such conditions particularly allow for the best raptor counts. On cloudy, windless days raptors often spend much of their time perched, and therefore often are out of sight. While the technique used might be considered to be a combination of the time-honored “point count” and “transect” methods, birds recorded during the transits from site to site were infrequent and only included under the caveats expressed above. None-the-less, the route was always virtually the same, decreasing any variability possibly associated with this technique. Therefore, in essence this was a standard point count study, yet one which attempted to maximize sightings and gain a full picture of the numbers and diversity of the considerable avian resources present.



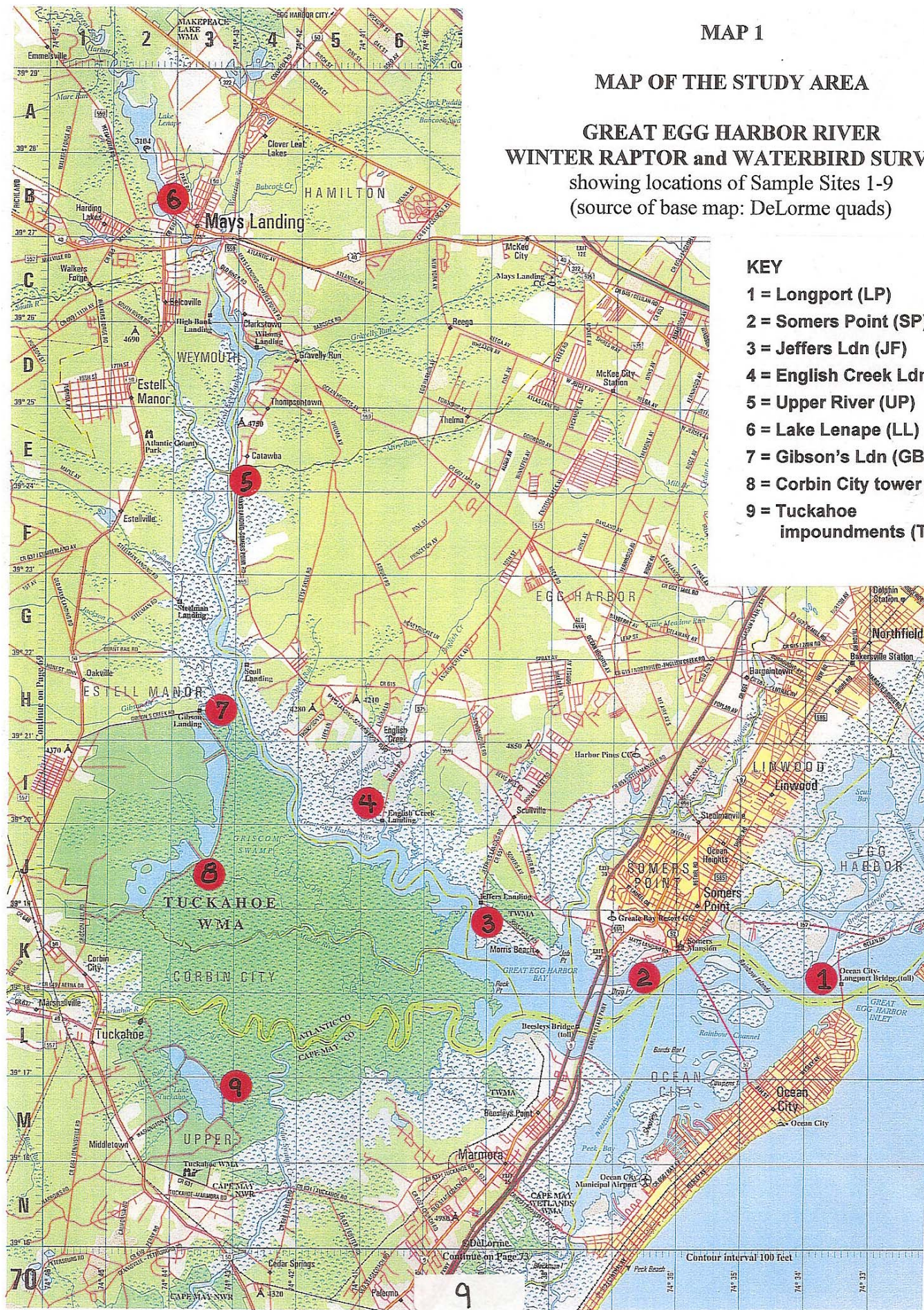
# MAP 1

## MAP OF THE STUDY AREA

### GREAT EGG HARBOR RIVER WINTER RAPTOR and WATERBIRD SURVEY showing locations of Sample Sites 1-9 (source of base map: DeLorme quads)

#### KEY

- 1 = Longport (LP)
- 2 = Somers Point (SP)
- 3 = Jeffers Ldn (JF)
- 4 = English Creek Ldn (EC)
- 5 = Upper River (UP)
- 6 = Lake Lenape (LL)
- 7 = Gibson's Ldn (GB)
- 8 = Corbin City tower (CC)
- 9 = Tuckahoe impoundments (TK)





## FINDINGS

A total of 43 winter surveys were carried out over the five winter seasons, beginning in winter 2003-2004 and ending following winter 2007-2008. The results of the first five seasons of winter raptor and waterbird studies on the Great Egg Harbor River are shown in **Table 1**. Table 1 shows the peak numbers for all raptor and waterbird species for each of the five seasons of study. The **peak counts for the five year segment** are shown in **Bold Face**.

While average counts are of value in comparing data from year to year, and in part reflect the amount of time over the season which birds spend on the river (as well as the inevitable impacts of both daily and prolonged weather conditions upon count results), the peak count for many species far better reflects the true numbers present. For example, the peak of 1,238 American Black Ducks recorded on February 1, 2004, far better reflects the true number present than that year's seasonal average count of 365. Weather, ice, count conditions, tide, and access can greatly vary and alter the results of any given survey. This is why a minimum of 7-10 surveys per field season are required to truly assess bird populations present in the system.

**Table 2** represents a smaller subset of Table 1, and shows only key signature raptor and waterfowl species found on the Great Egg Harbor River. Table 2 shows seasonal peaks and seasonal averages for 22 species for each of the five winter field seasons. The **all-time high peak count**, or "best count" for each species, is shown in **Bold Face**. Also shown is the five-year average for each species, including the average peak and the mean average for the five-year segment. This information will be important for comparing the first five years (2003 to 2008) to the planned second five year segment (2008-2013) when this data eventually becomes available.

**TABLE 1.1**

**Great Egg Harbor River Raptor and Waterbird Survey**

**5-YEAR SUMMARY – PEAK NUMBERS**

| <b>FIELD SEASON</b>        | <b>1<br/>2003-2004<br/>(N = 8)</b> | <b>2<br/>2004-2005<br/>(N = 9)</b> | <b>3<br/>2005-2006<br/>(N = 7)</b> | <b>4<br/>2006-2007<br/>(N = 9)</b> | <b>5<br/>2007-2008<br/>(N = 10)</b> |
|----------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-------------------------------------|
| <b>LOONS to CORMORANTS</b> |                                    |                                    |                                    |                                    |                                     |
| Red-throated Loon          | 3                                  | 7                                  | 8                                  | 17                                 | <b>22</b>                           |
| Common Loon                | 20                                 | 27                                 | 21                                 | 31                                 | <b>42</b>                           |
| Pied-billed Grebe          | 1                                  | 1                                  | <b>2</b>                           | 1                                  | 1                                   |
| Horned Grebe               | 28                                 | 27                                 | 10                                 | 34                                 | <b>42</b>                           |
| Red-necked Grebe           | 3                                  | 1                                  |                                    | 2                                  |                                     |
| Northern Gannet            | 1                                  |                                    | 5                                  |                                    | <b>500</b>                          |
| White Pelican              |                                    | <b>1</b>                           |                                    |                                    |                                     |
| Double-cr Cormorant        | 61                                 | <b>464</b>                         | 139                                | 91                                 | 189                                 |
| Great Cormorant            | 3                                  | 3                                  | 2                                  | 2                                  | 3                                   |
| <b>HERONS to VULTURES</b>  |                                    |                                    |                                    |                                    |                                     |
| American Bittern           |                                    | 1                                  |                                    | 1                                  |                                     |
| Great Blue Heron           | 22                                 | <b>29</b>                          | 22                                 | <b>29</b>                          | 27                                  |
| Great Egret                | 2                                  | 21                                 | 2                                  | 3                                  | <b>28</b>                           |
| Snowy Egret                |                                    |                                    |                                    |                                    | 1                                   |
| Black-cr Nt-Heron          |                                    |                                    | 1                                  |                                    |                                     |
| Black Vulture              | 5                                  | 5                                  | <b>16</b>                          | 11                                 | 12                                  |
| Turkey Vulture             | 120                                | 110                                | 106                                | <b>132</b>                         | 106                                 |
| <b>WATERFOWL</b>           |                                    |                                    |                                    |                                    |                                     |
| Snow Goose                 | <b>110</b>                         | 70                                 |                                    | 3                                  |                                     |
| Canada Goose               | 764                                | <b>906</b>                         | 474                                | 442                                | 562                                 |
| Brant                      | 2425                               | <b>5440</b>                        | 1570                               | 1332                               | 4984                                |
| Mute Swan                  | 89                                 | 84                                 | <b>126</b>                         | 92                                 | 94                                  |
| Tundra Swan                | 23                                 | <b>38</b>                          | 27                                 | 12                                 | 24                                  |
| Wood Duck                  |                                    | 6                                  | 6                                  | 2                                  | 1                                   |
| Gadwall                    | 27                                 | 12                                 | 16                                 | <b>42</b>                          | 32                                  |
| Eurasian Wigeon            |                                    |                                    |                                    |                                    | 1                                   |
| American Wigeon            | 20                                 | <b>114</b>                         | 28                                 | 35                                 | 97                                  |
| Am Black Duck              | <b>1238</b>                        | 1115                               | 868                                | 813                                | 882                                 |
| Mallard                    | 220                                | 172                                | 203                                | 104                                | <b>263</b>                          |
| Blue-winged Teal           | 2                                  | <b>9</b>                           | 2                                  |                                    | 8                                   |
| Northern Shoveler          |                                    |                                    | 17                                 | 6                                  | <b>37</b>                           |

**Peak Counts are BOLD FACED.** N = number of surveys per field season

TABLE 1.2

## Great Egg Harbor River Raptor and Waterbird Survey

## 5-YEAR SUMMARY – PEAK NUMBERS

| FIELD SEASON           | 1<br>2003-2004<br>(N = 8) | 2<br>2004-2005<br>(N = 9) | 3<br>2005-2006<br>(N = 7) | 4<br>2006-2007<br>(N = 9) | 5<br>2007-2008<br>(N = 10) |
|------------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------------------------|
| Northern Pintail       | 497                       | 484                       | 644                       | 443                       | <b>783</b>                 |
| Green-winged Teal      | 1032                      | 859                       | 1140                      | 949                       | <b>2510</b>                |
| Common Teal            |                           | <b>3</b>                  | 1                         | 2                         | 1                          |
| Canvasback             |                           | <b>8</b>                  |                           |                           | 1                          |
| Redhead                | 2                         |                           |                           | <b>8</b>                  |                            |
| Ring-necked Duck       | 12                        | 7                         | 11                        | <b>111</b>                | 2                          |
| Greater Scaup          | 301                       | 75                        | 1                         | <b>4158</b>               | 60                         |
| Lesser Scaup           | 20                        | 1                         | 10                        | <b>2142</b>               | 1                          |
| Scaup (sp.)            | <b>7050</b>               | 4300                      | 750                       | 6555                      | 800                        |
| Surf Scoter            | 2                         | <b>150</b>                | 100                       | 1                         | 14                         |
| White-winged Scoter    |                           | 2                         |                           |                           | 1                          |
| Black Scoter           |                           | 50                        | <b>60</b>                 |                           | 3                          |
| Scoter (sp.)           |                           | 300                       | <b>800</b>                |                           | 50                         |
| Long-tailed Duck       | 120                       | 415                       | 66                        | 184                       | <b>484</b>                 |
| Bufflehead             | <b>1168</b>               | 599                       | 815                       | 703                       | 1088                       |
| Com. Goldeneye         | <b>61</b>                 | 22                        | 56                        | 35                        | 48                         |
| Hooded Merganser       | 34                        | 138                       | <b>149</b>                | 107                       | 138                        |
| Com. Merganser         | 91                        | <b>205</b>                | 48                        | 181                       | 141                        |
| Red-br Merganser       | 172                       | <b>180</b>                | 165                       | 178                       | 140                        |
| Ruddy Duck             | 3                         | 6                         | <b>24</b>                 | 4                         | 6                          |
| <b>DIURNAL RAPTORS</b> |                           |                           |                           |                           |                            |
| Osprey *               | 7                         | <b>45</b>                 | 6                         | 15                        | 39                         |
| Bald Eagle             | 14                        | 11                        | <b>18</b>                 | 16                        | <b>18</b>                  |
| Northern Harrier       | 41                        | <b>47</b>                 | 37                        | 38                        | 47                         |
| Sharp-sh Hawk          | 1                         | <b>7</b>                  | 5                         | 2                         | 6                          |
| Cooper's Hawk          | 3                         | <b>5</b>                  | 4                         | 2                         | 4                          |
| Northern Goshawk       | 1                         | 1                         |                           |                           |                            |
| Red-sh Hawk            | <b>4</b>                  | 3                         | 1                         | 1                         | 2                          |
| Red-tailed Hawk        | 57                        | 56                        | <b>59</b>                 | 57                        | 49                         |
| Rough-leg. Hawk        | 9                         | <b>10</b>                 | 5                         | 2                         | 4                          |
| Golden Eagle           | 1                         | <b>2</b>                  | <b>2</b>                  | 1                         |                            |
| American Kestrel       |                           | 3                         | <b>4</b>                  | 1                         |                            |
| Merlin                 | 1                         | <b>2</b>                  |                           | <b>2</b>                  |                            |
| Peregrine Falcon       | 3                         | 3                         | 4                         | <b>6</b>                  | 4                          |

