RAPTORS AND WATERBIRDS

ON THE GREAT EGG HARBOR RIVER

ATLANTIC COUNTY, NJ

WINTER, 2003-2004

An Inaugural Systematic Study of an Important Avian Wintering Area

Submitted to:
The Great Egg Harbor River Watershed Association

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The birds of the Great Egg Harbor River are one of the many Outstandingly Remarkable Resource Values that enabled designation of the river into the National Wild and Scenic Rivers System in 1992. This baseline study provides a starting point for gathering information on the status and trends of raptors and waterbirds in the river corridor to assure their long-term protection.

The Great Egg Harbor Watershed Association (GEHWA) would like to recognize and thank the National Park Service for financial and administrative support of this project. This inventory is just one example of the successful partnership GEHWA maintains with the National Park Service to jointly protect the 129-mile river corridor and watershed.

Special thanks to Clay Sutton, who brought his wealth of bird knowledge and years of professional expertise to the Great Egg Harbor River.

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On the Cover:

An immature Golden Eagle in flight. Photo by Clay Sutton. Golden Eagles are a special winter treat in the southern New Jersey area. While far less common than Bald Eagles in our region, and (because they are a chief predator at the top of the food chain), never numerous, they are none-the-less a hallmark of the Great Egg in fall and winter. Attracted to their preferred wide open spaces found in the watershed, they are found annually in small numbers. The Great Egg is one of the most reliable places in not only New Jersey, but in all of the Northeast and the Mid-Atlantic, to enjoy this dramatic and charismatic winter visitor from the far north and west.

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EXECUTIVE SUMMARY:

In an effort to establish baseline data on raptor and waterbird use of the lower Great Egg Harbor River watershed, information which can be used to determine status and trends in avian use and populations, a systematic study was established during the winter of 2003-2004. Data was gathered at nine sites, for forty-five minutes per site, at a rate of approximately every two weeks during the period from December 8, 2003 to March 18, 2004 in order to assess winter populations and distribution of birds, primarily raptors and waterfowl.

Substantial use of the Great Egg Harbor River system was proven. Systematic sampling determined raptor use of the Great Egg River and estuary to be substantial 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 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.

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.

GREAT EGG HARBOR WINTER RAPTORS AND WATERBIRDS

INTRODUCTION:

The Great Egg Harbor River, including its important Tuckahoe River tributary, is one New Jersey's great river and bay systems. The Great Egg easily rivals the Mullica / Wading River complex, the Maurice River, and the Cohansey River as one of 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 a well-established reputation for substantial wildlife populations and avian-use, surprisingly little systematic ornithological data has been gathered on the Great Egg Harbor or Tuckahoe Rivers. Most published avian use data is anecdotal at best, chance sightings or non-systematic surveys (such as Christmas Bird Counts). Such records hint at exceptional bird use of the area, but unfortunately offer biologists or planners little definitive data for resource management, land use planning options, decision-making, and protection strategies.

Compared to the long-term in-depth studies on the Cumberland County's Maurice River, and to lesser yet substantial data on the Cohansey River, little is known of raptor (hawk and eagle), waterbird, and shorebird use of the Great Egg system. (Herein waterbirds are defined largely as waterfowl - ducks and geese, and wading birds - herons, egrets, and ibis). The Maurice and the Cohansey have been intensively studied when compared to the Great Egg Harbor and Tuckahoe River system. (See: For Further Reference).

In winter, 2003-2004, a systematic survey of Great Egg Harbor River avian resources was initiated. While ornithological findings for the season were important in their own right, most importantly the establishment of a systematic survey methodology, route, and data collection mechanism can allow for comparisons over time. A single season effort does not allow any assessment of long-term trends, yet this one season's study will allow for its inclusion as baseline data for future identical, systematic studies.

GOALS AND OBJECTIVES:

In winter 2003-2004, a winter raptor and waterbird survey was funded and initiated by the Great Egg Harbor Watershed Association. 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 variety and large numbers of wintering birds - birds which have migrated in autumn from regions farther north and west, including high Arctic regions, to feed in 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 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 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, could 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 direct resource protection and acquisition prioritization.

3. Submission of rare, threatened and endangered species records to the Endangered and Nongame Species Project of the DFW, NJDEP. By submission of a copy of this report, including mapping, findings of this study will supplement and aid ENSP's Landscape Project 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 is much anecdotal information on the area's bird life, no systematic raptor or waterbird studies have been carried out in the past on the Great Egg (excepting the DFW's twiceannual waterfowl counts). The lack of Great Egg data on winter raptors, a hallmark feature of South Jersey river systems, is noteworthy in its absence - far less is known about the Great Egg Harbor River than is known about the Maurice, Cohansey, or even the Mullica Rivers.

5. The key objective of the survey efforts was 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 particularly 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:

The winter season raptor and waterbird survey on the Great Egg Harbor River was conducted systematically between the second week of December and the third week of March. Eight surveys were conducted, at roughly the rate of every two weeks during the winter period. It should be noted that the December period 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.

Nine to ten winter surveys had been planned, but due to a combination of snow, ice, and scheduling conflicts, only eight were carried out. The ninth contracted survey was ultimately conducted on May 6, a date which reflects a time of peak spring migration. (This May 6 data is shown and discussed herein, but not included in winter averages computed).

Two observers, Sutton and 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, of course, the two authors' many years of extensive experience in Southern New Jersey and elsewhere. (Clay Sutton's resume is found at the end of this report).

Additional birds, most often raptors, observed *between* official count sites were recorded if and only if the observers were confident it had not been previously 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; an 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 would allow the observers to confidently assess that it had not possibly have been already counted. Due to such constraints, counts of raptors, particularly eagles, are thought to be conservative. As discussed below, the Great Egg basin is a very large area, extremely wide in the lower portions.

The nine count locations, the official 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 all birds counted. For example, the Tuckahoe WMA site, Site 9, southeast of Tuckahoe has three impoundment pools, and not all pools can be counted from the same 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 alternate viewing locations could all birds, particularly waterbirds, be reasonably and reliably tallied.

In order to avoid bias in the sampling technique, the route was reversed 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 Islands 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 alternate sites on Job's Point Road and Jeffers Landing 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 was "the bulkhead" in Mays Landing just south of Route 40.

(6) Lake Lenape. Observations were conducted from the spillway in Mays Landing.

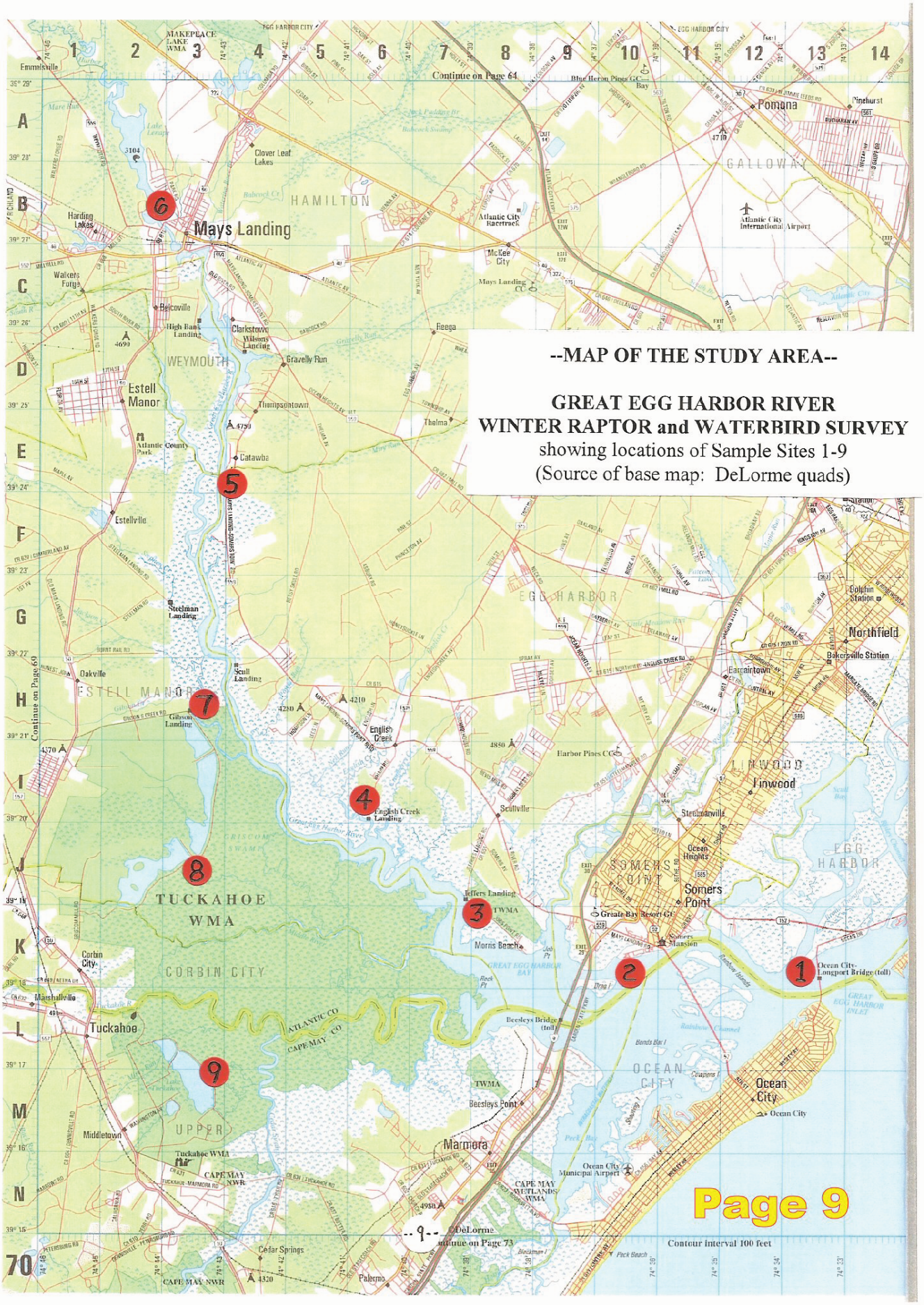
(7) Gibson Landing, at the end of Gibson's Creek Road in the Corbin City unit of Tuckahoe WMA.

(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 all of the various nooks of the 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 Tuckahoe River tributary to the Lower Great Egg Harbor River basin area 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 often out of sight).

The data set will reflect that the final downriver site, Site 1, at the Longport Bridge, was only added on the fourth of the eight winter surveys - when the observers realized that time, logistics, and route (and observed huge numbers of waterfowl down bay) would and should allow an additional site to be added to the route. The first few surveys, while not exploratory as such, allowed us to work out the most efficient route and sample locations.



--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)

FINDINGS:

The results of the Great Egg Harbor River Winter Raptor and Waterbird Survey for winter 2003-2004 are shown in Table 1. Eight full surveys were carried out in the time period between December 8, 2003 and March 18, 2004. A ninth spring survey was carried out on May 6, 2004. (While this data is also shown in Table 1, it is not computed into winter averages shown).

Table 1 shows the average (mean) count for key species, and peak daily high counts are shown in boldface. 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 far better reflects the number present than the mere 248 counted 12 days earlier. Weather, ice, count conditions, and access can greatly vary and alter the results of any given survey. This is why a minimum of 8-10 surveys are required to truly assess bird populations present in the system.