Peak Counts are **BOLD FACED**. N = number of surveys per field season

Osprey \* -- number shows peak spring count (not a wintering species)

**TABLE 1.3**

**Great Egg Harbor River Raptor and Waterbird Survey**

**5-YEAR SUMMARY – PEAK NUMBERS**

| <b>FIELD SEASON</b>         | <b>1<br/>2003-2004<br/>(N = 8)</b> | <b>2<br/>2004-2005<br/>(N = 9)</b> | <b>3<br/>2005-2006<br/>(N = 7)</b> | <b>4<br/>2006-2007<br/>(N = 9)</b> | <b>5<br/>2007-2008<br/>(N = 10)</b> |
|-----------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-------------------------------------|
| <b>GROUSE to SHOREBIRDS</b> |                                    |                                    |                                    |                                    |                                     |
| Ring-neck Pheasant          | 1                                  |                                    | <b>3</b>                           | 1                                  | 2                                   |
| Wild Turkey                 |                                    |                                    | 12                                 |                                    |                                     |
| Clapper Rail                | 1                                  |                                    | 1                                  |                                    |                                     |
| Virginia Rail               | 2                                  |                                    |                                    |                                    |                                     |
| American Coot               |                                    |                                    |                                    |                                    | 6                                   |
| Black-bellied Plover        | 6                                  | 6                                  | <b>11</b>                          | 3                                  | 10                                  |
| Semipalmated Plover         |                                    |                                    |                                    | 1                                  |                                     |
| Killdeer                    | 3                                  | 3                                  |                                    | 4                                  | <b>14</b>                           |
| Am Oystercatcher            | 30                                 | 52                                 | 54                                 | 57                                 | <b>67</b>                           |
| Greater Yellowlegs          | 12                                 | 13                                 | 36                                 | 20                                 | <b>89</b>                           |
| Lesser Yellowlegs           | 1                                  | 1                                  | 2                                  | 1                                  | <b>8</b>                            |
| Marbled Godwit              |                                    |                                    | 1                                  |                                    |                                     |
| Ruddy Turnstone             | 10                                 |                                    |                                    |                                    |                                     |
| Sanderling                  | 75                                 | 20                                 | 27                                 | 40                                 | <b>90</b>                           |
| Western Sandpiper           |                                    |                                    | 3                                  |                                    |                                     |
| Pectoral Sandpiper          |                                    |                                    |                                    |                                    | 2                                   |
| Dunlin                      | 801                                | 450                                | 686                                | 445                                | <b>1225</b>                         |
| Wilson's Snipe              | <b>6</b>                           | 5                                  | 5                                  | 2                                  | 2                                   |
| American Woodcock           | 1                                  | <b>3</b>                           |                                    | 2                                  |                                     |
| <b>GULLS to ALCIDS</b>      |                                    |                                    |                                    |                                    |                                     |
| Bonaparte's Gull            |                                    | <b>400</b>                         | 1                                  | 150                                |                                     |
| Ring-billed Gull            | √                                  | √                                  | √                                  | √                                  | √                                   |
| Herring Gull                | √                                  | √                                  | √                                  | √                                  | √                                   |
| Gt BI-backed Gull           | √                                  | √                                  | √                                  | √                                  | √                                   |
| Caspian Tern                |                                    |                                    |                                    | 1                                  |                                     |
| Sandwich Tern               |                                    |                                    | 1                                  |                                    |                                     |
| Forster's Tern              |                                    | 2                                  |                                    |                                    |                                     |
| <b>OWLS to KINGFISHERS</b>  |                                    |                                    |                                    |                                    |                                     |
| E. Screech Owl              |                                    |                                    | 1                                  |                                    |                                     |
| Great Horned Owl            | <b>4</b>                           |                                    | 1                                  |                                    | 1                                   |
| Short-eared Owl             | 6                                  | 7                                  | 5                                  |                                    | <b>10</b>                           |
| Belted Kingfisher           | 6                                  | 7                                  | <b>10</b>                          | 6                                  | 5                                   |

**Peak Counts are BOLD FACED.** N = number of surveys per field season

**TABLE 2**

**Comparison of Winter Raptor and Waterfowl Totals, Great Egg Harbor River**

**Winter 2003-2004 to winter 2007-2008**

|                        | 2003- 2004   |       | 2004- 2005   |       | 2005- 2006 |       | 2006- 2007 |            | 2007- 2008  |       | 5-Year Average |               |
|------------------------|--------------|-------|--------------|-------|------------|-------|------------|------------|-------------|-------|----------------|---------------|
|                        | PEAK         | AVG.  | PEAK         | AVG.  | PEAK       | AVG.  | PEAK       | AVG.       | PEAK        | AVG.  | of<br>Peak     | of<br>Average |
|                        | (N = 8)      |       | (N = 9)      |       | (N = 7)    |       | (N = 9)    |            | (N = 10)    |       |                |               |
| <b>WATERFOWL:</b>      |              |       |              |       |            |       |            |            |             |       |                |               |
| Canada Goose           | 764          | 322   | <b>906</b>   | 359   | 474        | 267   | 442        | 183        | 562         | 270   | 630            | 280           |
| Brant                  | 2,425        | 985   | <b>5,440</b> | 3,125 | 1,570      | 893   | 1,332      | 856        | 4984        | 2484  | 3150           | 1669          |
| Am. Black Duck         | <b>1,238</b> | 365   | 1,115        | 647   | 868        | 481   | 813        | 517        | 882         | 556   | 983            | 513           |
| Mallard                | 220          | 73    | 172          | 74    | 203        | 82    | 104        | 48         | <b>263</b>  | 115   | 192            | 78            |
| Northern Pintail       | 497          | 106   | 484          | 132   | 644        | 212   | 443        | 149        | <b>783</b>  | 349   | 570            | 190           |
| Green-winged Teal      | 1,032        | 172   | 859          | 229   | 1,140      | 276   | 949        | 298        | <b>2510</b> | 894   | 1298           | 374           |
| Bufflehead             | <b>1,168</b> | 467   | 599          | 343   | 815        | 418   | 703        | 345        | 1088        | 421   | 875            | 399           |
| Red-breasted Merganser | 172          | 86    | <b>180</b>   | 92    | 165        | 79    | 178        | 99         | 140         | 78    | 167            | 87            |
| <b>RAPTORS:</b>        |              |       |              |       |            |       |            |            |             |       |                |               |
| Black Vulture          | 5            | 1.50  | 5            | 3.20  | <b>16</b>  | 6.40  | 11         | 4.20       | 12          | 3.80  | 9.80           | 3.80          |
| Turkey Vulture         | 120          | 61.00 | 110          | 76.00 | 106        | 86.00 | <b>132</b> | 106.0<br>0 | 106         | 83.00 | 115.0<br>0     | 82.00         |
| Bald Eagle             | 14           | 8.25  | 11           | 7.30  | <b>18</b>  | 8.90  | 16         | 8.20       | <b>18</b>   | 9.10  | 15.40          | 8.35          |
| Northern Harrier       | 41           | 31.00 | <b>47</b>    | 36.00 | 37         | 27.00 | 38         | 26.00      | <b>47</b>   | 34.00 | 42.00          | 31.00         |
| Sharp-shinned Hawk     | 3            | 0.88  | <b>7</b>     | 1.70  | 5          | 2.40  | 2          | 0.89       | 6           | 1.78  | 4.60           | 1.53          |
| Cooper's Hawk          | 3            | 1.13  | <b>5</b>     | 1.90  | 4          | 2.00  | 2          | 1.00       | 4           | 1.30  | 3.60           | 1.47          |
| Northern Goshawk       | 1            | 0.13  | 1            | 0.10  | 0          | 0.00  | 0          | 0.00       | 0           | 0.00  | 0.40           | 0.05          |
| Red-shouldered Hawk    | <b>4</b>     | 0.90  | 3            | 0.63  | 1          | 0.43  | 1          | 0.33       | 2           | 0.33  | 2.20           | 0.52          |
| Red-tailed Hawk        | 57           | 40.00 | 56           | 45.00 | <b>59</b>  | 42.00 | 57         | 41.00      | 49          | 38.00 | 56.00          | 41.00         |
| Rough-legged Hawk      | 9            | 3.38  | <b>10</b>    | 4.60  | 5          | 2.30  | 2          | 1.00       | 4           | 1.78  | 6.00           | 2.61          |
| Golden Eagle           | 1            | 0.38  | <b>2</b>     | 0.80  | <b>2</b>   | 0.43  | 1          | 0.22       | 0           | 0.00  | 1.20           | 0.37          |
| Am. Kestrel            | 0            | 0.00  | 3            | 0.30  | <b>4</b>   | 0.57  | 1          | 0.22       | 0           | 0.00  | 1.60           | 0.22          |
| Merlin                 | 1            | 0.11  | <b>2</b>     | 0.30  | 0          | 0.00  | <b>2</b>   | 0.22       | 0           | 0.00  | 1.00           | 0.13          |
| Peregrine Falcon       | 3            | 1.38  | 3            | 1.60  | 4          | 2.70  | <b>6</b>   | 1.89       | 4           | 1.89  | 4.00           | 1.89          |

All-time highest counts in **Bold Face**

N = number of surveys per field



## **DISCUSSION**

### **WINTER RAPTORS OF THE GREAT EGG HARBOR**

Wintering populations of birds of prey are a characteristic feature of coastal New Jersey woodlands and marshes. These raptor concentrations occur in part as a result of the well-known coastal fall migration of hawks through the region, as migrants pause and “stage” here and plausibly elect to remain in the food-rich quality habitats available throughout southern New Jersey.

The Great Egg Harbor River System hosts large numbers of wintering raptors. Five years of winter study has documented 15 species of wintering raptors on the Great Egg, with at least 13 species occurring annually. The Great Egg hosts one of the highest assemblages of raptors in New Jersey, with similar numbers unrecorded, or at least unreported, elsewhere in New Jersey excepting the Delaware Bay’s Maurice River (see Literature Cited / For Farther Reference). Accordingly, wintering raptors are a high ecovalue of the Great Egg Harbor River. Diversity and numbers are excellent, not only for New Jersey, but also for the entire mid-Atlantic coastal region. Species by species accounts follow, with discussions that mostly address current status (2003-2008) rather than trends, as a single five year segment does not allow an in-depth look at long-term trends.

#### **Black Vulture**

Black Vultures continue to expand their range and numbers in the Northeast and in New Jersey. They remain, however, somewhat uncommon away from the Delaware Bayshore in winter. Numbers seem to have peaked in the middle of the study and to have declined slightly since; this is perhaps a comment only on local distribution (i.e. location of vulture roosts) than any true change in status. A peak daily high or “best count” of 16 was achieved, and the five-year daily average was 3.8.

#### **Turkey Vulture**

Turkey Vultures, often called “Buzzards” by locals, are a staple of winter on the Great Egg. A peak daily high of 132 and a five-year daily average of 68 both indicate that vultures are in sight daily at virtually all survey locations, and that nature’s clean-up crew is hard at work on the Great Egg.

#### **Osprey**

Osprey migrate to warmer climes in fall, and do not (normally) winter in the mid-Atlantic; numbers shown in Table 1 are those “spring arrivals” recorded during the last survey of the winter season study period, during the third or fourth week of March. That said, in winter 2007-2008, an Osprey successfully wintered on the Great Egg (as did one on or adjacent to the Mullica River, at Forsythe NWR). To our knowledge, this is the first winter this has occurred, perhaps an indicator of climate change.

### **Bald Eagle**

Bald Eagles are today a hallmark of the Great Egg in winter, and even in just five years of data, increasing numbers can easily be seen. Daily high counts of 18 were achieved twice during the 2003-2008 study period, and a five-year average of 8.35 Bald Eagles were recorded per survey. The Great Egg complex is one of the best and most reliable places in Atlantic coastal New Jersey to see Bald Eagles, and only the Mullica River rivals the Great Egg for wintering eagles. Augmenting true “wintering” birds (mostly immatures) at least seven pairs of Bald Eagles today nest in the Great Egg system (including birds from beyond the mainstem study area, such as those on the upper Great Egg, the Tuckahoe River, and Great Cedar Swamp Creek). Unlike in the not so distant past, Bald Eagles are a daily sight over the Great Egg Harbor River and its tributaries.

### **Golden Eagle**

Whereas Bald Eagles nest in the region, Golden Eagles do not. Golden Eagles recorded in winter in New Jersey are migrants from the far north and west (most East Coast Golden Eagles breed in the James Bay / Hudson Bay region). The Great Egg has proven to be one of the top areas in the East to see wintering Golden Eagles. Two to three individuals are recorded most winters; peaks of two were recorded twice, and the daily average is 0.37 – numbers achieved elsewhere in New Jersey only from the Mullica River (and only rarely from anywhere else in the Mid-Atlantic region).

### **Northern Harrier**

The Northern Harrier or “Marsh Hawk” is another popular and conspicuous hallmark species of the winter marsh. They are recorded in large numbers, with a best count of 47 and a five-year average of 31 recorded per day.

### **Sharp-shinned Hawk**

This small forest-dwelling accipiter is secretive in winter, and certainly more numerous than those tallied on any given day. Up to 7 Sharp-shinned Hawks have been recorded in a day, and the five-year daily average is 1.53. None-the-less, far more are present than are counted, and counts herein are highly conservative for both Sharp-shinned and Cooper’s Hawks.

### **Cooper’s Hawk**

Also retiring in winter, this larger accipiter is only slightly less numerous than Sharp-shinned Hawk on the Great Egg in winter. The peak is 5 birds in a day, with a five-year daily average of 1.47. Like Osprey and Bald Eagles, Cooper’s Hawks have recovered in recent decades from a major decline linked to the use of DDT.

### **Northern Goshawk**

The Goshawk is a large, northern forest accipiter. Goshawks are rare anywhere in New Jersey in winter or at any season. A total of three individuals, all immatures (as expected), were recorded during the five years of survey efforts.

### **Red-shouldered Hawk**

The Red-shoulder is another forest-dwelling raptor that is always considerably more numerous than those seen and recorded. Most seen are during the coldest winter days when they sit low on sunlit edges – both to warm up and to seek prey attracted by the sun and warmth. A peak of 4 was tallied, and a 5-year average was 0.52 birds per survey.

### **Red-tailed Hawk**

Red-tails are by far the most conspicuous of all our wintering hawks, and were present along the length of the Great Egg in excellent numbers – attracted by the feeding opportunities offered by the bounty of the vast saltmarshes and upland edge. Highest numbers were recorded in early winter or late winter when late fall migrants or early spring migrants augmented “local resident” and wintering Red-tailed Hawks. An excellent peak of 59 and a five-year average of 41 were achieved for the study period.

### **Rough-legged Hawk**

Even prior to this study, the Tuckahoe/Corbin City/Great Egg complex was widely known as one of the best places to see Rough-legs in New Jersey. This survey only confirmed and corroborated this reputation. 2.61 Rough-legs were seen per survey and an excellent peak count of ten was tallied in winter 2004-2005. Each winter season, the vast marshes of the lower river attract good numbers of this irruptive and charismatic winter visitor from the high Arctic regions. The irruptive and nomadic behavior of Rough-legs results in counts that vary considerably from year to year on the Great Egg and elsewhere in the region.

### **American Kestrel**

This small falcon was once a staple in southern New Jersey. Yet during this survey, very few were seen, and even those that were seen represented early spring migrants, not wintering birds. The peak was a mere 4, and the average a dismal 0.22 per survey. The American Kestrel, once common in the general area, has today virtually disappeared as a wintering bird throughout southern New Jersey. (See comments under Historical data). Not a single individual truly wintered (spent the entire winter or even a good portion of it) during the entire five years of study.

### **Merlin**

Merlin are northern forest nesters and highly migratory. Most Merlin spend the winter far to the south of New Jersey, yet a few always remain in our area near the northern limit of their winter range. One to two are present each winter (peak of 2 on 2 occasions) and a 5-year average of 0.13 was recorded.

### **Peregrine Falcon**

Peregrines nest on the Great Egg (on a Tuckahoe WMA artificial nest box tower erected and maintained by ENSP), and these residents are supplemented in winter by other wintering birds. Peregrine was by far the most common winter falcon on the Great Egg, with a best count of an excellent 6, and a daily average of 1.89. The Peregrine is another former victim of DDT that has recovered exceptionally in recent decades.

**Short-eared Owl**

Crepuscular (active in the dim light of dawn or dusk) if not truly diurnal in its habits, the Short-eared Owl is the one owl which can be in part censused during daylight hours (and using the methodology of this study). As with Rough-legged Hawk, the Great Egg Harbor River area, specifically the dikes at Tuckahoe WMA (both the Corbin City and Tuckahoe sides), have long been known to be one of the best and most reliable places in all of New Jersey to find and enjoy Short-eared Owls. An irruptive species, they were recorded in numbers during 4 of the 5 winter seasons. A peak count of 10 Short-ears has been recorded near sunset at Tuckahoe WMA (winter, 2007-2008). A targeted effort (at dusk) would have undoubtedly revealed additional Short-ears, but it can be conservatively estimated that up to 12-15 Short-eared Owls winter on the lower Great Egg in some years. Accordingly, the Great Egg amply maintained its reputation for hosting some of the highest regional numbers of this always exciting wetlands / open country owl species.

## **WINTER WATERFOWL AND WATERBIRDS OF THE GREAT EGG HARBOR**

Great Egg Harbor Bay was found to be an excellent wintering area for waterbirds. Good numbers of Common Loons, Red-throated Loons, and Horned Grebes use the lower bay in winter. The Great Egg Harbor Bay area is unique in southern New Jersey in having a substantial wintering population of Double-crested Cormorants, and a few Great Cormorants are usually present as well.

Fourteen species of shorebirds were found by survey efforts. Winter is not a time of substantial shorebird use in the mid-Atlantic, yet shorebirds were found to use Great Egg Harbor Bay winter mudflats in some numbers – mostly east of the Garden State Parkway Bridge. Up to 1,225 Dunlin were counted, and up to 67 American Oystercatchers have been tallied during the winter season. A targeted seasonal shorebird survey in spring and fall on the bay mudflats would undoubtedly document major shorebird use during migration.

Waterfowl use of the Great Egg Harbor River and Bay system is substantial and highly significant in the region and in New Jersey. Thirty-one species of waterfowl were found by survey efforts over the five years of study, and high regional winter concentrations were documented for a number of key species.

### **Canada Goose**

A five-year average of 280 per survey was achieved for the route, and a peak count of 906 was tallied. While some Canadas were “local” geese, the high mid-winter counts include many wild migrant Canadas driven to the region by snow and ice conditions farther north.

### **Brant**

Among waterfowl, Brant, a small salt-water goose, are a hallmark species of Great Egg Harbor Bay, attracted to the rich, shallow-water bays and mudflats in vast flocks. The peak count of 5,440 is regionally significant, and better and more accurately reflects Great Egg usage than the more modest 5-year average of 1,669. Daily Brant locations (and numbers) vary greatly with tide, wind direction, ice conditions, and hunting pressure.

### **American Black Duck**

Likewise, the all-time peak of 1,238 Black Ducks better reflects known use than the considerably lower 5-year average of 513. Black Ducks are a highly representative species of the Atlantic Coastal marshes, and Great Egg populations are judged substantial and significant for this species of special concern.

### **Mallard**

With little of their preferred fresh water marsh available, Mallards are never abundant on the Great Egg. A modest peak of 263 and a 5-year daily average of only 78 were found.

### **Northern Pintail**

Pintail are never abundant in early winter, yet become quite numerous by late January and February. Pintails are known for spring “staging” in our region and peak numbers generally occur in early March on their return journey north. An excellent peak of 783 was tallied, and a five-year daily average of 190. Most of these handsome ducks were found in the Tuckahoe / Corbin City WMA impoundments.

### **Green-winged Teal**

As with Pintails, most teal were also recorded in Tuckahoe / Corbin City WMA impoundments. There is some evidence that numbers are increasing; the peak count occurred in the fifth season of study, with 2,510 recorded. Averages grew steadily too, with an average 894 recorded in 2007-2008. Such numbers are highly significant for New Jersey.

### **Diving Ducks**

The vast rafts of diving ducks found on Great Egg Harbor Bay were a delight and a key finding of the study. Anecdotally, the Great Egg Harbor Bay has long been known to support a huge concentration of diving ducks in winter, but to our knowledge it had never been quantified prior to these studies. In winter 2003-2004, the bay supported a flock of over 7,050 scaup and high numbers of other divers as well; similar numbers were also present in winter 2006-2007.

Typically, **Greater Scaup** outnumber **Lesser Scaup** by about a 10:1 ratio in salt water in winter (Walsh, et al, 1999). Therefore Great Egg Harbor Bay "scaup" are mostly Greater Scaup, yet both species were clearly present. The 2006-2007 flock held over 4,000 Greater Scaup and over 2,000 Lesser Scaup. This is a highly significant count for southern New Jersey. In New Jersey only Raritan Bay and Sandy Hook typically have higher counts. The Great Egg Harbor Bay is an important wintering area for scaup.

**Hooded Mergansers** are mostly found in the Tuckahoe / Corbin City WMA impoundments, and present in good numbers, with up to 149 counted. **Common Merganser** numbers varied from year to year, with largest numbers present during the coldest winters – when birds are pushed south as rivers and lakes to the north freeze. A peak number of 205 was counted in winter 2004-2005. **Red-breasted Merganser** (peak 180) and **Bufflehead** were more scattered but present in high numbers too. The 1,168 Bufflehead counted on February 1, 2004, are an all-time, all-place winter maximum for New Jersey (Walsh, et al, 1999). Bufflehead were widely spread from near Job Point to Great Egg Inlet, an attractive and active icon of Great Egg Harbor Bay in winter.

## COMPARISONS TO THE MULLICA RIVER

In 2003-2004 (the first year of studies), in evaluating our initial findings on the Great Egg Harbor River, we made many comparisons to the well-studied and comparatively much-better known Maurice River in Cumberland County. While such comparisons yielded perspective and value to the Great Egg findings, we noted that to some degree we were inevitably comparing “apples and oranges” when comparing and contrasting an Atlantic Coastal river and estuary to a Delaware Bay tributary.

As a result of such discussion, the Great Egg Harbor Watershed Association authorized comparative studies on the nearby Mullica River, also an Atlantic tributary and adjacent to the Great Egg. In an effort to put the Great Egg’s avian ecovalues in true regional perspective, five comparative surveys were carried out in winter 2004-2005 on the Mullica River. These surveys continued through 2007-2008, yielding a full four seasons of comparative studies.

The Mullica River study area and sample locations are shown on **Map 2**. The methodology used on the Mullica was designed to be identical to that used on the Great Egg: Nine sample locations were established on the Mullica between Green Bank in the west and on downriver to Great Bay Boulevard near Little Egg Inlet. Each site was visited for 45 minutes each during a given survey. Sampling direction was reversed every other survey to avoid time-of-day bias. The nine sites, beginning at the mouth of the river and then working upriver, were as follows: Great Bay Boulevard WMA, Graveling Point, the Garden State Parkway Bridge, Swan Bay WMA, Lower Bank, and Green Bank. The major Wading River tributary was monitored at the Wading River Bridge (Route 542), and Bass River was counted at Amassas Landing. Finally, the Leeds Point area, on the south side of Great Bay was monitored from Oyster Creek (Alternate Route 561).

There is some difference in the geographical scope of the study areas. The Great Egg Harbor River study area, from the head of Lake Lenape east to the Great Egg Harbor inlet constitutes about 12.6 linear miles (direct miles, not accounting for turns on the river). The Mullica River, on the other hand, is about 15.6 linear miles in length from Green Bank east to the landing at the foot of Great Bay Boulevard (Seven Bridges Road). While it bears noting that the study area on the Mullica is 3 miles longer, no attempt has been made (as yet) to compare width or acreage (or habitat types) of the comparative study areas. This will be carried out in future years as part of future in-depth comparisons. None-the-less, the identical methodologies allow comparisons to be made to the greatest extent currently practicable.