WINTER RAPTORS:

Fourteen species of diurnal raptors were recorded over the course of the survey period representing excellent winter diversity for the mid-Atlantic region. Beyond variety, hawk and eagle numbers were found to be high as well.

Black Vulture

Black Vultures continue to expand their range and numbers in New Jersey, although few wintered in the Great Egg area. A high of 5 was seen on February 16, and an average of 1.5 per visit was counted.

Turkey Vulture

Turkey Vultures are far more common on the river in winter than Black Vultures. Sixty-one were seen on average and a high count of 120 was estimated on March 3, 2004.

Osprey

Osprey are not an expected wintering bird in New Jersey or the mid-Atlantic, yet an Osprey did apparently (unsuccessfully?) try to winter on the Great Egg. An Osprey was seen by veteran observer Paul Kosten (and reported to us) on December 22, and December 31, 2003, once at Mays Landing and once at Scull Landing. It was not recorded on an official survey. The seven Osprey counted on March 18 represent returning spring migrants (breeding birds) to the Great Egg.

Bald Eagle

Bald Eagles are a hallmark of the Great Egg in winter. A high count of 14 was seen on February 1, 2004 when ice, snow, and harsh conditions to the north of New Jersey drove many birds south to our region. An excellent average of 8.25 Bald Eagles were seen on the official surveys. The Great Egg complex is one of the best and most reliable places in southern New Jersey to see Bald Eagles. On the Atlantic *coast* of New Jersey, only the Mullica River/Wading River complex rivals the Great Egg for numbers of wintering eagles. At least three pairs of Bald Eagles nest along the Great Egg and Tuckahoe Rivers: at Lake Lenape, on the Upper Tuckahoe, and near Scull Landing. One of the major highlights of our winter survey was the discovery of a new nesting eagle pair and nest across from Scull Landing on February 1. Nest building and subsequent incubation were noted. (As this report was written, nest success had not yet been relayed to us by the DFW, ENSP.) Yet another nesting pair was suspected on the lower Great Egg: a pair of adult Balds were repeatedly seen near Job Point, on the lower Patcong Creek over the course of the survey. The Great Egg system is a highly important area for both wintering and nesting Bald Eagles in New Jersey.

Golden Eagle

The Great Egg is one of the top areas in New Jersey and the mid-Atlantic to see wintering Golden Eagles (rivaled only by the Mullica River system). Three Goldens were seen during the survey, and all three were thought to be different individuals (two adults and one immature).

Northern Harrier

Northern Harriers or "Marsh Hawks" are another hallmark species of the winter marshes. Harriers wintered in large numbers - 41 were counted on December 8 and an average of 31 was accrued - excellent totals for New Jersey and particularly for the Atlantic coastal marshes.

Sharp-shinned Hawk

This small accipiter was present in low numbers, averaging only .88 per survey. Secretive in winter, probably far more were present than tallied.

Cooper's Hawk

Coopers, although also retiring in winter, were more conspicuous than Sharp-shins along the Great Egg. A peak count of three were tallied on December 8 and an average of 1.13 was achieved.

Northern Goshawk

Goshawks are rare in winter anywhere in New Jersey. An excellent two were seen on Great Egg surveys - one near Tuckahoe on December 19 and one at Drag Island on February 16. Both were immature birds (as would be expected).

Red-shouldered Hawk

Another inconspicuous, shy species in winter, Red-shoulders averaged .88 birds per survey buoyed by the peak four individuals seen on December 8, 2003. Due to widely varying localities, probably at least seven to eight Red-shoulders wintered in the lower Great Egg study area.

Red-tailed Hawk

Red-tails are the most obvious and conspicuous of all our wintering raptors, and were present along the length of the Great Egg in excellent numbers - attracted by the bounty and feeding opportunities of the vast salt marshes. A high of 57 were seen on January 20, and an average of 40 were seen per survey. These are significant numbers for anywhere in New Jersey.

Rough-legged Hawk

Even prior to this study, the Tuckahoe/Corbin City/Great Egg complex was widely known to be virtually the best place to see Rough-legs in New Jersey. This survey only confirmed and corroborated this reputation. 3.38 Rough-legs were seen per survey and an excellent peak of nine were tallied on February 1. Each winter season, the vast marshes of the lower river attract good numbers of this charismatic and irruptive winter visitor from the high Arctic regions.

American Kestrel

None were seen, not even as early spring migrants. The American Kestrel, once common in the general area, has virtually disappeared as a wintering bird throughout southern New Jersey.

Merlin

This small falcon sometimes winters along the coast, but the only one recorded was an early spring migrant on March 18 (a second was seen on the "spring" count on May 6). One "non-survey" Merlin was seen by Sutton on December 18, near the Garden State Parkway bridge so at least one apparently did winter in the region.

Peregrine Falcon

At least three or four Peregrines spent the winter in the Great Egg Region. This includes the nesting pair from the Tuckahoe WMA hack tower "eyrie" (maintained by ENSP) and one or two other Peregrines as well. Peregrines averaged an excellent 1.38 per survey, peaking at three on
February 1. The Somers Point water tower was found to be a popular Peregrine winter roost site.

Short-eared Owl

Crepuscular if not truly diurnal in its habits, the Short-eared Owl is the one owl which can be adequately 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. Six Short-ears were seen during the December 8 survey, all from Site 9. At least another six were known to be on the Corbin City side (Sites 7 and 8) in winter 2003-2004 -- often reported by others, particularly and reliably by Karen and Brian Johnson. A targeted effort (at dusk) would have undoubtedly revealed additional Short-ears, but it can be conservatively reported that at least 12-15 Short-eared Owls wintered on the lower Great Egg. 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:

Great Egg Harbor Bay was found to be an excellent wintering area for waterbirds. Good numbers of Common and Red-throated Loons and Grebes use the lower bay in winter. An unusual three Red-necked Grebes were seen on March 18, a high total for this uncommon species. The Great
Egg Harbor Bay area is unique in southern New Jersey in having a substantial population of wintering Double-crested Cormorants. A high of 61 were tallied on December 19.

Ten 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 mudflats in some numbers - mostly east of the Garden State Parkway Bridge. Over 800 Dunlin were counted on January 20, and at least 30 American Oystercatchers wintered. A targeted shorebird survey in spring and fall on the bay mudflats would undoubtedly document major shorebird use during migration. (The spring survey of May 6 suggested substantial use of the system at that time, and the 15 Whimbrel recorded on that date indicates the potential of significant use of the bay area by this declining, special-concern shorebird).

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

Canada Goose

The average of 322 per survey for the route were augmented by the peak count of 764 on February 1. While some Canadas were "local" geese, the high mid-winter counts included wild migrant Canadas driven to the region by snow and ice conditions farther north.

Brant

Among waterfowl, Brant are a hallmark species of Great Egg Harbor Bay, attracted to the areas rich shallow water bays and mudflats in vast flocks. The peak count of 2,425 on February 1 is regionally significant, and better and more accurately reflects Great Egg usage than the more modest average of985.

American Black Duck

Likewise, the peak of 1,238 Black Ducks better reflects known use than the lower average of365. Rather than driven *to* the region by the harsh conditions of winter 2223-2004, there is some evidence that Black Ducks were driven *from* the area. During most years, Black Ducks and to a lesser degree **Mallards** should use the entire system in substantial numbers in winter.

Northern Pintail

The peak of 497 on March 3 was at an expected time - Pintails are known for spring "staging" in our region in early March on their return journey north. Numbers however were not as high as expected - both Sutton and Dowdell recall seemingly much high numbers in past seasons at Tuckahoe WMA impoundments. It is known that ice conditions effected timing and duration of
Pintail (and Mallard) migration in the region in late winter/early spring 2003-2003.

Green-winged Teal

Teal numbers, although peaking at a quality 1,032 on March 3, also seemed down in comparison to previous recollections for the Tuckahoe WMA area. (Regionally, winter waterfowl numbers were known to be below average on Delaware Bay's Maurice River in 2003-2004; it may well have been a below average winter for many species of ducks on the Great Egg too). Most teal, as well as Pintails, were recorded in Tuckahoe WMA impoundments.

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. In winter 2003-2004, the bay supported a flock of over 7,000 scaup and high numbers of other divers as well.

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. On March 3, a peak of 7,050 scaup were tallied. 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.

Red-breasted Merganser (peak 172) and **Bufflehead** were more scattered but present in high numbers too. The 1,168 Bufflehead counted on February 1 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.

TABLE 1 - GREAT EGG HARBOR WINTER RAPTOR and WATERBIRD SURVEY
WINTER 2003-2004

	12/8/03	12/19/03	1/17/04	1/20/04	2/1/04	2/16/04	3/3/04	3/18/04	5/6/04	Avg.
Red-throated Loon								3	6	
Common Loon	1			5		2	3	**20**	6	
Pied-billed Grebe			1							
Horned Grebe	5	15	3	10	3	2	**28**	13		
Red-necked Grebe						1	1	3		
Northern Gannet								1	10	
Double-cr Cormorant	32	**61**	12	25	11	33	34	59	262	
Great Cormorant				1	1	**3**		2		
Great Blue Heron	13	**22**	11	12	15	7	14	20	2	
Great Egret	1	2							41	
Snowy Egret									47	
Little Blue Heron									24	
Tricolored Heron									1	
Green Heron									1	
Black-cr Nt-Heron									1	
Yellow-cr Nt-Heron									1	
Glossy Ibis									32	
Black Vulture		2		1	2	**5**	2		7	1.5
Turkey Vulture	43	31	59	41	61	52	**120**	81	67	61
Snow Goose		110								
Canada Goose	220	318	26	622	**764**	144	309	173	94	322
Brant	330	773	115	1950	**2425**	503	800	985	664	985
Mute Swan	29	25	88	56	11	16	**89**	82	46	
Tundra Swan		23	12	11	8	1				
Gadwall						13	**27**	6		
American Wigeon						2	**20**			
American Black Duck	158	340	184	248	**1238**	95	441	215	7	365
Mallard	40	75	100	35	**220**	31	61	24	7	73
Blue-winged Teal							2	2	1	
Northern Pintail		7	18		20	44	**497**	258		106
Green-winged Teal	15		4			6	**1032**	316	6	172
Redhead					2					
Ring-necked Duck				1	2			12		
Greater Scaup				**301**	200					
Lesser Scaup					**20**		2			
scaup (sp.)		170		2000	2800	1806	**7050**	3854		
Surf Scoter						2	2	2		
Long-tailed Duck				8	40	24	15	**120**		
Bufflehead	74	272	98	348	**1168**	560	890	327	4	467
Common Goldeneye				6	20	36	**61**	3		
Hooded Merganser	**34**	12	8	8	24	21	32	20		
Common Merganser	7			3	**91**	61	21	32		
Red-br Merganser	15	18	40	47	85	**172**	171	143	3	
Ruddy Duck					3					

NOTE:
(1) Winter Average shown does not include birds recorded on spring date May 6.
(2) Peak Winter Counts are bold faced. Averages shown for key species.

TABLE 1 (continued)
GREAT EGG HARBOR WINTER RAPTOR and WATERBIRD SURVEY
WINTER 2003-2004

	12/8/03	12/19/03	1/17/04	1/20/04	2/1/04	2/16/04	3/3/04	3/18/04	5/6/04	Avg.
Osprey								7	38	
Bald Eagle	9	10	9	10	**14**	4	3	7	4	8.25
Northern Harrier	**41**	37	29	29	25	35	28	23	5	31
Sharp-shinned Hawk	1	1	1		1	1	1	1	3	0.88
Cooper's Hawk	3	1		1	1		2	1	1	1.13
Northern Goshawk		1				1				
Red-shouldered Hawk	**4**	1		1			1			
Red-tailed Hawk	38	24	22	**57**	45	47	42	48	33	40
Rough-legged Hawk	4	3			**9**	6	2	3		3.38
Golden Eagle		1	1		1					0.38
American Kestrel										0
Merlin								1	1	
Peregrine Falcon		1		2	**3**	1	2	2	1	1.38
unidentified raptor		1								
Ring-nk Pheasant	1									
Clapper Rail		1							14	
Virginia Rail				2						
Black-bellied Plover				6					9	
Killdeer		1					**3**			
Am Oystercatcher				**30**		12	4	17	7	
Greater Yellowlegs		9					**12**		15	
Lesser Yellowlegs							1			
Willet									79	
Spotted Sandpiper									3	
Whimbrel									15	
Ruddy Turnstone				10						
Sanderling				10		**75**				
Least Sandpiper									73	
Dunlin	3	142		**801**	208	290		2	380	
Sh-billed Dowitcher									118	
Wilson's Snipe	2	1		1			6			
American Woodcock				1						
Laughing Gull									X	
Ring-billed Gull	150	X	100	250	**750**	X	X	X	X	
Herring Gull	75	X	200	200	**1000**	X	X	X	X	
Gt Bl-backed Gull	25	X	40	50	**250**	X	X	X	X	
Caspian Tern									1	
Common Tern									75	
Forster's Tern									287	
Great Horned Owl		1			**4**			1		
Short-eared Owl	**6**	1			1					
Belted Kingfisher	**6**	3	3				1	2		

NOTE:
(1) Winter Average shown does not include birds recorded on spring date, May 6.
(2) Peak Winter Counts are bold faced. Averages shown for key species.

COMPARISONS TO HISTORICAL DATA:

While there is little published systematic or long-term 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 2003-2004 study to any previously gathered data. By reviewing current findings in a historical perspective we can attempt to assess the completeness and applicability of 2003-2004 results. In short, are the current results indicative of a normal year or perhaps aberrant or unusual in nature? Are they a true picture of expected conditions and resultant status of birds on the river? 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 CBC only covers a portion of the current study area, it is a key portion, and highly central for the purpose of counting raptors - mobile along the river and, when soaring, visible for several miles.

Table 2 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. The area covered (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 valid, some usual information is readily gleaned when comparing Table 1 (2003-2004 results) with Table 2 (the historical record). Canada Geese, as would be expected, are three times as common in the modem 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 region-wide trend. Black Vultures 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 modem era. Only 1.1 was seen on average in the historical years where 8.25 were averaged in 2003-2004. Sharp-shinned Hawk was twice as common historically, and Cooper's twice as common today, also an expected regional trend and change in status. Red-shouldered Hawk numbers are quite the same but Red-tailed Hawks have become far more common today. (Remember that the historical coverage is only about one-third of the total modem study area). Still, on the other hand, Rough-legs were more common historically. The decline of Rough-legs over time is a well-known regional phenomenon - not linked just to the Great Egg. 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 none were seen at all in the 2003-2004 survey efforts. Ruffed Grouse are well known to have declined drasticallyin the region, and the historical record clearly indicatesthis loss when compared to modem-day findings.

It is important to remember that all historical samples were taken in late December. 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 some insight into region wide changes and trends for some key species in the Great Egg drainage.

TABLE 2 - HISTORICAL: 1983 to 1992
GREAT EGG HARBOR RIVER WINTER RAPTOR and WATERBIRD SURVEY

	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	1 i				1a	3i		2i	1a	3a	1.1
Northern Harrier	35	22	20	21	21	32	9	31	14	8	
Sharp-shinned Hawk	1	1		3	2	1	3	3	1	1	1.6
Cooper's Hawk		(1 cw)		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	
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	

COMPARISONS TO OTHER RIVER SYSTEMS:

When attempting to place Great Egg Harbor River avian ecovalues in perspective, it is helpful to review current findings in light of known raptor aIid waterfowl use of other key South Jersey River systems.

One impetus behind the current Great Egg effort was the similar long-term raptor and waterfowl studies which have been carried out on Cumberland County's Maurice River under the auspices of the Citizens United to Protect the Maurice River and its Tributaries, Inc. (CU). CU has contracted similar, ground-breaking studies on the Maurice River for seventeen years, from the winter of 1987-1988 until the present. Though less intensive and long-running, Sutton has also done similar comparative studies on the Cohansey River (on Cumberland County's Delaware Bayshore) for fourteen seasons.

Table 3 shows a comparison of current Great Egg Harbor River raptor studies to the highly similar survey efforts which have been conducted on the Maurice and Cohansey Rivers. Shown are: (1.) Current averages and peak counts for 2003-2004 studies on all three rivers; (2.) The most recent five-year segment averages and peaks for the Maurice River, 1997-2002; and (3.) The longterm (17 year) averages and peak counts for the Maurice River, 1987-2002. Only raptor comparisons are shown, and not waterfowl, as the coastal bays differ so drastically in waterfowl species diversity and compositions as compared to Delaware Bayshore waters-. (For a glaring example, Snow Geese are quite uncommon on all Atlantic coastal marshes, including the Great Egg, and Brant are actually very rare on the Bayshore).

Table 3 is most useful for the purpose of placing the Great Egg Harbor ecovalues in proper regional perspective within New Jersey. The Maurice and Cohansey have been comparatively heavily studied - they are a good long-term baseline by which to compare the (comparatively meager) one-season findings on the Great Egg.

A comparison of the findings on the Maurice River with those of the Great Egg are particularly possible due to the fact that to the greatest extent possible, the Great Egg Study was modeled on the seventeen year Maurice efforts. The two rivers are remarkably similar in length: the tidal Maurice River from the dam at Union Lake to East Point on Delaware Bay is 15.6 linear miles in length (not counting bends in the river). The tidal Great Egg, from the dam at Lake Lenape to the Longport Bridge in the Great Egg Harbor Inlet, is 16.2 linear miles in length - again not counting oxbows and bends. The Cohansey River is somewhat smaller in length; from Sunset Lake to the Delaware Bay at Cohansey Point is 12.3 miles.

The nine survey point, 45 minute observation per point, methodology used in the current Great Egg study is exactly the same as used on the Maurice and Cohansey Rivers. Again, the Great Egg Study was designed at the outset to use methodology which should make results, and the river's ecovalues, directly comparable. Finally and highly significantly, there is no observer bias; Sutton

and Dowdell have done *all* of the Maurice and Cohansey counts over the past seventeen years.

The result is that, at least on the macro-level, the findings on the three rivers can be compared and contrasted, and at least certain gross similarities and differences emerge. While similar in length, the three study areas differ in configuration and acreage. Both the Maurice and Cohansey are far more linear than the Great Egg. The Great Egg is far wider on the lower river, particularly in the Griscom Swamp/Tuckahoe WMA area. Where the avian resources of the Maurice and Cohansey can be surveyed in a linear fashion (that is, by following one side of the river and being able to see across it to count), this cannot be done on the Great Egg. Far wider, distant "treeline birds" cannot be seen and counted on the far bank. This was the reasoning behind adding the final two (the eighth and ninth) sampling sites on the far side (Tuckahoe side) of the river. Otherwise the full basin could not have been surveyed. In short, there are some sizable logistical differences between sampling the Great Egg compared to the other rivers.

None-the-less, we believe final tallies are still strongly comparable, and that it is possible to compare and contrast the three South Jersey river systems. The Great Egg displays similar high wildlife values to the Maurice and Cohansey Rivers. Red-tailed Hawk and Northern Harrier numbers are remarkable similar on all three systems. While Bald Eagles were fewer on the Great Egg in 2003-2004 (compared to record seasons on the Maurice and Cohansey), the numbers found were not only regionally substantial, but similar to the long-term averages for the Maurice River.

The only real problem encountered is in comparing one data set, the Great Egg for one season, to a seventeen year data set (Maurice) and fourteen year data set (Cohansey). The Maurice has been sampled about ten times per season, the Cohansey less so – usually about four to five surveys each winter. With only one season's sampling and data, it is hard to know what constitutes an "average" year for the Great Egg. The comparisons to Great Egg historical data suggests, for example, that Golden Eagle and Rough-legged Hawk were below average in 2003-2004.

Only through the long-term accrual of a larger data set can we truly assess the ultimate avian ecovalues and status and trends, on the Great Egg Harbor River and Bay.

TABLE 3
Great Egg Harbor River, Maurice River, and Cohansey River Comparison

	Great Egg		Maurice		Cohansey		Maurice		Maurice	
	Average 2003-2004	Peak 2003-2004	Average 2003-2004	Peak 2003-2004	Average 2003-2004	Peak 2003-2004	Average 1997-2002 5-yr. mean	Peak 1997-2002 5-yr. mean	Average 1987-2002 15-yr. mean	Peak 1987-2002 15-yr. mean
Black Vulture	1.5	5	22.5	75	3.75	12	13.8	42.6	11.37	33.46
Turkey Vulture	61	120	95.1	142	49.5	76	85.8	145.8	76.73	137.53
Bald Eagle	8.25	14	13.7	28	18.25	20	8.36	15	6.87	12.46
Northern Harrier	31	41	29.3	40	26.25	32	23	32	20.6	29.5
Sharp-sh Hawk	.88	1	2.3	5	2.75	6	2.72	6.6	2.65	8.13
Cooper's Hawk	1.13	3	2.4	5	1.5	5	2.28	4.4	1.69	4.06
Northern Goshawk	-	I	-	-	-	-	na	na	na	na
Red-sh Hawk	.88	4	1.5	8	1.5	3	na	na	na	na
Red-tailed Hawk	40	57	50.4	87	37.25	48	4-1.6	53.4	39.4	52.53
Rough-leg. Hawk	3.38	9	.3	1	.75	2	na	na	na	na
Golden Eagle	.38	1	.3	1	-	-	na	na	na	na
American Kestrel	-	-	.3	2	.5	1	.93	2.6	1.59	3.87
Merlin	-	1	-	-	-	-	na	na	na	na
Peregrine Falcon	1.38	3	.3	2	-	-	na	na	na	na

DISCUSSION:

As detailed above, the systematic surveys carried out in winter 2003-2004 confirmed and corroborated previous anecdotal sightings and information. Focused systematic survey efforts clearly determined the Great Egg Harbor River system to be an important area in New Jersey for wintering raptors, both diversity and numbers, and water birds - principally waterfowl and most notably Brant, American Black Ducks, Scaup, Bufflehead and Red-breasted Merganser.

The single spring survey carried out suggested the Great Egg to be equally important as a spring migration stopover and staging area for a variety of raptors, waterbirds, and shorebirds.

An important aspect of the project was the determination of specific use areas frequented by rare, threatened, and endangered species. Because the area was divided into nine count sites, 10cationa1 or site-specific sightings information was accrued, maintained and documented. During each survey, all rare, threatened and endangered species sighted were mapped (onto the grid system of DeLorme quads) as to where they were sighted and where specific movements were noted.