Four years of winter raptor, waterfowl, and waterbird surveys of the Mullica River (2004-2008) are shown in **Table 3**. The results of all four years of surveys are shown, and **peaks for all species** are shown in **Bold Face**. A subset of Table 3 is presented in **Table 4**, which shows peaks and averages for all key species for each of the four years. The comparison between the winter raptor and waterfowl populations of the Great Egg Harbor River and Mullica River for the winter seasons studied is shown in **Table 5**. All-time peak counts, as well as averages (average peaks and average means) for key species are included for each river system.

Despite the Mullica's slightly longer length (of the study area), in winter the two rivers show many ornithological similarities, and a few major differences. Vulture populations are remarkably similar, as are numbers of most raptors. Northern Harrier peaks and averages were similar for the Mullica and Great Egg. Sharp-shinned Hawk and Cooper's Hawk numbers were nearly identical, and while the Great Egg tops the Mullica for peak numbers, the Mullica bests the Great Egg (barely) for the average number per survey for these accipiter species. Red-tailed Hawk numbers however were consistently lower on the Mullica for unknown reasons (this anomaly is born out by historical data too - see below).

Rough-legged Hawks were seemingly twice as common on the Mullica, yet the Mullica average for Rough-legged is substantially boosted by the peak of 21 individuals seen on January 25, 2005. This amazing number - a very high count for New Jersey - resulted from a major incursion to the region which occurred on and just before the January 25 survey date - as large numbers were pushed into the South Jersey region by major snow falls to the north in upstate New York and the northeastern states. This was a temporary incursion - lasting only about two weeks - but on January 25 we really "hit the peak" of this remarkable movement. We feel we didn't quite hit this key peak time on the Great Egg, although we did record an excellent ten Rough-legs on the Great Egg a week later, on February 2, 2005. Suffice it to say that both rivers are substantially important for Rough-legged Hawk use in winter.

Wintering Bald Eagle numbers (counts that inevitably include nesting birds - as nonmigratory local residents also "winter" on the river . . .) are remarkably similar on both the Great Egg and the Mullica. While the Mullica peak count just bested the Great Egg during this five year segment (18 on the Great Egg and 20 on the Mullica), the average of each year's peak are virtually identical (15.4 vs 15.5), and the average per day are quite similar (8.35 on the Great Egg versus 9.2 on the Mullica). In short, both rivers are highly important to wintering Bald Eagles and host a high percentage of all Bald Eagles found on the Atlantic Coastal marshes of New Jersey.

Golden Eagles are more prevalent on the Mullica River, no doubt in no small part due to the inducement of the vast Pinelands Region surrounding the Mullica and Wading Rivers. Also, Golden Eagles are clearly attracted each season to the vast concentrations of waterfowl - principal prey species - at Forsythe NWR (see comments below). To Golden Eagles, "Brig" is a sumptuous bird feeder. During this survey, what was highly likely the same "pair" of adult Golden Eagles (one male and one female) were seen hunting over Forsythe NWR (seen from Leed's Point) on at least three of the four winters of study. The Great Egg hosts Golden Eagles each winter, but in fewer numbers. The Great Egg peak was 2, and the average was 0.37 per survey. The Mullica Golden Eagle peak was 4; and the average was 0.88. Both rivers are two of the best places to encounter wintering Golden Eagles anywhere in the mid-Atlantic or Northeastern regions.

While many strong comparisons can be made between the Great Egg and Mullica for raptors, there are some notable contrasts regarding waterfowl. Canada Geese were far more numerous on the Mullica, and Snow Geese more prevalent on the Mullica as well (averages clearly boosted by the large flocks attracted to Forsythe NWR - see below). Brant averaged far fewer on the Mullica - although whether this is true in the long-term remains to be learned - and



may be an artifact of physical coverage; the lower Great Egg is far more accessible and visible than the wider, more vast, and less easily viewed lower Mullica basin.

Black Ducks were more prevalent on the Great Egg, but Mallards far more common on the Mullica. Inexplicably (based on Mallard status – the two species are usually found together...), Northern Pintails are virtually absent on the Mullica. Similarly, Green-winged Teal were scarce on the Mullica. Strange contrasts continued for diving ducks. Scaup were less common on the bays of the lower Mullica, and Bufflehead far less common than on the Great Egg. Conversely, Mullica Red-breasted Merganser edged the Great Egg numbers, and Hooded Merganser were far more common on the Mullica River route.

Any avian discussion of the Mullica River complex and Great Bay must include discussion of Forsythe National Wildlife Refuge, a.k.a. “Brigantine.” While not technically within the geographical boundaries of this study, it exerts a tremendous influence on the birds of the study area – particularly waterfowl. Just as the quality impoundments at Tuckahoe / Corbin City WMA attract and concentrate ducks and geese on the Great Egg (and as the Bivalve Estuarine Enhancement Program does on the Maurice River), Brigantine, by its sheer size and quality of habitat (vast impoundments), attracts and concentrates large numbers of Mullica River region waterfowl. But where Tuckahoe / Corbin can be counted because they are “within” that study area, the impoundments at Brig are largely adjacent to Reeds Bay, Little Bay, and Brigantine Inlet - and are not really a part of Great Bay or the Mullica River system. In essence, Tuckahoe / Corbin City WMA are “in bounds,” but Forsythe NWR is (just barely ...) “out of bounds.”

We cannot gainsay the degree to which Forsythe exerts a massive influence on Mullica River waterfowl. Because of the size and high quality of the impoundments, as well as the relative safety from hunting pressure, the NWR clearly pulls in many birds from the Mullica. As one birder aptly put it, “Brigantine simply ‘sucks in’ most of the area’s waterfowl.” And while many return to the nearby Mullica River at night to feed, by day they are safely back at the refuge, sanctuary, and feeding station that is Forsythe NWR.

While one could make a case to include this site and its birds in a Mullica River count, to do so would bias the count to such a degree that comparisons to the Great Egg and/or other rivers would be moot and meaningless. For example, few Green-winged Teal and Pintails are counted on Mullica surveys, but at the same time, just two miles away, perhaps 10,000 teal and 10,000 pintails can often be present at Forsythe. It is a dilemma with no real answer - to count Forsythe NWR birds would be to bias the count beyond comparability (plus it would take 6-8 hours to truly census the Refuge, time not available under current survey protocol). But, at the same time, to *not* count Brigantine waterfowl will forever undercount (and so bias) any Mullica survey efforts. Such are the issues with Forsythe NWR, one of the premier refuges in the entire country, and the implications when attempting hard comparisons to the Great Egg Harbor River.

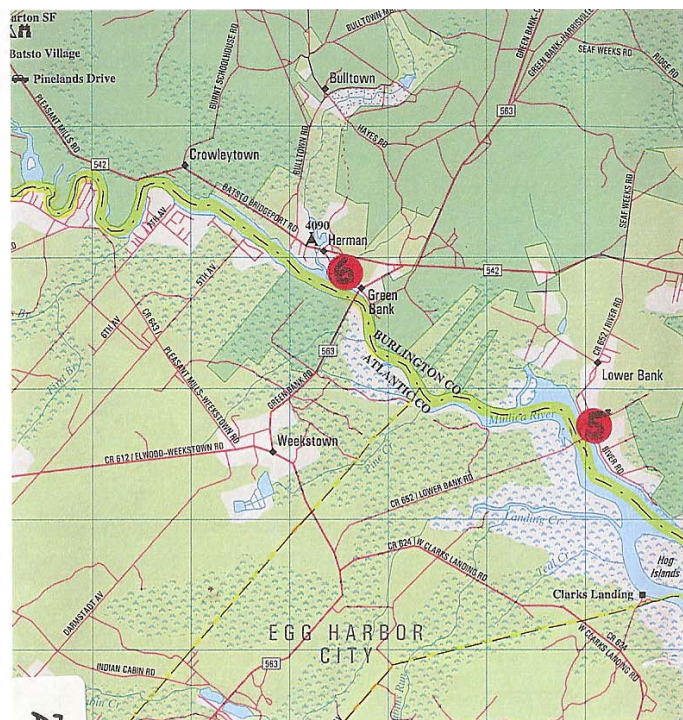
In summary, and in fact, the Great Egg Harbor River (and Bay) and the Mullica River (and Great Bay) are very similar in winter raptor and waterfowl populations. They are two wild,

scenic, and high quality rivers with high avian ecovalues. If in a few ways the Mullica bests the Great Egg, it must be remembered that the Mullica is of greater length, and particularly wider near the mouth. And, Forsythe NWR exerts a pressure on Mullica waterfowl, drawing in huge numbers in a way that renders some comparisons with the Great Egg to be of little value.

The Mullica River was concurrently studied during this survey because the Mullica was in part better known, understood, and documented – and able to provide a valid “comparison” for the Great Egg. In this regard, the Great Egg Harbor River and estuary have stacked up quite nicely by comparison. Avian ecovalues are similar and of exceedingly high value on both the Great Egg and the Mullica River, and documented significant populations of raptors and waterbirds warrant high consideration and protection during the planning process for any projects or anticipated changes in these incomparable regions. Both rivers hold and support large numbers of raptors, waterfowl, and waterbirds throughout the seasons, and based on the findings of this five-year survey, host some of the larger winter bird populations in New Jersey and in the entire Northeast.

After five years of study on the Great Egg and four comparison years on the Mullica, few if any regional rivers – save the Delaware Bayshore’s Maurice River – can boast of better study, better data, or better understanding. If other Mid-Atlantic region-Atlantic Coastal river systems have equal or greater values, they have either been unreported or undocumented to anywhere near the degree to which these studies have discovered the values of the Great Egg Harbor River and to a lesser degree (if only in coverage), the Mullica River.

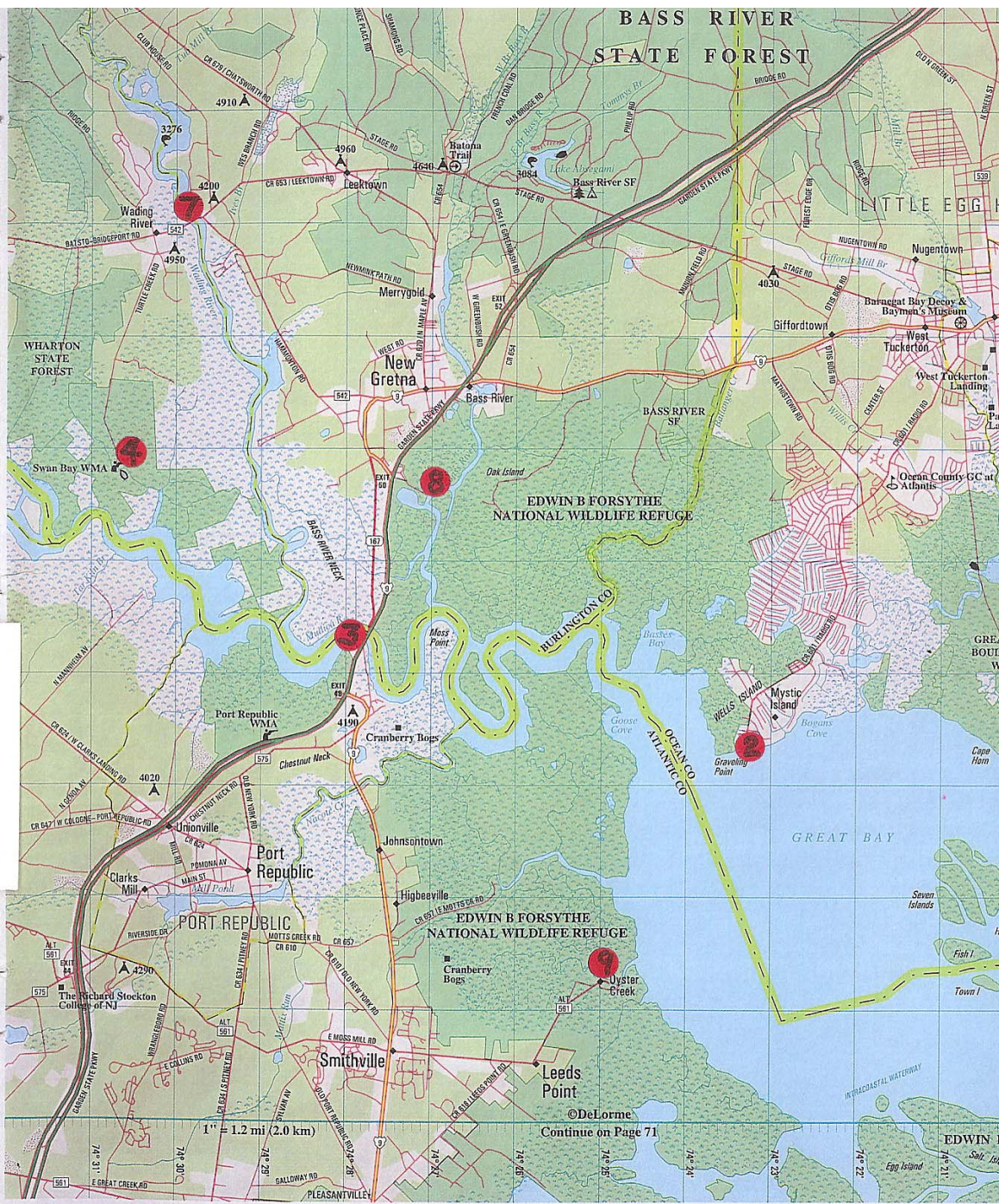




**MAP 2**  
**MAP OF THE STUDY AREA**  
**MULLICA RIVER**  
**WINTER RAPTOR and WATERBIRD SURVEY**  
 showing locations of Sample Sites 1-9  
 (source of base map: DeLorme quads)