All threatened and endangered species mapping is included here as Appendix 1. These date and site-specific maps, backed by this report, should suffice to meet DFW, ENSP documentation requirements for RTE reporting. By copy of this report, all documentation and mapping should be forwarded to the ENSP in order to realize the full value of these survey efforts as they relate to RTE species protection and, in turn, appropriate land-use planning.

New Jersey-listed threatened and endangered species encountered during this study included Yellow-crowned Night-Heron, Bald Eagle, Northern Harrier, Northern Goshawk, Red-shouldered Hawk, Peregrine Falcon, Osprey, Cooper's Hawk, and Short-eared Owl.

While the state list sometimes differentiates between *breeding* and *non-breeding* populations, a winter period survey can not often ascertain into which group an individual bird falls. For example, many of our Bald Eagles are true *wintering* birds from farther north, but our *resident* adult eagles, being non-migratory, are therefore present in winter too. This is true also, if to a lesser extent, with all other raptor species. (This is not only generally and widely known, but clearly borne out by our extensive, comparative, Maurice River experience and observations).

In addition, what we normally consider to be "winter" is in fact nesting season for Bald Eagles (our earliest-nesting diurnal raptor), and our late winter period is easily the courtship, mating, and nest-building season for many resident and early arrival hawk species such as Red-tails, Redshoulders, Harriers, Cooper's Hawks, and Peregrines.

DISCUSSION: Effects of weather **on Raptors and Waterbirds**

The winter 2003-2004 was protracted, and the coldest in over a decade. January, 2004 was the coldest since 1985 in Atlantic City, the coldest since 1982 in Philadelphia and the coldest since 1977 in New York City. Accordingly, the Great Egg was frozen to a greater extent, and longer than most recent winters. Even the lower Great Egg Harbor Bay was largely ice-bound during a number of the winter surveys. Expected waterfowl were not found in Tuckahoe WMA impoundments on a number of surveys due to the total freeze-up.

Ice conditions not only drive waterfowl to the coastal region from farther north, but also function to concentrate birds in ice-free reaches on the swifter portions of the river systems. (In the past, our top Maurice River waterfowl counts have occurred during winters with major ice-events on the river. Yet on the Maurice, winter 2003-2004 was an exception to this general rule).

In addition the best winters for Bald Eagles occur in the harshest years, when ice, snow, and cold weather to the north drive eagles south to the coastal and Delaware Bay areas. It is unknown what over-all effects the severe weather of 2003-2004 had on wintering raptors and waterfowl. Observed numbers were regionally significant and judged as exceptional for south Jersey and New Jersey, yet we don't know whether numbers were elevated, average, or even below average if and when compared to long-term averages over time. Maurice River averages and ecovalues have been computed over a seventeen year span; our one season on the Great Egg, though excellent, is comparatively just a snapshot in time.

CONCLUSIONS AND RECOMMENDATIONS:

Targeted and systematic studies on the Great Egg Harbor River in Winter 2003-2004 revealed that substantial numbers and variety of raptors and waterbirds are dependent on the river and bay during the winter season. Regionally significant numbers of raptors and waterfowl were recorded, important baseline data which confirms, corroborates, expands and develops the extent of the avian ecovalues which had been hinted at in previous anecdotal and non-systematic reports.

In comparison and contrast to known avian ecovalues on the Delaware Bayshore's Maurice River and Cohansey River, the Great Egg essentially stacks up well. Raptor and waterfowl numbers are similarly high, significant and substantial when compared to other regional barometers.

Sometimes, however, information and answers only beget more questions. As detailed above, it is inherently difficult to compare one year of data to seventeen (or fourteen). We do not yet know what constitutes an "average" winter on the Great Egg, and in 2003-2004 a few species-dabbling ducks, Rough-legged Hawk, Golden Eagle -- seemed "below average" for the area when measured against the authors' considerable experience in the region. It is also difficult and problematic to compare an Atlantic coastal river, the Great Egg, with tributaries to the Delaware Bay. There are many inherent differences between coastal and bay shore rivers -- the Maurice and Cohansey largely lack the major shallow water bays associated with the Great Egg and Mullica systems. While many apt comparisons can be made, some contrasts remain substantial.

To gain a better picture of the true regional importance and significance of the Great Egg System, the following recommendations are offered and suggested:

1. **The Great Egg Winter Survey should be carried out for at least four more years**, using the same methodology as employed in 2003-2004. A five-year average would be the ideal to create a true baseline of what constitutes a normal "average" year for the Great Egg. A more long-term study would more adequately elucidate the true avian ecovalues of the system. Based on many of the thoughts and comments above, it is our "gut feeling" that expected long-term averages of raptors and waterfowl may well be higher than those numbers observed in 2003-2004.

2. Because of the inherent difficulty indirectly comparing Delaware Bayshore Rivers (the Maurice and Cohansey) to an Atlantic Coastal River (the Great Egg), we urge and **recommend that some comparative studies be undertaken on the Mullica River.** The Mullica River is another system for which only anecdotal and non-standardized ornithological data exists. To learn the Great Egg's true importance on the Atlantic Coast of New Jersey, it would be interesting to compare and contrast its avian ecovalues to those of the Mullica. These two rivers are similar in length and scope; baseline data on the Mullica would be of great value in determining the relative role and importance of the Great Egg. In short, it would offer a better comparison than the Bayshore rivers allow.

We do not believe the Mullica would need to be sampled as often as the Great Egg; if the Great Egg is monitored 8-9 times, a schedule of 4-5 visits on the Mullica could allow for a valid comparison. (The Cohansey River, although sampled over 14 years, has only been visited 3-4 times per season). Of real interest and value, if the Mullica were added to the mix, *all four* of South Jersey's major river systems would have comparative winter bird surveys and data! By comparing and contrasting Great Egg findings to a second similar Atlantic Coastal river system, we would be better able to put Great Egg raptor and waterfowl ecovalues in better regional and statewide perspective.

Nevertheless, even if no additional studies are done, or if baseline studies on the Great Egg are not continued, 2003-2004 surveys have indicated that the Great Egg Harbor River and Bay are truely a "harbor" for substantial and significant populations of raptors and waterfowl in winter, and these concentrations have now been systematically documented to be regionally important and significant in both New Jersey and the entire mid-Atlantic Coastal region. Not surprisingly to those who know the wonders of the winter river, the Great Egg Harbor River has, as expected, proven to be great indeed.

ACKNOWLEDGEMENTS:

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 particularly thank Doyle Dowdell for assistance in the field on several surveys. We heartily thank Karen and Brian Johnson, Paul Kosten, and Karen Williams Kosten 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. Thank you all; your enthusiasm and love of the river and its resources 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 their 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 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 you all, 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.

LITERATURE CITED / FOR FURTHER REFERENCE:

DUIllle, Peter, David Sibley, and Clay Sutton. 1988. *Hawks In Flight -- The Flight Identification of Noth American Migrant Raptors.* Houghton Mifflin Company, Boston.

Clark, William S. and Brian K. Wheeler. 1987. *A Field Guide to Hawks -- North America.* The Peterson Field Guide Series. Houghton Mifflin Company, Boston.

Sibley, David. 2000. *The Sibley Guide to Birds.* Alfred A. Knopf, New York.

Sutton, Clay and Pat Sutton. 1996. *How to Spot Hawks and Eagles.* Houghton Mifflin Company, Boston.

Sutton, Clay, *et al.* 2004. "Identifying and Enjoying Atlantic Coast Seabirds from Shore." *Birding.* Vol. 36; No.3, (June, 2004).

Walsh, Joan, *et al. Birds of New Jersey.* 1999. The New Jersey Audubon Society, Bernardsville, NJ.

Wheeler, Brian K. and William S. Clark. 1995. *A Photographic Guide to North American Raptors.* Academic Press, London.

All comparative Maurice River ornithological studies referenced and discussed throughout this report have been directed and co-authored by Clay Sutton, either as an independent contractor or formerly as staff ornithologist of Herpetological Associates, Inc., Plant and Wildlife Consultants. (Cohansey River studies are embedded within the Maurice River annual reports). Principal publications resulting (either wholly or in part) from these studies (and either funded or co-funded by Citizens United to Protect the Maurice River and its Tributaries, Inc.) are as follows:

Sutton, C. and J. Dowdell. 1987. An Inventory and Habitat Assessment of the Birds of the Manumuskin River Drainage System and Portions of the Adjacent Maurice River, Cumberland County, N.J. Herpetological Associates, Inc.

Sutton, c., 1988. "Wintering Raptors and Waterfowl on the Maurice River." Records of New Jersey Birds, 14(3): 42-51. New Jersey Audubon Society.

Sutton, c., J. Dowdell, et al1988-2003. "Wintering Raptors and Waterfowl on the Maurice River." Yearly progress and summary reports prepared for Citizens United to Protect the Maurice River and its Tributaries. (Fourteen Individual Seasonal Reports.)

Sutton, C., C. Schultz, and P. Kerlinger. 1991. "Autumn Raptor Migration Along New Jersey's Delaware Bayshore - A Hawk Migration Study at East Point, New Jersey." Hawk Migration Studies, 17(1): 58-64. Hawk Migration Association of North America.

Sutton, C., and K. Williams. 1992. Comparative Raptor and Waterfowl Use of Specific Sections of the Maurice River. Report prepared for the Natural Lands Trust, Inc., by Herpetological Assoc., Inc.

Niles, L. and C. Sutton. 1995. Migratory Raptors. Pages 433-440 in L.E. Dove and R.M. Nyman, Editors. Living Resources of the Delaware Estuary. Delaware Estuary Program, USEPA.

Sutton, C. and P. Kerlinger. 1997. "The Delaware Bayshore of New Jersey: A Raptor Migration and Wintering Site of Hemispheric Significance." The Journal of Raptor Re"search, 31(1): 54-58. The Raptor Research Foundation.

Sutton, C., V. Elia, and 1. Dowdell. 1998. "Status and Trends in Wintering Raptors and Waterfowl on the Maurice River: A Ten Year Study." Records of New Jersey Birds, 24(2): 26-35. New Jersey Audubon Society.

Sutton, C., J. Dowdell. 2002. "Wintering Raptors and Waterfowl on the Maurice River" - The Fifteenth Year of an on-going and long-term study. Observed Status and Trends: A Fifteen Year Review 1987-2002. Prep.for Citizens United to Protect the Maurice River and its Tributaries, Inc.