**KEY**

- 1 = Great Bay Blvd WMA (Seven Bridges Road)
- 2 = Graveling Point (GP)
- 3 = Gdn St Pkwy Bridge (BR)
- 4 = Swan Bay WMA (SW)
- 5 = Lower Bank (LB)
- 6 = Green Bank (GB)
- 7 = Wading River Bridge (WD)
- 8 = Amassas Landing (AM)
- 9 = Leeds Point (LD)





**TABLE 3.1****Mullica River Raptor and Waterbird Survey****4-YEAR SUMMARY – PEAK NUMBERS**

| <b>FIELD SEASON</b>        | <b>1</b>         | <b>2</b>         | <b>3</b>         | <b>4</b>         |
|----------------------------|------------------|------------------|------------------|------------------|
|                            | <b>2004-2005</b> | <b>2005-2006</b> | <b>2006-2007</b> | <b>2007-2008</b> |
|                            | <b>(N = 5)</b>   | <b>(N = 6)</b>   | <b>(N = 6)</b>   | <b>(N = 8)</b>   |
| <b>LOONS to CORMORANTS</b> |                  |                  |                  |                  |
| Red-throated Loon          | 18               | 21               | <b>25</b>        | 15               |
| Common Loon                | 15               | 16               | 16               | <b>26</b>        |
| Pied-billed Grebe          | 1                | 1                | 4                | <b>6</b>         |
| Horned Grebe               | 11               | 12               | 9                | <b>24</b>        |
| Red-necked Grebe           |                  | 1                | 1                |                  |
| Northern Gannet            |                  |                  | 4                | <b>20</b>        |
| Double-cr Cormorant        | <b>220</b>       | 5                | 42               | 5                |
| Great Cormorant            |                  |                  |                  | 1                |
| <b>HERONS to VULTURES</b>  |                  |                  |                  |                  |
| American Bittern           | 1                | <b>2</b>         | 1                |                  |
| Great Blue Heron           | 12               | 21               | 22               | <b>38</b>        |
| Great Egret                | <b>60</b>        | 3                | 3                | 4                |
| Snowy Egret                | <b>6</b>         |                  |                  |                  |
| Black-cr Nt-Heron          |                  | 1                |                  | 1                |
| Glossy Ibis                | 1                |                  |                  |                  |
| Black Vulture              | 9                | 8                | 15               | <b>25</b>        |
| Turkey Vulture             | <b>119</b>       | 114              | 88               | 116              |
| <b>WATERFOWL</b>           |                  |                  |                  |                  |
| Snow Goose                 | 850              | 1000             | <b>1080</b>      | 1000             |
| Canada Goose               | 366              | 980              | <b>1293</b>      | 665              |
| Brant                      | 1421             | 1785             | 1800             | <b>3100</b>      |
| Mute Swan                  | 6                | 8                | <b>19</b>        | 4                |
| Tundra Swan                | 55               | <b>461</b>       | 15               | 6                |
| Wood Duck                  | <b>26</b>        | 24               |                  | 11               |
| Gadwall                    |                  | <b>15</b>        | 11               | 4                |
| American Wigeon            |                  |                  | 1                | 1                |
| Am Black Duck              | 530              | <b>892</b>       | 601              | 870              |
| Mallard                    | 365              | 334              | 489              | <b>547</b>       |
| Northern Shoveler          | 1                |                  | 1                | <b>10</b>        |
| Northern Pintail           | 1                | 20               | <b>30</b>        | 6                |
| Green-winged Teal          | <b>22</b>        | 2                | 21               | 8                |

**Peak Counts are BOLD FACED.** N = number of surveys per field season

**TABLE 3.2****Mullica River Raptor and Waterbird Survey****4-YEAR SUMMARY – PEAK NUMBERS**

| <b>FIELD SEASON</b>    | <b>1</b>         | <b>2</b>         | <b>3</b>         | <b>4</b>         |
|------------------------|------------------|------------------|------------------|------------------|
|                        | <b>2004-2005</b> | <b>2005-2006</b> | <b>2006-2007</b> | <b>2007-2008</b> |
|                        | <b>(N = 5)</b>   | <b>(N = 6)</b>   | <b>(N = 6)</b>   | <b>(N = 8)</b>   |
| Canvasback             |                  | 5                | 2                | <b>32</b>        |
| Redhead                |                  |                  | <b>24</b>        | 20               |
| Ring-necked Duck       | <b>40</b>        | 28               | 32               | 30               |
| Greater Scaup          | 25               | <b>50</b>        | 1                | 10               |
| Lesser Scaup           |                  | 1                | <b>45</b>        | 10               |
| Scaup (sp.)            | 400              | 700              | 451              | <b>1265</b>      |
| Common Eider           |                  |                  | 3                |                  |
| Surf Scoter            | <b>52</b>        | 47               | 9                | 6                |
| White-winged Scoter    |                  |                  |                  | 1                |
| Black Scoter           |                  | 2                | 1                | 1                |
| Scoter (sp.)           | <b>254</b>       | 50               | 40               | 35               |
| Long-tailed Duck       | 84               | <b>155</b>       | 55               | 61               |
| Bufflehead             | 150              | 365              | 446              | <b>806</b>       |
| Com. Goldeneye         | 6                | 16               | 25               | <b>74</b>        |
| Hooded Merganser       | 93               | 131              | 208              | <b>649</b>       |
| Com. Merganser         | <b>245</b>       | 27               | 43               | 23               |
| Red-br Merganser       | <b>410</b>       | 98               | 95               | 136              |
| Ruddy Duck             |                  | 7                | 2                | <b>54</b>        |
| <b>DIURNAL RAPTORS</b> |                  |                  |                  |                  |
| Osprey *               | 24               |                  |                  |                  |
| Bald Eagle             | <b>20</b>        | 11               | 14               | 17               |
| Northern Harrier       | 42               | 48               | 37               | <b>58</b>        |
| Sharp-sh Hawk          | 2                | 4                | 3                | <b>5</b>         |
| Cooper's Hawk          | 3                | 4                | 4                | 4                |
| Northern Goshawk       | 1                |                  |                  |                  |
| Red-sh Hawk            | <b>3</b>         |                  |                  | 1                |
| Red-tailed Hawk        | 39               | <b>42</b>        | 40               | 40               |
| Rough-leg. Hawk        | <b>21</b>        | 12               | 2                | 7                |
| Golden Eagle           | 2                | 2                | <b>4</b>         | 2                |
| American Kestrel       | 2                |                  |                  |                  |
| Merlin                 | 2                | 1                | 1                | 2                |
| Peregrine Falcon       | 5                | 4                | 5                | <b>8</b>         |

**Peak Counts** are **BOLD FACED**. N = number of surveys per field season

Osprey \* -- number shows peak spring count (not a wintering species)

**TABLE 3.3**

**Mullica River Raptor and Waterbird Survey**

**4-YEAR SUMMARY – PEAK NUMBERS**

| FIELD SEASON                | 1         | 2         | 3           | 4         |
|-----------------------------|-----------|-----------|-------------|-----------|
|                             | 2004-2005 | 2005-2006 | 2006-2007   | 2007-2008 |
|                             | (N = 5)   | (N = 6)   | (N = 6)     | (N = 8)   |
| <b>GROUSE to SHOREBIRDS</b> |           |           |             |           |
| Ring-neck Pheasant          | <b>2</b>  | 1         |             |           |
| Clapper Rail                |           | 1         | 1           |           |
| American Coot               |           | 1         | <b>5</b>    | 1         |
| Black-bellied Plover        | 1         | 2         | <b>11</b>   |           |
| Killdeer                    | 2         | 1         | 7           | <b>9</b>  |
| Am Oystercatcher            | <b>20</b> |           | 15          | 2         |
| Greater Yellowlegs          | 5         | 8         | 8           | 6         |
| Lesser Yellowlegs           |           |           | 1           | <b>5</b>  |
| Marbled Godwit              |           |           | 8           |           |
| Ruddy Turnstone             |           |           | 2           |           |
| Red Knot                    |           |           |             | 1         |
| Sanderling                  | 100       | 25        |             | 100       |
| Purple Sandpiper            |           |           |             | 10        |
| Dunlin                      | 30        | 412       | <b>2500</b> | 1107      |
| Wilson's Snipe              |           | 1         | 2           | <b>5</b>  |
| American Woodcock           |           |           | 7           |           |
| <b>GULLS to ALCIDS</b>      |           |           |             |           |
| Laughing Gull               | 1         |           | <b>3</b>    |           |
| Bonaparte's Gull            |           |           | <b>4</b>    | 1         |
| Ring-billed Gull            | √         | √         | √           | √         |
| Herring Gull                | √         | √         | √           | √         |
| Lesser BI-backed Gull       |           |           | 2           |           |
| Gt BI-backed Gull           | √         | √         | √           | √         |
| Forster's Tern              | 1         |           |             |           |
| <b>OWLS to KINGFISHERS</b>  |           |           |             |           |
| Barn Owl                    |           | 1         |             |           |
| Great Horned Owl            |           |           | 1           |           |
| Short-eared Owl             | 2         | 1         |             | <b>8</b>  |
| Belted Kingfisher           | 2         | 4         | 4           | <b>7</b>  |

**Peak Counts are BOLD FACED.** N = number of surveys per field season

TABLE 4

## Comparison of Winter Raptor and Waterfowl Totals, Mullica River

Winter 2004-2005 to Winter 2007-2008

|                        | 2004- 2005 |      | 2005- 2006 |      | 2006- 2007 |      | 2007- 2008 |         | 4-Year Average |         |
|------------------------|------------|------|------------|------|------------|------|------------|---------|----------------|---------|
|                        | PEAK       | AVG. | PEAK       | AVG. | PEAK       | AVG. | PEAK       | AVG     | of             | of      |
|                        | (N = 5)    |      | (N = 7)    |      | (N = 6)    |      | (N = 8)    |         | Peak           | Average |
| WATERFOWL:             |            |      |            |      |            |      |            |         |                |         |
| Canada Goose           | 366        | 174  | 980        | 463  | 1,293      | 547  | 665        | 444.00  | 826            | 407     |
| Brant                  | 1,421      | 793  | 1,785      | 706  | 1,800      | 970  | 3100       | 1157.00 | 2027           | 907     |
| Am. Black Duck         | 530        | 312  | 892        | 442  | 601        | 348  | 870        | 478.00  | 723            | 395     |
| Mallard                | 365        | 196  | 334        | 220  | 489        | 356  | 547        | 431.00  | 434            | 301     |
| Northern Pintail       | -          | -    | 20         | 7    | 30         | 10   | 6          | 1.50    | 14             | 5       |
| Green-winged Teal      | 22         | 8    | 2          | 1    | 21         | 5    | 8          | 1.60    | 13             | 4       |
| Bufflehead             | 150        | 67   | 365        | 230  | 446        | 217  | 806        | 345.00  | 442            | 215     |
| Red-breasted Merganser | 410        | 116  | 98         | 64   | 95         | 49   | 136        | 73.00   | 185            | 76      |