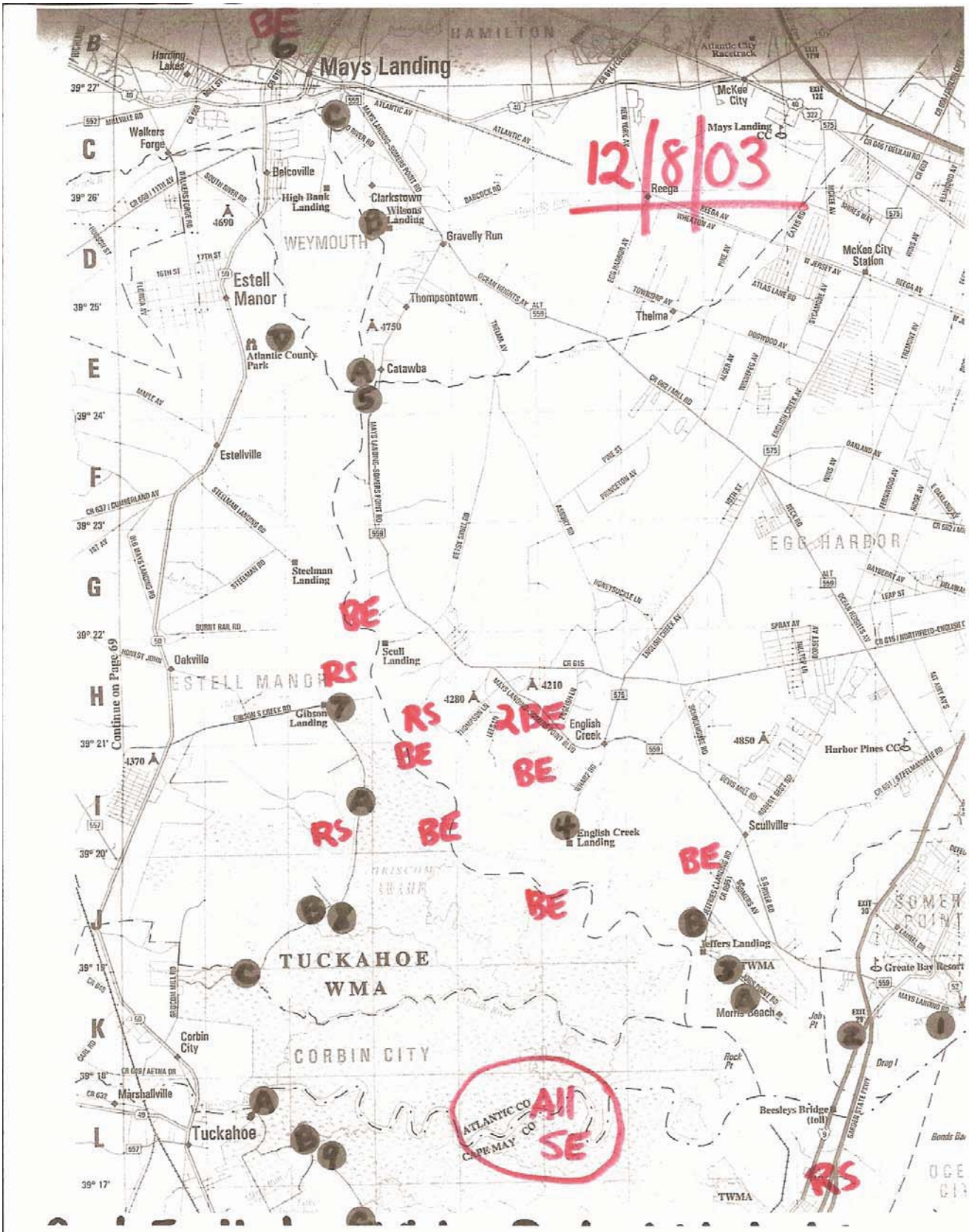
APPENDIX 1.

Rare, Threatened, and Endangered Species Locations

FIELD MAPS

Legend:

Bald Eagle	**(BE)**	**State Endangered, Federally Threatened**
Golden Eagle	**(GE)**	**Species of special interest**
Red Shouldered Hawk	**(RS)**	**State Threatened**
Northern Goshawk	**(NG)**	**State Endangered**
Cooper's Hawk	**(CH)**	**State Threatened**
Peregrine Falcon	**(PF)**	**State Endangered**
Northern Harrier	**(NH)**	**State Endangered**
Adult of species	**(A or AD)**	
Immature of species	**(i)**	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HAMILTON
Harding Lakes
Atlantic City Racetrack
McKee City
Mays Landing CC
Walkers Forge
Belcoville
High Bank Landing
Clarkstown
Wilsons Landing
Reega
WEYMOUTH
Gravelly Run
McKee City Station
Estell Manor
Thompsontown
Thelma
Atlantic County Park
Catawba
Estellville
EGG HARBOR
Steelman Landing
Scull Landing
Oakville
ESTELL MANOR
Gibson Landing
English Creek
Harbor Pines CC
English Creek Landing
Scullville
Jeffers Landing
TWMA
Greate Bay Resort
TUCKAHOE WMA
Morris Beach
Corbin City
CORBIN CITY
Marshallville
Tuckahoe
Beesleys Bridge (toll)
ATLANTIC CO
CAPE MAY CO
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12/8/03
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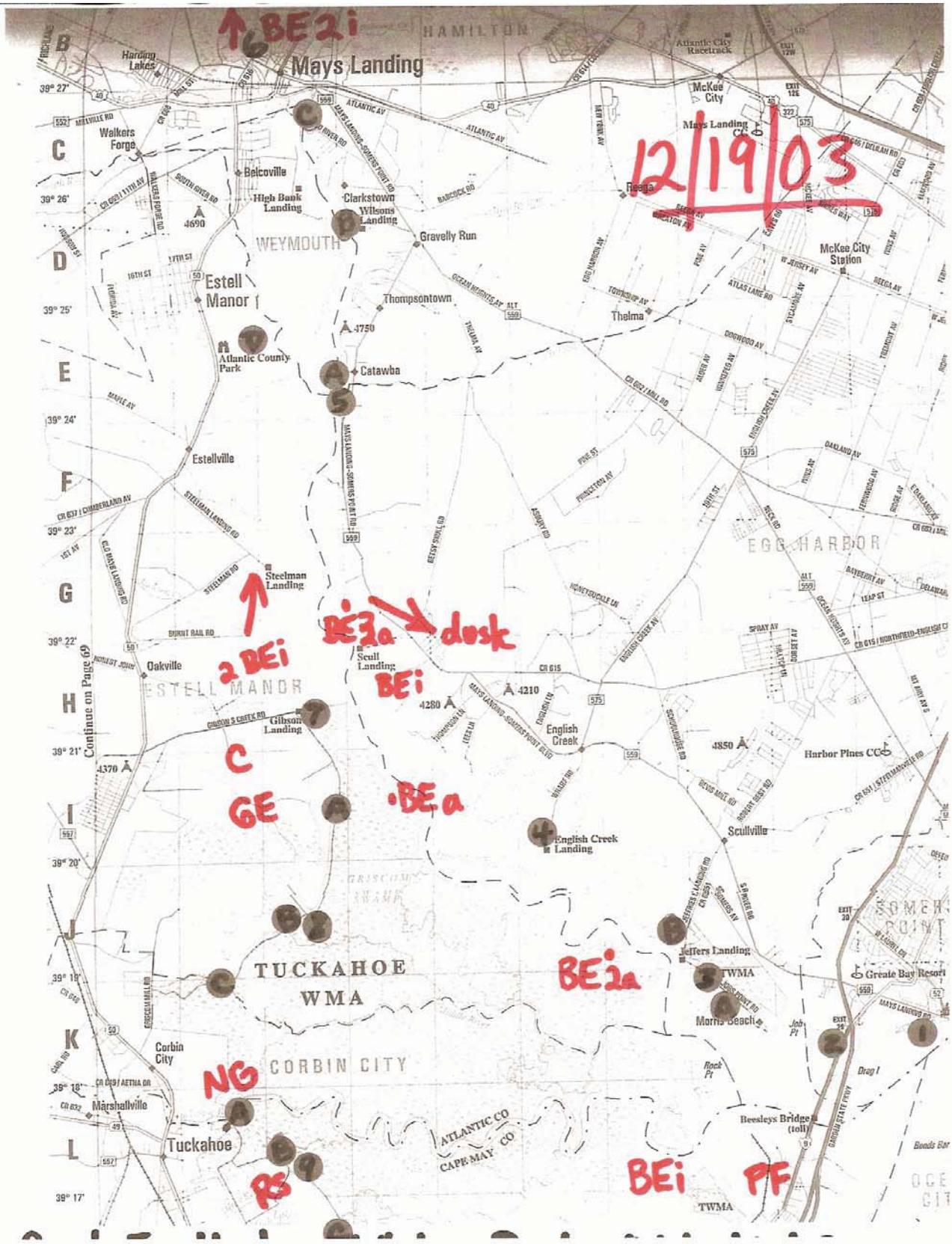
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Mays Landing
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HAMILTON
Harding Lakes
Walkers Forge
Belcoville
High Bank Landing
Clarkstown
Wilsons Landing
Gravelly Run
WEYMOUTH
Estell Manor
Thompsontown
Atlantic County Park
Catawba
Estellville
Steelman Landing
Oakville
ESTELL MANOR
Gibson Landing
Scull Landing
BE2a
desk
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GE
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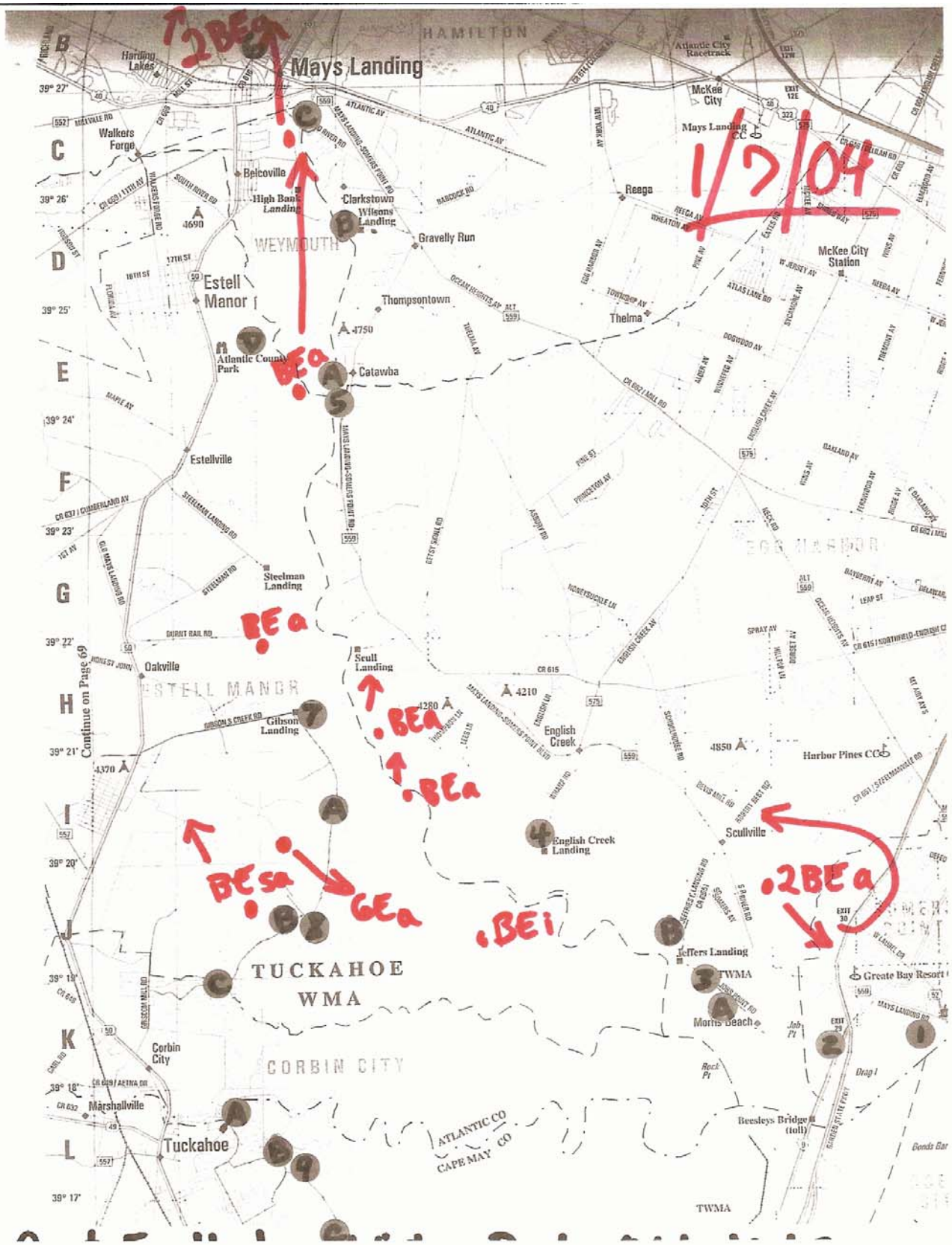
English Creek
English Creek Landing
Scullville
Harbor Pines CC
Atlantic City Racetrack
McKee City
Mays Landing
McKee City Station
Thelma
Reega
EGG HARBOR
Continue on Page 69
TUCKAHOE WMA
Corbin City
CORBIN CITY
Marshallville
Tuckahoe
NG
RS
ATLANTIC CO
CAPE MAY CO
Jeffers Landing
TWMA
Morris Beach
Greate Bay Resort
Beesleys Bridge (toll)
BEi
PF
TWMA


Mays Landing
HAMILTON
Harding Lakes
Walkers Forge
Belcoville
High Bank Landing
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Gravelly Run
WEYMOUTH
Estell Manor
Thompsontown
Atlantic County Park
Catawba
Estellville
Steelman Landing
Oakville
Scull Landing
ESTELL MANOR
Gibson Landing
English Creek
English Creek Landing
Scullville
Harbor Pines CC
Atlantic City Racetrack
McKee City
Mays Landing
Reega
McKee City Station
Thelma
EGG HARBOR
Jeffers Landing
TWMA
Morris Beach
Greate Bay Resort
TUCKAHOE WMA
Corbin City
CORBIN CITY
Marshallville
Tuckahoe
ATLANTIC CO
CAPE MAY CO
Beesleys Bridge (toll)
TWMA
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BEsa
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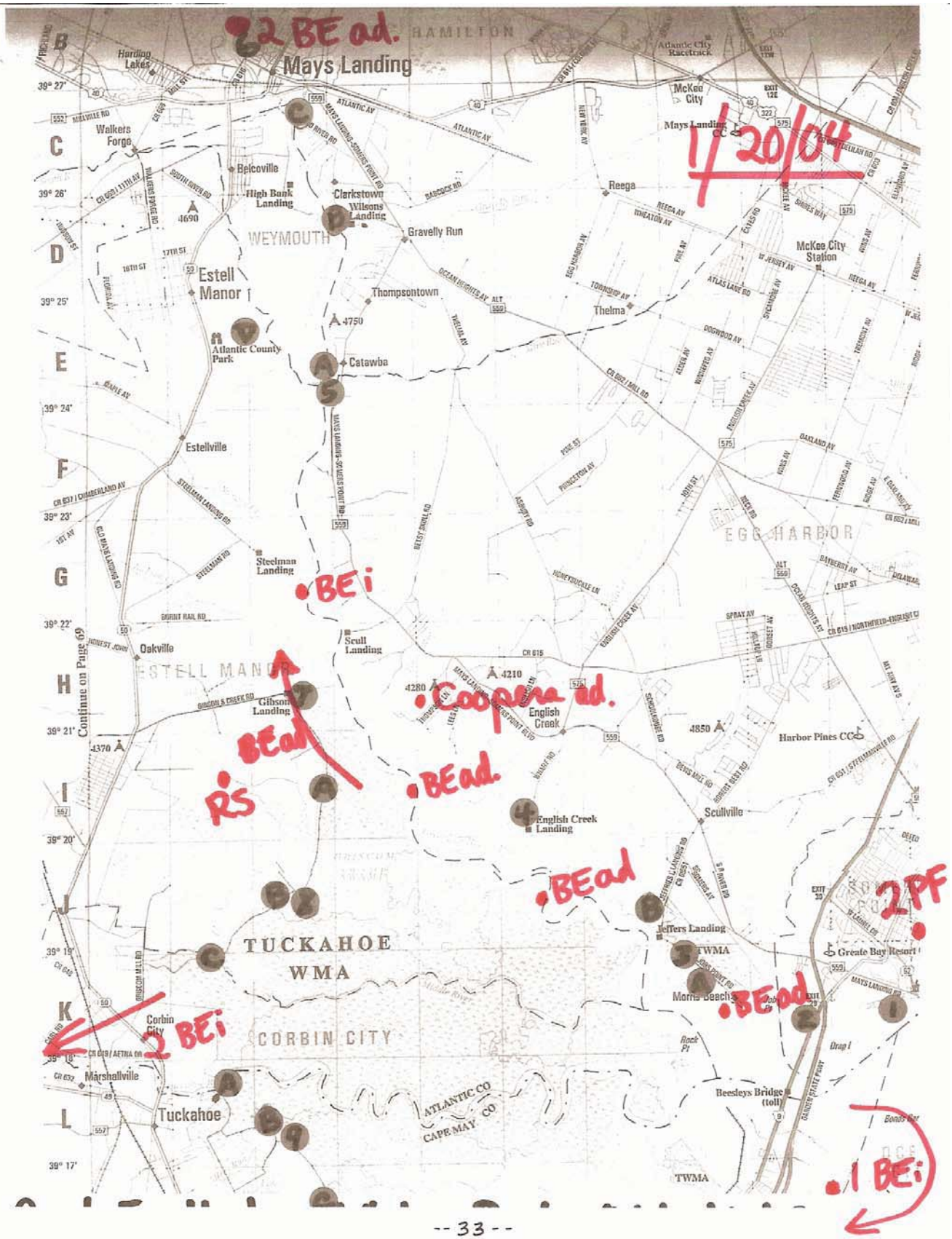
2BEa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Mays Landing
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Harding Lakes
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39° 27'
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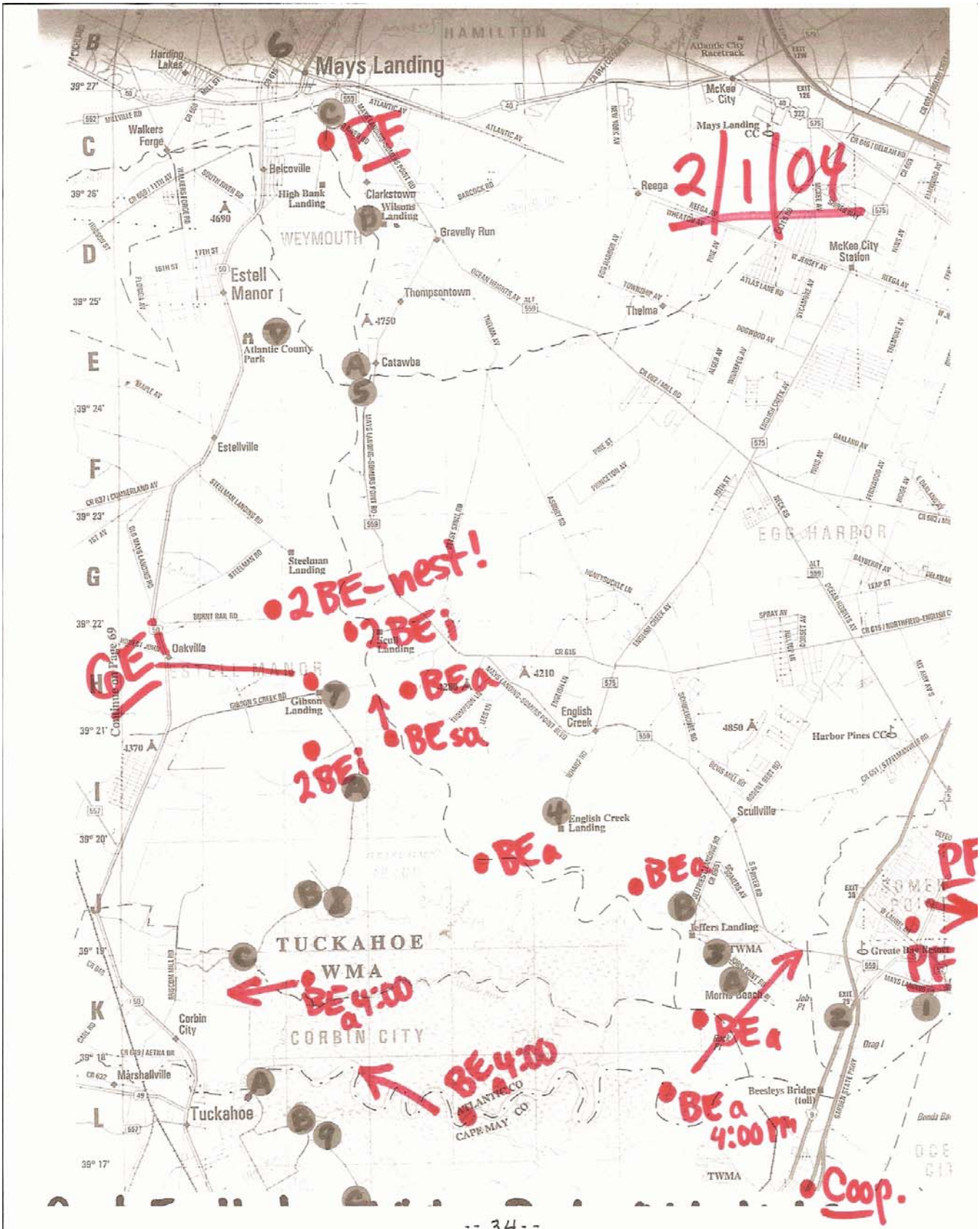
Mays Landing
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Walkers Forge
Belcoville
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Clarkstown
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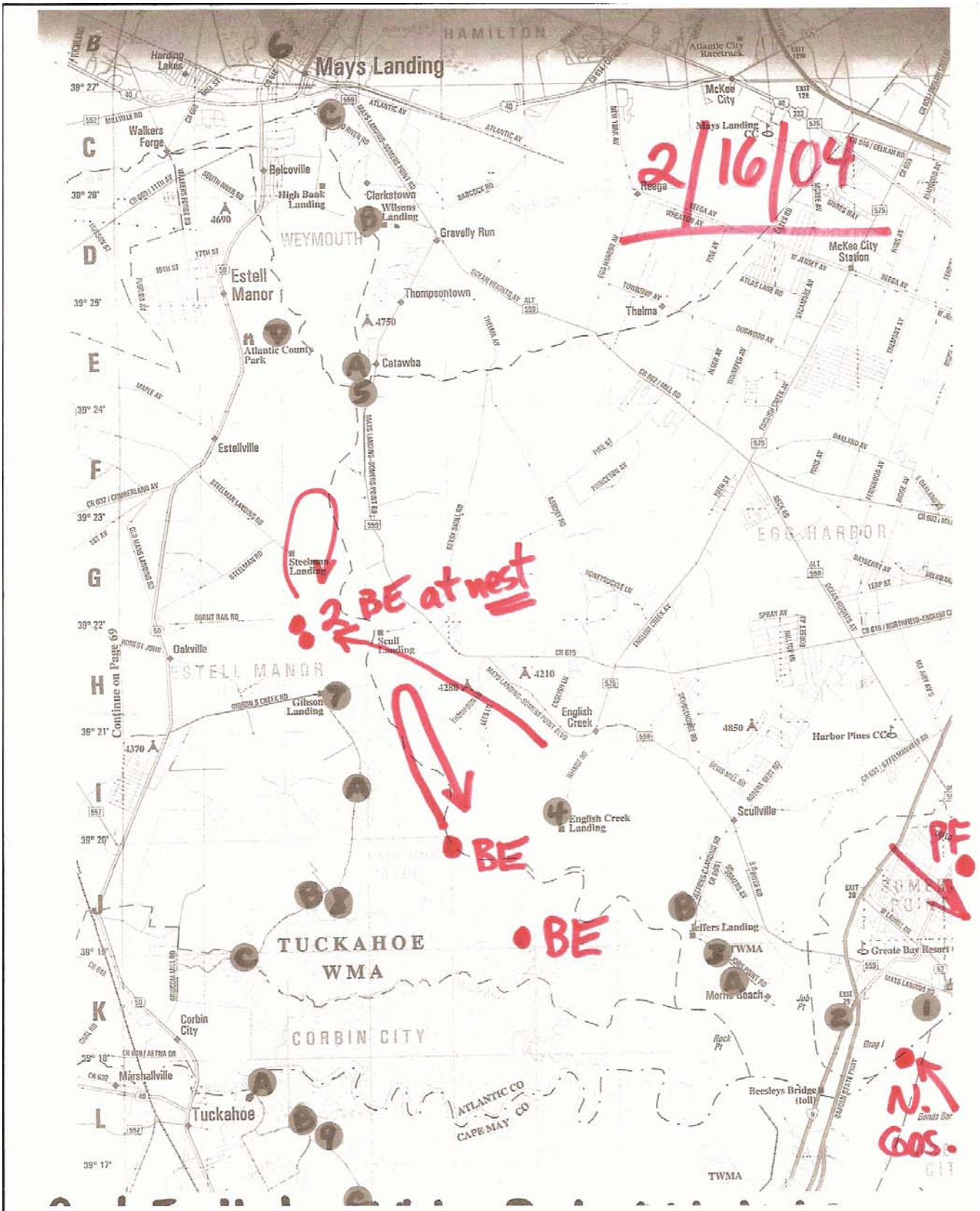
Gibson Landing
English Creek
Harbor Pines CC
English Creek Landing
Scullville
Jeffers Landing
TWMA
Morris Beach
Greate Bay Resort
TUCKAHOE
WMA
CORBIN CITY
Corbin City
Marshallville
Tuckahoe
Beesleys Bridge (toll)
ATLANTIC CO
CAPE MAY CO
Continued on Page 69
PE
2BE-nest!
2BEi
BEa
BEsa
2BEi
BEa
BEa
BE a 4:00
BE 4:00
BEa
BE a 4:00 PM
PE
PE
Coop.