|                     |     |       |     |       |    |       |     |       |        |       |
|---------------------|-----|-------|-----|-------|----|-------|-----|-------|--------|-------|
| RAPTORS             |     |       |     |       |    |       |     |       |        |       |
| Black Vulture       | 9   | 5.20  | 8   | 3.80  | 15 | 4.70  | 25  | 7.40  | 14.00  | 5.30  |
| Turkey Vulture      | 119 | 70.00 | 114 | 71.00 | 88 | 57.00 | 116 | 74.00 | 109.00 | 68.00 |
| Bald Eagle          | 20  | 10.80 | 11  | 8.00  | 14 | 8.80  | 17  | 9.00  | 15.50  | 9.20  |
| Northern Harrier    | 42  | 31.00 | 48  | 38.00 | 37 | 30.00 | 58  | 45.00 | 46.00  | 36.00 |
| Sharp-shinned Hawk  | 2   | 1.20  | 4   | 2.20  | 3  | 1.50  | 5   | 2.00  | 3.50   | 1.73  |
| Cooper's Hawk       | 3   | 1.60  | 4   | 1.30  | 4  | 1.50  | 4   | 2.25  | 3.75   | 1.66  |
| Northern Goshawk    | 1   | 0.20  |     |       |    |       |     |       | 0.25   | 0.05  |
| Red-shouldered Hawk | 3   | 1.00  | 0   | 0.00  | 0  | 0.00  | 1   | 0.13  | 1.00   | 0.28  |
| Red-tailed Hawk     | 39  | 31.00 | 42  | 34.00 | 40 | 24.00 | 40  | 28.00 | 40.00  | 29.00 |
| Rough-legged Hawk   | 21  | 10.60 | 12  | 6.20  | 2  | 1.00  | 7   | 3.80  | 10.50  | 5.40  |
| Golden Eagle        | 2   | 0.80  | 2   | 1.00  | 4  | 1.33  | 2   | 0.38  | 2.50   | 0.88  |
| Am. Kestrel         | 2   | 0.80  | 0   | 0.00  | 0  | 0.00  | 0   | 0.00  | 0.50   | 0.20  |
| Merlin              | 2   | 0.40  | 1   | 0.17  | 1  | 0.33  | 2   | 0.38  | 1.50   | 0.32  |
| Peregrine Falcon    | 5   | 4.00  | 4   | 3.20  | 5  | 2.67  | 8   | 3.88  | 5.50   | 3.44  |

Peak Counts are BOLD FACED.

N = number of surveys per field

**TABLE 5****Comparison of the Great Egg Harbor River and the Mullica River****Winter 2003-2004 to Winter 2007-2008**

| <b>GREAT EGG HARBOR RIVER</b> |                       |                |
|-------------------------------|-----------------------|----------------|
| <b>Absolute<br/>PEAK</b>      | <b>5-Year Average</b> |                |
|                               | <b>of Peak</b>        | <b>of Avg.</b> |
|                               | <b>(N = 43)</b>       |                |

| <b>MULLICA RIVER</b>     |                       |                |
|--------------------------|-----------------------|----------------|
| <b>Absolute<br/>PEAK</b> | <b>4-Year Average</b> |                |
|                          | <b>of Peak</b>        | <b>of Avg.</b> |
|                          | <b>(N = 26)</b>       |                |

**WATERFOWL:**

|                        |      |      |      |
|------------------------|------|------|------|
| Canada Goose           | 906  | 630  | 280  |
| Brant                  | 5440 | 3150 | 1669 |
| Am. Black Duck         | 1238 | 983  | 513  |
| Mallard                | 263  | 192  | 78   |
| Northern Pintail       | 783  | 570  | 190  |
| Green-winged Teal      | 2510 | 1298 | 374  |
| Bufflehead             | 1168 | 875  | 399  |
| Red-breasted Merganser | 180  | 167  | 87   |

|      |      |     |
|------|------|-----|
| 1293 | 826  | 407 |
| 3100 | 2027 | 907 |
| 892  | 723  | 395 |
| 547  | 434  | 301 |
| 30   | 14   | 5   |
| 22   | 13   | 4   |
| 806  | 442  | 215 |
| 410  | 185  | 76  |

**RAPTORS**

|                     |     |        |       |
|---------------------|-----|--------|-------|
| Black Vulture       | 16  | 9.80   | 3.80  |
| Turkey Vulture      | 132 | 115.00 | 82.00 |
| Bald Eagle          | 18  | 15.40  | 8.35  |
| Northern Harrier    | 47  | 42.00  | 31.00 |
| Sharp-shinned Hawk  | 7   | 4.60   | 1.53  |
| Cooper's Hawk       | 5   | 3.60   | 1.47  |
| Northern Goshawk    | 1   | 0.40   | 0.05  |
| Red-shouldered Hawk | 4   | 2.20   | 0.52  |
| Red-tailed Hawk     | 59  | 56.00  | 41.00 |
| Rough-legged Hawk   | 10  | 6.00   | 2.61  |
| Golden Eagle        | 2   | 1.20   | 0.37  |
| Am. Kestrel         | 4   | 1.60   | 0.22  |
| Merlin              | 2   | 1.00   | 0.13  |
| Peregrine Falcon    | 6   | 4.00   | 1.89  |

|     |        |       |
|-----|--------|-------|
| 25  | 14.00  | 5.30  |
| 119 | 109.00 | 68.00 |
| 20  | 15.50  | 9.20  |
| 58  | 46.00  | 36.00 |
| 5   | 3.50   | 1.73  |
| 4   | 3.75   | 1.66  |
| 1   | 0.25   | 0.05  |
| 3   | 1.00   | 0.28  |
| 42  | 40.00  | 29.00 |
| 21  | 10.50  | 5.40  |
| 4   | 2.50   | 0.88  |
| 2   | 0.50   | 0.20  |
| 2   | 1.50   | 0.32  |
| 8   | 5.50   | 3.44  |

N = number of surveys per field season



## COMPARISONS TO GREAT EGG HARBOR RIVER HISTORICAL DATA

While there is little published systematic or long-term historical data available for the Great Egg Harbor study area, it is none-the-less desirable to attempt to compare and contrast the results of the winter 2003-2008 studies to any available previously gathered data. By reviewing current findings in a historical perspective we can attempt to assess changing status and trends over time. One source of historical data is site-specific Christmas Bird Count (CBC) data for the region. The southwestern part of the study area falls within the boundaries of the Marmora CBC, and as such was counted by Sutton and his party from 1983 to 1992, a ten year period. While this territory of the Marmora CBC only covers a portion of the current study area, it is a key portion and highly central for the purpose of counting raptors - highly mobile along the river and, when soaring, visible for several miles. Accordingly, the historical data set is far more valuable for assessing raptor numbers than it is for waterfowl comparisons. (For example, Great Egg Harbor Bay and the Tuckahoe impoundments were not included in the Sutton CBC territory, therefore making most waterfowl comparisons impossible.)

**Table 6** shows historical winter raptor and waterbird records for the Great Egg Harbor River gathered by Sutton as part of the Marmora CBC from 1983 to 1992. **Peaks and averages for key species** are shown in **Bold Face**. The area covered (CBC territory) was Gibson Creek Road to Tuckahoe, and mostly east of Route 50 -- primarily the impoundments at Corbin City. While direct comparisons are not possible or highly valid, some useful information is readily gleaned when comparing current results with the historical record. **Table 7** shows 2003-2008 results compared with that of 1983-1992. Canada Geese, as would be expected, are three times as common in the modern era than in the 1980's. Among raptors, where the best comparisons are possible, Turkey Vultures have become over 10 times more common during current winters, a known (but little-documented) region-wide trend. Black Vultures, a "southern vulture" that has only recently expanded its range into New Jersey, were yet unknown in winter in the 1980s, and are far more common in southern New Jersey today.

As predictable, due to region-wide recovery, Bald Eagles have become far more common in the modern era. Only 1.1 was seen on average in the historical years where 8.35 were averaged in the period 2003-2008. Sharp-shinned Hawk was similarly common historically, but Cooper's are more than twice as common today, also showing an expected regional trend and change in status as birds have recovered from the DDT era. Red-shouldered Hawk numbers are quite the same but Red-tailed Hawks have become far more common today. On the other hand, Rough-legged Hawks were far more common historically. The decline of wintering Rough-legs over time is a well-known regional phenomenon -- not linked just to the Great Egg -- and probably linked to the loss of the Rough-legged Hawk's preferred high marsh (*Spartina patens*) habitat (a victim of mosquito control practices throughout the region). So too Golden Eagles seemed more numerous historically than currently. Peregrines, similar to Bald Eagles, have undergone a nation-wide recovery and are far more common today. A true victim is American Kestrel - an average of 1.2 were seen historically where no true wintering birds were seen at all in the 2003-2004 survey efforts. Ruffed Grouse are well known to have declined drastically in the region, and the historical record clearly highlights this loss when compared to modern-day

findings (wherein grouse were completely absent on 43 survey routes run from 2003-2008).

It is important to remember that all historical samples were taken in late December. Historical averages shown are for that period only - and do not span the season as do current survey averages. While not directly comparable, the historic information none-the-less offers considerable insight into region-wide changes and trends over time for many key species in the Great Egg drainage.

**TABLE 6.1**

**GREAT EGG HARBOR RIVER WINTER RAPTOR and WATERBIRD SURVEY (MARMORA CBC)**

**HISTORICAL (1983 TO 1992)**

|                     | 12/31/83 | 12/16/84 | 12/29/85 | 12/21/86 | 12/27/87 | 12/19/88 | 12/30/89 | 12/16/90 | 12/31/91 | 12/31/92 | Avg. |
|---------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|
| Pied-billed Grebe   |          |          |          |          | 1        |          |          |          |          |          |      |
| American Bittern    |          |          | 1        |          |          |          |          |          |          |          |      |
| Great Blue Heron    | 4        | 2        | 10       | 11       | 12       | 6        | 5        | 6        | 8        | 7        |      |
| Great Egret         |          |          |          |          |          |          |          | 1        |          |          |      |
| Black-cr Nt-Heron   |          |          | 1        | 1        |          |          |          |          |          |          |      |
| Turkey Vulture      |          | (2cw)    | 6        | (2cw)    | 9        | 23       | 1        | 10       |          |          | 4.9  |
| Canada Goose        | 330      | 102      | 10       | 171      | 101      |          | 124      | 43       | 31       | 45       | 95.7 |
| Brant               |          |          | 50       |          | 1000     |          |          |          |          | 2000     |      |
| Mute Swan           |          | 8        |          | 7        |          | 26       |          | 7        | 9        | 16       |      |
| Tundra Swan         | 8        | 54       | 4        | 46       | 46       | 11       |          |          | 28       | 7        |      |
| Wood Duck           |          | 2        |          | 1        | 2        |          |          |          |          |          |      |
| Gadwall             |          |          |          | 2        | 2        |          |          |          | 20       |          |      |
| American Wigeon     |          |          |          |          |          |          |          |          | 68       |          |      |
| Am Black Duck       | 250      | 33       | 27       | 63       | 272      | 121      | 144      | 123      | 255      | 713      |      |
| Mallard             | 2        | 4        | 4        | 7        | 16       | 11       | 10       | 4        | 12       | 14       |      |
| Northern Pintail    |          | 27       |          | 17       | 6        | 9        | 2        | 2        |          | 16       |      |
| Green-winged Teal   |          |          |          | 1        | 1        |          |          | 7        | 31       | 3        |      |
| Ring-necked Duck    |          |          |          |          |          |          |          |          |          | 1        |      |
| Common Goldeneye    |          |          |          | 4        |          |          |          |          |          |          |      |
| Hooded Merganser    |          | 2        |          | 18       | 8        | 1        | 2        | 5        | 148      | 41       |      |
| Common Merganser    |          |          |          | 3        |          |          | 15       | 2        | 13       | 12       |      |
| Red-br Merganser    |          | 1        |          |          | 1        |          |          |          |          |          |      |
| Bald Eagle          | 1i       |          |          |          | 1a       | 3i       |          | 2i       | 1a       | 3a       | 1.1  |
| Northern Harrier    | 35       | 22       | 20       | 21       | 21       | 32       | 9        | 31       | 14       | 8        | 21.3 |
| Sharp-shinned Hawk  | 1        | 1        |          | 3        | 2        | 1        | 3        | 3        | 1        | 1        | 1.6  |
| Cooper's Hawk       |          | (1cw)    |          | 1        | 2        |          | 1        |          | 2        |          | 0.6  |
| Red-shouldered Hawk | 1        | 2        |          | 1        | 2        | 2        | 1        |          |          |          | 0.9  |
| Red-tailed Hawk     | 10       | 5        | 12       | 15       | 11       | 13       | 8        | 21       | 8        | 8        | 11.1 |
| Rough-legged Hawk   | 12       | 2        | 8        | 8        | 5        | 4        | 4        | 3        | 2        | 1        | 4.9  |
| Golden Eagle        | 1a       |          | 1sa      | 2a       | 1a       |          |          |          | 2a - i   | 1a       | 0.8  |
| American Kestrel    | 1        |          | 2        | 1        | 3        | 1        | 1        | 1        | 1        | 1        | 1.2  |
| Peregrine Falcon    |          |          | 2        |          |          |          |          |          |          | (2cw)    | 0.2  |
| Ring-nk Pheasant    | 1        | 1        | 2        | 1        | (cw)     | 1        | (cw)     |          | 1        |          |      |
| Ruffed Grouse       |          | 1        | 6        | 1        | 1        |          | 2        |          |          | 1        |      |