2/16/04
2 BE at nest
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Gravelly Run
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Steelman Landing
Scull Landing
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ESTELL MANOR
Gibson Landing
English Creek
Harbor Pines CC
English Creek Landing
Scullville
EGG HARBOR
Continue on Page 69
TUCKAHOE WMA
Jeffers Landing TWMA
Greate Bay Resort
Morris Beach
Corbin City
CORBIN CITY
Marshallville
Tuckahoe
ATLANTIC CO
CAPE MAY CO
Beesleys Bridge (toll)
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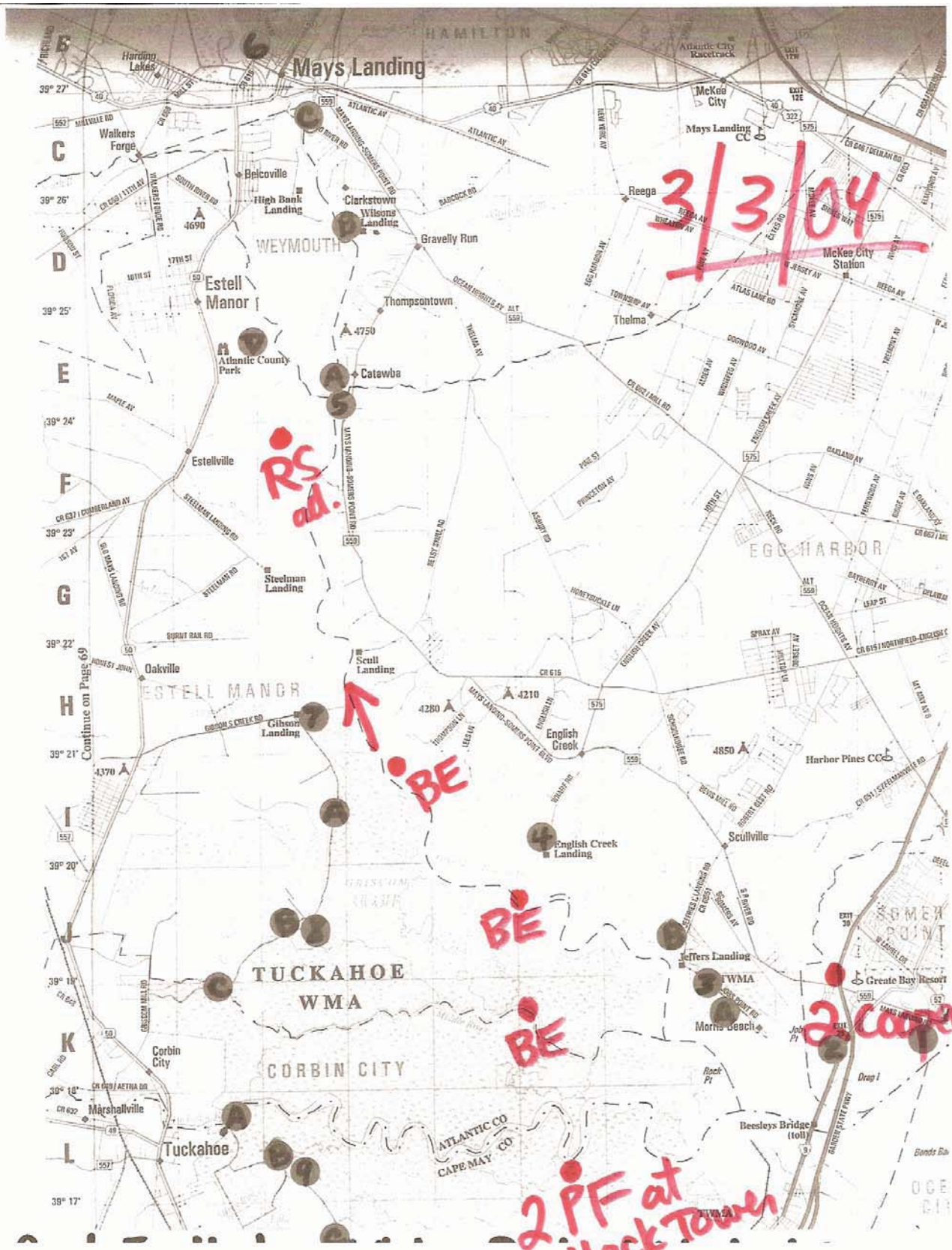
Mays Landing
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Atlantic County Park
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Gibson Landing
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Harbor Pines CC
Mays Landing CC
McKee City
McKee City Station
Reega
Thelma
EGG HARBOR
Jeffers Landing
TWMA
Morris Beach
Greate Bay Resort
TUCKAHOE WMA
CORBIN CITY
Corbin City
Marshallville
Tuckahoe
Beesleys Bridge (toll)
ATLANTIC CO
CAPE MAY CO
Continue on Page 69
3/3/04
RS ad.
BE
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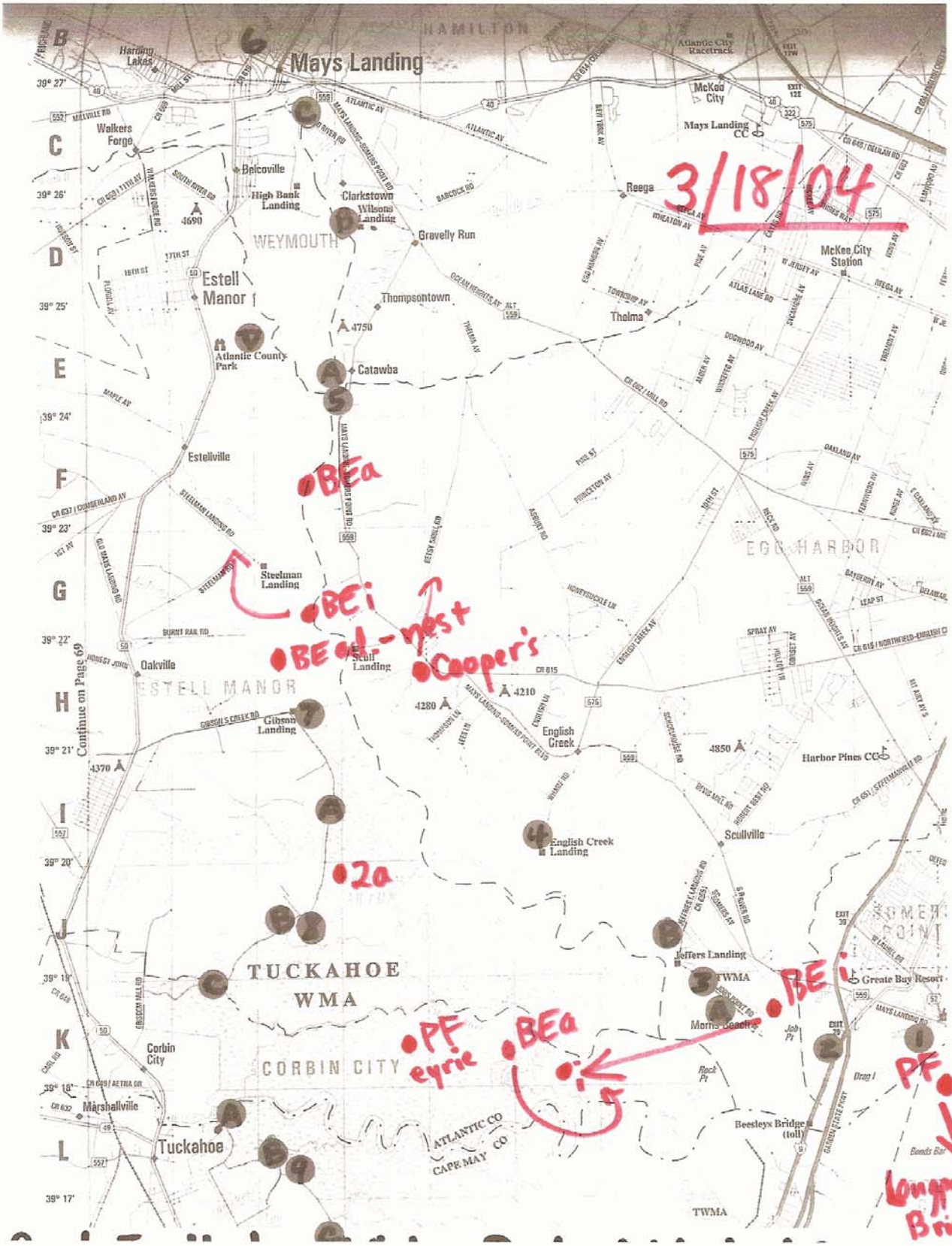
BE
2 PF at Hack Town
2 camps