**TABLE 6.2**

**GREAT EGG HARBOR RIVER WINTER RAPTOR and WATERBIRD SURVEY (MARMORA CBC)**

**HISTORICAL (1983 TO 1992)**

|                    | 12/31/83 | 12/16/84 | 12/29/85 | 12/21/86 | 12/27/87 | 12/19/88 | 12/30/89 | 12/16/90 | 12/31/91 | 12/31/92 | Avg. |
|--------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|
| Wild Turkey        |          |          |          |          |          |          |          |          |          | 5        |      |
| Northern Bobwhite  |          | 1        | 1        |          |          |          | 1        |          |          |          |      |
| Clapper Rail       |          | 2        |          |          | 1        | 1        |          |          |          |          |      |
| Virginia Rail      |          | 1        |          |          |          | 1        |          |          |          |          |      |
| Killdeer           |          |          |          |          | 2        |          |          |          | 4        |          |      |
| Greater Yellowlegs |          |          |          |          | 3        |          |          | 1        | 3        | 2        |      |
| Lesser Yellowlegs  |          |          |          |          | 1        |          |          |          |          |          |      |
| Dunlin             |          | 70       |          | 15       | 61       | 10       |          | 21       |          |          |      |
| Wilson's Snipe     |          | 1        | 2        | 1        | 1        | 1        |          | 1        |          |          |      |
| American Woodcock  |          | 1        | 3        | 1        | 1        |          |          | 1        |          |          |      |
| Ring-billed Gull   |          | 9        | 2        | 22       | 20       | 4        |          | 47       | 30       | 35       |      |
| Herring Gull       | 35       | 35       | 50       | 269      | 60       | 70       | 32       | 26       | 50       | 12       |      |
| Gt Bl-backed Gull  | 1        |          | 2        | 6        | 1        | 1        | 1        | 6        | 1        | 2        |      |
| Barn Owl           |          |          |          | 1        |          |          |          |          |          |          |      |
| E. Screech-Owl     |          | 1        | 4        | 1        | 4        |          | 3        | 1        | 1        |          |      |
| Great Horned Owl   | 8        | 13       | 14       | 10       | 16       | 2        | 2        | 3        | 2        | 11       |      |
| Barred Owl         |          |          | 1        | 1        | 2        |          |          |          |          | 1        |      |
| Long-eared Owl     |          |          |          | 1        |          |          |          |          |          |          |      |
| Short-eared Owl    | 1        |          | 7        | 5        |          | 1        | 1        | 6        | 1        |          |      |
| N. Saw-whet Owl    |          |          |          |          | (1 cw)   |          |          |          |          |          |      |
| Belted Kingfisher  | 1        | 3        | 4        | 3        | 3        | 3        | 3        | 4        | 5        | 2        |      |

**TABLE 7****Comparison of Winter Raptor Numbers****Historical Great Egg Harbor River Data****Compared to Present Day Great Egg Harbor River Survey**

|                        | <b>1983 - 1992</b>       |                             | <b>2003 - 2008</b>       |   |
|------------------------|--------------------------|-----------------------------|--------------------------|---|
|                        | <b>Absolute<br/>PEAK</b> | <b>Average<br/>(N = 10)</b> | <b>Absolute<br/>PEAK</b> | <b>Average<br/>(of Average #s)<br/>(N = 43)</b> |
| Black Vulture          | 0                        | 0.00                        | 16                       | 3.80  |
| Turkey Vulture         | 23                       | 4.90                        | 132                      | 82.00   |
| Bald Eagle             | 3                        | 1.10                        | 18                       | 8.35  |
| Northern Harrier       | 35                       | 21.00                       | 47                       | 31.00   |
| Sharp-shinned Hawk     | 3                        | 1.60                        | 7                        | 1.53  |
| Cooper's Hawk          | 2                        | 0.60                        | 5                        | 1.47  |
| Northern Goshawk       | 0                        | 0.00                        | 1                        | 0.05  |
| Red-shouldered<br>Hawk | 2                        | 0.90                        | 4                        | 0.52  |
| Red-tailed Hawk        | 21                       | 11.00                       | 59                       | 41.00   |
| Rough-legged Hawk      | 12                       | 4.90                        | 10                       | 2.61  |
| Golden Eagle           | 2                        | 0.80                        | 2                        | 0.37  |
| Am. Kestrel            | 3                        | 1.20                        | 4                        | 0.22  |
| Merlin                 | 0                        | 0.00                        | 2                        | 0.13  |
| Peregrine Falcon       | 2                        | 0.20                        | 6                        | 1.89  |

N = number of surveys

## COMPARISONS TO MULLICA RIVER HISTORICAL DATA

When reviewing 2004-2008 Mullica River data and assessing its relevance to current Great Egg Harbor River studies, it is important to evaluate whether this four-year data set is relevant and applicable, and if it reflects similar historic changes to that seen for the Great Egg Harbor River. While four years of data can say little of long-term trends, we can augment the Mullica data (and its value) by reviewing it in light of known historical findings. Virtually all historic Mullica River ornithological information is of an anecdotal, non-standardized sort. While considerable reference to the Mullica can be found in the literature over many decades, little if any of it is systematic or standardized. That said, one old non-published data set stands out – Clay Sutton’s own field notes relating to informal raptor studies conducted along the Mullica dating back to 1974.

**Table 8** shows the results of raptor surveys along the Mullica River between December 11, 1974 and December 9, 1984. This data set summarizes 37 surveys conducted over eleven winter seasons on the Mullica. **Peak counts** are shown in **Bold Face**, and averages are given. While non-standardized as to route and methodology, these informal counts none-the-less covered roughly the same geographical area as the current Mullica Survey Route – and were conducted by one of the current study’s counters, Clay Sutton. (These field studies were also specifically raptor oriented.) In a broad-brush approach, these historical surveys offer some comparison over time – and insight into the temporal implications and relevance of today’s counts. As such, they offer poignant evidence of the changes in the abundance of some raptors over time.

**Table 9** compares historical Mullica River winter raptor data to that gathered during this 2004-2008 winter survey. Peaks and averages are presented. Between 1974 and 1984, Mullica Bald Eagles peaked at a mere 6 and averaged only 1.8 birds per survey. When these meager numbers are compared to current numbers we can see stunning proof of the recovery of Bald Eagles in New Jersey and in the east. So too, Sharp-shinned Hawk and Cooper’s Hawk numbers clearly reflect known recoveries of these species from both DDT and shooting. The Peregrine’s dramatic recovery can be seen not only in the comparison but even in the clear trend visible in the 1974-1984 data alone.

Northern Harrier winter populations – a key feature of the Mullica – as well as those of Northern Goshawk, Red-shouldered Hawk and Merlin show similar numbers in both the historical and current data. Historical Rough-legged Hawk peaks (20 birds achieved twice) and today’s 21 are almost identical, and Golden Eagle status and use appears consistent over time. The Red-tail Hawk trend is curious. Historical counts confirm that Red-tails were never numerous on the Mullica (at least compared to the Great Egg Harbor River and the Maurice River), but that they have clearly become more numerous over time - as attested to by historical averages compared to the present. (Interestingly, in the 1970s and 1980s Rough-legs actually were slightly more numerous than Red-tails on the Mullica in winter.) Red-tail is well-known to have experienced a long-term and on-going population increase throughout the northeast.

The most dramatic trends are seen in Turkey Vulture, Black Vulture, and American Kestrel. Turkey Vultures were almost non-existent in winter in the 1970s and 1980s and Black Vultures unheard of. Reflecting a known region-wide trend, vulture populations have exploded in recent years. Vultures were historically absent from the Mullica and Pinelands in winter and today's dramatic increase and range expansion may well be linked to climate change.

The other trend is more sobering. American Kestrel averaged 2.24 per survey in historical surveys with a peak of 10 in 1976. In 2004-2008, only 0.2 were averaged per survey, with the peak a mere two. These "two," seen on April 5, 2005, were both spring migrants - seen in flight high and heading north. Only *one* Kestrel was actually known to have wintered along the vast Mullica in the four years of study. (In essence, wintering Merlin and Peregrine were both far more common than Kestrel on the Mullica and the Great Egg in 2004-2008, stark evidence of the drastic decline of the beleaguered and disappearing American Kestrel).

In addition to the above, historic CBCs can give us further perspective on the depth of the decline of the American Kestrel. The Oceanville CBC, which encompasses most of our Mullica River Study Area, recorded 24 kestrel in 1970 and 1974; 25 in 1976, and 34 in 1978. In four years of our current study, in 26 days afield, a total of only 2 sightings were accrued. (No American Kestrel were seen on the 2008 Oceanville CBC). The Marmora CBC encompasses most of our current Great Egg Harbor River study area. This CBC recorded a peak of 28 American Kestrel in 1976. In the five years of our study, only 9 were seen in 43 days afield and even here, all were judged as early or late migrants – not one was a true wintering bird. (No American Kestrel were counted on the 2008 Marmora CBC.)

Given that breeding data (there are far more Bald Eagle nests known in New Jersey today than American Kestrel nests) and migratory count data fully confirm and corroborate winter findings, American Kestrel is as severely endangered in New Jersey as any other avian species, and it is currently listed only as "special concern." These and many other data sets confirm the overdue and drastic need for endangered species status for the American Kestrel.

In summary, although it was non-standardized, available historical Mullica River data offers good perspective on 2004-2005 findings. Clear trends are discernable over time, and historical numbers confirm and corroborate current findings regarding key species such as Northern Harrier, Rough-legged Hawk, and Golden Eagle. Not only important in its own right (as it relates to and highlights the Mullica River's stellar status over time as one of New Jersey's most important river systems), Mullica winter raptor data also serves to place current and on-going Great Egg Harbor River studies into a proper and regional perspective. Put simply, any river that can stand up to the Mullica as well as the Great Egg has done in this comparison, is a worthy river in and of itself.

**TABLE 8**  
**Historical Mullica River Winter Raptor Surveys**  
**1974 to 1984 (37 surveys over 11 Winter Seasons)**

| Species            | 12/11<br>1974 | 1/5<br>1975   | 1/4<br>1976  | 1/23<br>1976 | 2/7<br>1976  | 2/16<br>1976 | 2/28<br>1976 | 12/5<br>1976 | 12/22<br>1976 | 12/27<br>1976 | 1/1<br>1977 | 1/19<br>1977 | 3/17<br>1977  | 12/26<br>1977 | 12/28<br>1977 | 1/2<br>1978  | 1/15<br>1978 | 1/28<br>1978 | 3/5<br>1978       | 12/17<br>1978 |
|--------------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|-------------|--------------|---------------|---------------|---------------|--------------|--------------|--------------|-------------------|---------------|
| Turkey Vulture     |               |               |              |              |              |              |              |              |               |               |             |              |               |               |               |              |              |              |                   |               |
| Bald Eagle         | 3             | 1             | 3            | 1            | 1            | 2            | 1            | 1            |               | 1             | 1           | 1            | 1             | 2             | 1             | 2            | 1            | 1            | 2                 | 3             |
| Northern Harrier   | 35            | 6             | 50           | 15           | 25           | 20           | 4            | 12           | 12            | 15            | 20          | 8            | 12            | 10            | 6             | 10           | 12           | 25           | 10                | 4             |
| Sharp-sh Hawk      | 1             | 1             | 2            | 1            |              |              |              |              | 1             |               | 2           | 1            |               | 3             |               |              |              | 3            | 1                 |               |
| Cooper's Hawk      |               |               |              |              | 1            |              |              | 2            |               |               |             |              |               |               |               |              |              |              |                   |               |
| Northern Goshawk   |               |               |              |              |              |              |              |              |               |               |             |              |               |               |               |              |              |              |                   | 1             |
| Red-sh Hawk        |               |               |              |              | 1            | 3            |              |              |               |               |             |              |               |               |               |              |              |              |                   |               |
| Red-tailed Hawk    | 8             | 12            | 5            | 8            | 5            | 20           | 10           | 3            | 6             | 2             | 4           | 2            | 15            | 8             | 2             | 3            | 2            | 10           | 6                 | 2             |
| Rough-legged Hawk  | 8             |               | 3            | 10           | 15           | 10           | 4            | 1            | 4             | 1             | 4           | 4            | 1             | 1             | 2             | 3            | 20           | 8            | 10                | 4             |
| Golden Eagle       | 1             |               | 2            | 1            | 3            | 1            |              | 1            | 3             | 2             | 1           | 1            | 1             | 3             | 2             | 3            | 3            | 2            |                   | 2             |
| American Kestrel   | 8             | 1             | 3            | 4            | 3            | 10           | 6            | 1            | 2             |               | 2           | 2            | 2             | 6             |               | 2            | 2            | 2            | 2                 | 1             |
| Merlin             | 1             |               | 1            |              |              |              |              |              | 1             |               |             |              |               |               |               |              |              |              |                   |               |
| Peregrine Falcon   |               |               |              |              |              |              |              |              |               |               |             |              |               |               |               | 1            |              |              |                   | 2             |
| unidentified eagle |               |               |              |              |              |              |              |              | 2             |               | 2           |              |               |               |               |              | 1            | 1            |                   | 2             |
|                    |               |               |              |              |              |              |              |              |               |               |             |              |               |               |               |              |              |              |                   |               |
| Species            | 12/22<br>1978 | 12/27<br>1978 | 1/15<br>1979 | 1/27<br>1979 | 12/2<br>1979 | 2/2<br>1980  | 2/23<br>1980 | 3/1<br>1980  | 12/20<br>1980 | 12/21<br>1981 | 1/8<br>1982 | 2/21<br>1982 | 12/18<br>1982 | 1/1<br>1983   | 1/1<br>1984   | 1/22<br>1984 | 12/9<br>1984 |              | Average<br>N = 37 |               |
| Turkey Vulture     |               |               |              |              |              |              | 6            |              |               |               |             | 4            |               |               |               |              | 1            |              | 0.30              |               |
| Bald Eagle         | 1             | 2             | 2            | 3            |              | 6            | 2            | 1            | 1             | 1             | 4           | 2            | 4             | 1             |               | 2            | 5            |              | 1.80              |               |
| Northern Harrier   | 6             | 10            | 10           | 12           | 25           | 8            | 2            | 2            | 12            | 15            | 18          | 3            | 20            | 10            | 20            | 8            | 30           |              | 14.11             |               |
| Sharp-sh Hawk      | 1             | 1             | 1            |              | 4            |              |              |              | 1             |               | 1           |              |               |               |               | 1            | 2            |              | 0.76              |               |
| Cooper's Hawk      |               | 1             |              |              |              |              |              | 1            |               |               |             |              |               |               |               |              |              |              | 0.14              |               |
| Northern Goshawk   |               |               | 1            |              |              |              |              |              |               |               |             |              |               |               |               |              |              |              | 0.05              |               |
| Red-sh. Hawk       |               |               |              |              |              |              |              |              |               |               | 1           |              |               |               | 1             | 1            |              |              | 0.19              |               |
| Red-tailed Hawk    | 2             | 4             | 2            | 6            | 8            | 4            | 5            | 3            | 2             | 3             | 8           | 10           | 10            | 10            | 5             | 6            | 6            |              | 6.14              |               |
| Rough-legged Hawk  | 2             | 6             | 4            | 20           | 4            | 5            | 2            | 6            | 4             | 5             | 12          | 3            | 20            | 10            | 6             | 2            | 6            |              | 6.22              |               |
| Golden Eagle       | 1             | 2             |              | 2            |              | 1            |              |              | 1             | 2             | 1           | 2            | 2             | 1             |               |              | 2            |              | 1.32              |               |
| American Kestrel   | 1             | 1             | 1            | 2            | 4            | 1            | 1            |              | 1             | 2             | 1           | 2            |               | 2             | 2             | 1            | 2            |              | 2.24              |               |
| Merlin             |               |               |              |              |              |              |              |              |               |               |             |              |               |               | 1             |              | 1            |              | 0.14              |               |
| Peregrine Falcon   |               |               |              |              | 3            |              |              |              | 2             | 1             | 2           | 2            | 2             | 1             |               | 2            | 2            |              | 0.54              |               |
| unidentified eagle |               | 2             | 1            | 2            |              |              |              |              |               |               |             |              |               |               |               |              |              |              | 0.35              |               |

N = Number of surveys, Peak daily counts shown in **Bold Face**



**TABLE 9****Comparison of Winter Raptor Numbers****Historical Mullica River Data****Compared to Present Day Mullica River Survey**

|                     | <b>1974 - 1984</b>   |                         | <b>2004 - 2008</b>   |   |
|---------------------|----------------------|-------------------------|----------------------|---|
|                     | <b>Absolute Peak</b> | <b>Average (N = 37)</b> | <b>Absolute Peak</b> | <b>Average (of Average #s) (N = 26)</b> |
| Black Vulture       | 0                    | 0.00                    | 25                   | 5.30                                    |
| Turkey Vulture      | 6                    | 0.30                    | 119                  | 68.00                                   |
| Bald Eagle          | 6                    | 1.80                    | 20                   | 9.20                                    |
| Northern Harrier    | 50                   | 14.10                   | 58                   | 36.00                                   |
| Sharp-shinned Hawk  | 4                    | 0.76                    | 5                    | 1.73                                    |
| Cooper's Hawk       | 2                    | 0.14                    | 4                    | 1.66                                    |
| Northern Goshawk    | 1                    | 0.05                    | 1                    | 0.05                                    |
| Red-shouldered Hawk | 3                    | 0.19                    | 3                    | 0.28                                    |
| Red-tailed Hawk     | 20                   | 6.14                    | 42                   | 29.00                                   |
| Rough-legged Hawk   | 20                   | 6.22                    | 21                   | 5.40                                    |
| Golden Eagle        | 3                    | 1.32                    | 4                    | 0.88                                    |
| American Kestrel    | 10                   | 2.24                    | 2                    | 0.20                                    |
| Merlin              | 1                    | 0.14                    | 2                    | 0.32                                    |
| Peregrine Falcon    | 3                    | 0.54                    | 8                    | 3.44                                    |

N = Number of surveys

## CONCLUSIONS AND RECOMMENDATIONS

Four intensive seasons of study on the Great Egg Harbor River, and four comparative years of study on the Mullica River – studies designed in-part to place the Great Egg findings in regional perspective and rank – have documented high concentrations of wintering raptors, wintering waterfowl, and other waterbirds. These populations are deemed significant and substantial for the Atlantic Coastal marshes in all of New Jersey, and in the Mid-Atlantic region. Few areas have reported numbers that rival the Great Egg Harbor River, and fewer still if any can claim the documentation that is now available for the Great Egg Harbor River (and to a lesser degree the Mullica River).

In short and in summary, this data set for the Great Egg Harbor River not only clearly establishes it as one of the best studied rivers in New Jersey and in the region (second only to the lengthy studies of Cumberland County, New Jersey's Maurice River), but also indicates significant raptor and waterfowl numbers that are documented to a level few other areas or sites can match.

We believe that the goals and objectives of this project, as conceived in concert with the Great Egg Harbor Watershed Association in 2003, have been substantially met (see page 5). We have established an avian data base that can be used to determine status and trends in bird populations and bird use; through the establishment of nine specific count sites we have determined key use areas of raptors and waterbirds and by submission of rare, threatened, and endangered species use mapping to the Endangered and Nongame Species Program we have supplemented and assisted their important work.

Finally, through the provision of this and all seasonal reports to concerned agencies and organizations, we have met the key objective of discovering and providing avian resource data to be used in Great Egg Harbor River management and protection. Through the posting of these reports on-line, as well as through programs and presentations, we have gained important publicity and brought overdue recognition to the extraordinary avian resource and ecotourism opportunities of the Great Egg Harbor Watershed.

Early winter findings have discovered significant late fall migration through the Great Egg system, and late winter surveys have found important spring migration and spring staging occurring as well. Important bird use of the region doesn't begin on December 1 and end on March 31. As a result, past recommendations have urged additional spring and fall surveys of the region. These recommendations have been accepted by the Great Egg Harbor Watershed Association, and current ongoing studies are looking at the river on a year-round basis – researching avian ecovalues in all seasons, including spring migration, breeding season, and fall migration – as well as maintaining core winter-season studies.

Such expanded survey efforts will be a focus of avian research for the 2008-2009 field season and hopefully beyond. The GEHWA sponsored studies outlined herein are one of very few true long-term avian status and distribution surveys occurring anywhere in New Jersey or

the region, and should be continued, particularly as land-use changes continue and accelerate in the area. Energy choices, including but not limited to wind power projects, also call for current and in-depth knowledge of the status and trends of birds.

Beyond expanding current studies outside of the winter season (as is already in place), it would be of importance to expand geographical coverage as well. Findings outlined herein are not absolute totals or maxima by any means; they are representative for the route, protocol, and methodology. Findings are derived from the best observation sites, and the protocol makes them repeatable, but data achieved is not exhaustive as to what is present. Raptors, for example, are counted on the mainstream Great Egg, but how many additional hawks and eagles might be seen if other areas of the Great Egg were sampled, such as the Tuckahoe River above Route 50, Great Cedar Swamp Creek south of County Route 631 and Route 50, Patcong Creek north of Route 559, or the upper river areas north of Lake Lenape, such as Makepeace Lake WMA and Winslow WMA? In essence we have been monitoring the main stem river but completely ignoring the tributaries.

Similarly, additional overlooks in Ocean City, Somers Point, and Longport would no doubt significantly increase waterfowl numbers and diversity beyond what is counted at the nine established point count sites. Shorebird use of the Great Egg could far more adequately be documented on low tide mudflats (or even high tide roosts) that could be censused by boat – essentially by viewing areas too far away to be seen and counted by land-based observers. Such expanded scope should not be a part of regular ongoing studies; our recommendation is that these adjunct / ancillary counts be conducted if and when additional observers (volunteers) might be available. It would be important information to know; we know the Great Egg is “great” in many ways, but we can’t help but wonder if avian populations might be 10% or 20%, or even higher if the entire system (not just the representative point counts) could be sampled concurrently in one day.

We have discovered that the numbers and diversity of raptors, waterfowl, and waterbirds (including shorebirds) on the Great Egg in winter are highly significant. It is our goal now to learn to what extent these species and numbers are present in the other seasons, and to what extent these current documented and published findings represent the birds present in the entire Great Egg Harbor River, Bay, and estuary system. The Great Egg may be even greater than we realize.

## ACKNOWLEDGMENTS

We thank all those friends of the Great Egg Harbor River for their encouragement and support during this project. We thank Pat Sutton and Gail Dwyer for their generous assistance with data charts and report writing, and we thank Doyle Dowdell, Michael O'Brien, Carole Brown, and Pat Sutton for assistance in the field on several surveys. We heartily thank Karen and Brian Johnson for sharing so many Great Egg sightings with us, and for showing such great interest in the study. Capt. Jim Watson took a major interest in the project, and offered great logistical insight and field assistance. Paul Kosten shared many interesting sightings and offered considerable insight and knowledge of both the Great Egg and Mullica Rivers' avian resources. Thank you all; your enthusiasm and love of the rivers and their birds are infectious.

We sincerely thank *all* of the officers and members of the Great Egg Harbor Watershed Association for their interest, support, and great enthusiasm for this winter study. We particularly thank Fred and Julie Akers for the advocacy for the study, and for their knowledge and assistance in the planning and preparation for the field work. We had some fun in the field, too! Thanks, Fred, for nurturing a tiny idea into a landmark and ongoing long-term study, and thanks for your always friendly encouragement and optimistic outlook. Keep up all your good work on the Great Egg.

Finally, we thank the U.S. Department of the Interior's National Park Service, Wild and Scenic Rivers Program for their assistance to the Great Egg Harbor Watershed Association. The award of a Wild and Scenic River Partnership Grant enabled this survey to be conducted and the report compiled. Thank you for your visions of a wild and scenic Great Egg and Southern New Jersey.

It was a pleasure and privilege working with all of you, named and unnamed, on this important study aimed at keeping the Great Egg healthy, protected, and available to the myriad of birds and other wildlife so dependent upon it. We look forward to seeing you in the field.

– Clay Sutton

## LITERATURE CITED / FOR FURTHER REFERENCE

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All comparative Maurice River ornithological studies discussed and / or referenced in this report and the previous 2003-2008 Great Egg Reports have been directed and co-authored by Clay Sutton, either as an independent contractor or formerly as staff ornithologist, Southern Regional Manager and Vice President of Herpetological Associates, Inc., Plant and Wildlife Consultants. (Comparative Cohansey River studies are embedded within the Maurice River annual reports). Principal publications resulting (either wholly or in part) from these studies (and funded or co-funded by Citizens United to Project the Maurice River and its Tributaries, Inc.) are as follows:

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