Mays Landing
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McKee City
Mays Landing CC
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High Bank Landing
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Gravelly Run
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Atlantic County Park
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Cooper's
Scull Landing
Oakville
ESTELL MANOR
Gibson Landing
English Creek
Harbor Pines CC
English Creek Landing
Scullville
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TUCKAHOE WMA
Jeffers Landing
TWMA
Greate Bay Resort
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PF eyrie
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Corbin City
CORBIN CITY
Marshallville
Tuckahoe
ATLANTIC CO
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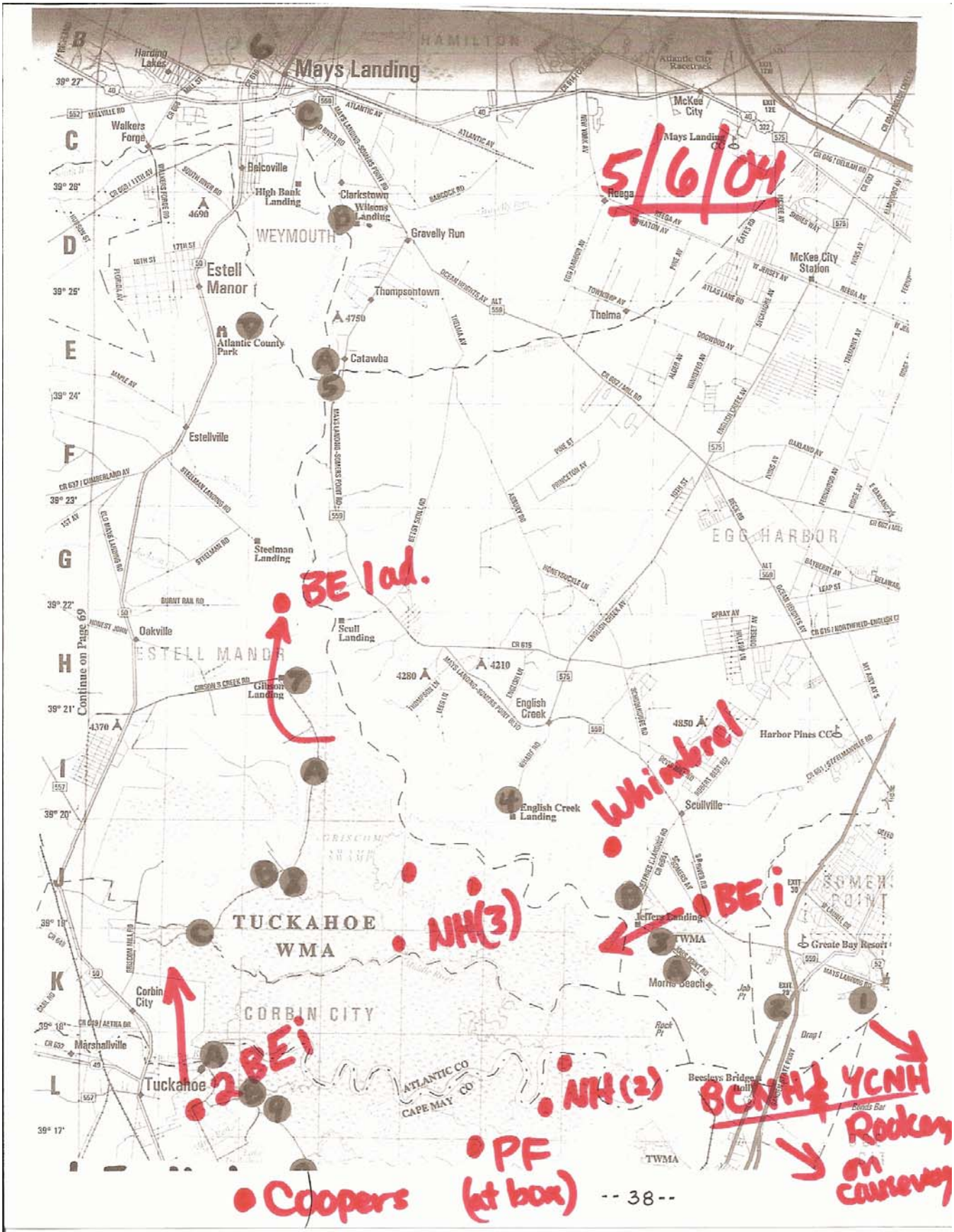
Mays Landing
5/6/04
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NH(3)
2 BEi
NH (2)
BCNH
4 YCNH
Rockaway
on causeway
PF
(at box)
Coopers
Continue on Page 69
TUCKAHOE WMA
CORBIN CITY
ESTELL MANOR
EGG HARBOR
WEYMOUTH
HAMILTON
Estell Manor
Estellville
Atlantic County Park
Catawba
Thompsontown
Gravelly Run
Clarkstown
Wilsons Landing
High Bank Landing
Belcoville
Walkers Forge
Harding Lakes
Oakville
Steelman Landing
Scull Landing
Gibson Landing
English Creek
English Creek Landing
Scullville
Harbor Pines CC
Mays Landing CC
McKee City
McKee City Station
Reega
Thelma
Atlantic City Racetrack
Jeffers Landing
TWMA
Morris Beach
Great Bay Resort
Corbin City
Marshallville
Tuckahoe
Beesleys Bridge
TWMA
ATLANTIC CO
CAPE MAY CO
4690
4750
4370
4280
4210
4850
Rock Pt
Job Pt
Drag I
Bonds Bar
-- 38 --

THE RESUME OF CLAY SUTTON

CLAY SUTTON

CLAY SUTTON P ATRICIA TAYLOR SUTTON 129 BUCKS AVENUE CAPE MAY COURT HOUSE NEW JERSEY 08210 609-465-3397 (PHONE) / 609-465-2273 (FAX) pcsutton@bellatlantic.net

NATURALIST' & BIOLOGIST / WRITER & LECTURER

Natural History Services
Environmental Consulting

. Contract Writing Assignments .
Programs, Workshops
. Nature Tours, Field Trips

. Resource Inventory, RTE Surveys .
Habitat Evaluation, EIS
. Wildlife Photography

BOOKS:

Birding Cumberland -- *A Birder's Guide to Cumberland County, NJ.* Clay Sutton. 2003. Cumberland County Department of Planning and Development and Citizens United to Protect the Maurice River. Millville, NJ. 101 pp.

City Birding. Mark Allison, editor. 2003. Clay Sutton was a contributing author to this collection of essays. Stackpole Books, Mechanicsburg, PA. 181 pp.

Birdwatching. Insight Guides, Judith Dunham, editor. 2000. Clay Sutton was one of 12 contributing authors, writing 4 of 23 chapters. Discovery Travel Adventures, Discovery Communications, Inc., Singapore. 224 pp.

How to Spot Butterflies. Patricia Sutton and Clay Sutton. 1999. Houghton Mifflin Company, Boston, MA. 160 pp.

How to Spot Hawks and Eagles. Clay Sutton and Patricia Sutton. 1996. Houghton Mifflin Company, Boston, MA. 144 pp.

How to Spot an Owl. Patricia Sutton and Clay Sutton. 1994. Houghton Mifflin Company, Boston, MA. 144 pp.

Birds of Prey of North America. Clay Sutton and Richard Walton. 1994. National Audubon Society Pocket Guide Series. Chanticleer Press. Alfred A. Knopf, New York. 192 pp.

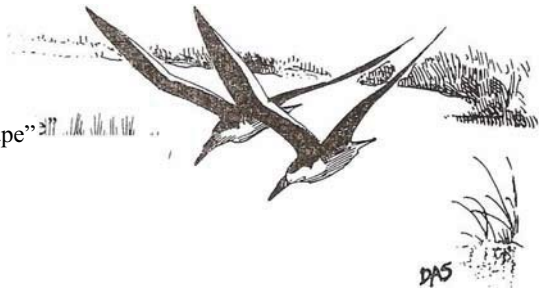
Hawks In Flight, A Field Guide to North American Migrant Raptors. Pete Dunne, David Sibley, and Clay Sutton 1988. Houghton Mifflin Company, Boston. 254 pp. (Second edition in preparation; publication due 2004)

MAGAZINE ARTICLES by Clay and Pat Sutton:

Clay and Pat Sutton are authors of over 50 natural history articles in 14 popular magazines.
SEE ATTACHMENT A.

Clay and Pat Sutton were regular columnists for *WildBird* magazine:
"Beyond Birds" 2001 and 2002. SEE ATTACHMENT B

Clay Sutton is an on-line feature columnist, writing the “Nature of the Cape”
For Cape May Times (www.CapeMayTimes.com)
2001 to presents



PROFESSIONAL EXPERIENCE:

1997-present	Professional Writer, Naturalist, Biologist (self-employed)
1996	Naturalist/Ecologist. The Nature Conservancy, Delaware Bayshore Office, New Jersey Chapter.
1993-1995	Integrator of Scientific Information. Delaware Estuary Program, U.S. Environmental Protection Agency, Region 2. Prepared **DELEP** Characterization Report.
1990-1995	Vice-president. Herpetological Associates, Inc., Wildlife and Environmental Consultants.
1986-1990	Southern Regional Manager. Herpetological Associates, Inc., Wildlife and Environmental Consultants.
1989-1998	Adjunct Instructor. University of Maine at Machias, The Institute For Field Ornithology. Taught continuing education Raptor Field Course/Workshop.
1981-1987	Adjunct Faculty. Stockton State College, Department of Science and Math. Taught avian biology classes in classroom, laboratory, and field.
1982-1986	Environmental Program Administrator (Director, Division of Environmental Services). Cape May County, New Jersey, Dep~ment of Health.
1980-1982	Principal Environmental Planner. Cape May County, New Jersey, Department of Health and Cape May County Planning Board.
1978-1980	Senior Environmental Planner. Cape May County, New Jersey, Department of Health.
1973-1978	Environmental Planner. Cape May County, New Jersey, Department of Health.
1972	Research Assistant (biological field research in tropical Chiapas, Mexico). Dr. John Winklemann, Gettysburg College, Gettysburg, PA.

PROFESSIONAL APPOINTMENTS/AFFILIATIONS:

Advisory Committee, Endangered and Nongame Species Program, Division of Fish and Wildlife. New Jersey Department of Environmental Protection. 2000 to present.

Advisory Council, Hawk Migration Association of North America. 2000 to 2003.

Board of Directors. South Jersey Land Trust, New Jersey. Founding Board Member. 1991 to present

Board of Directors. New Jersey Audubon Society. 1980 to 1986.

Biologist, Ornithology Associate. Curry and Kerlinger, L.L.C., Professional Consulting Group, Cape May, New Jersey. 2001 to present.

Field Ornithology Workshop Instructor. The Institute for Field Ornithology, The American Birding Association. Colorado Springs, Colorado. 2000 to present.

Raptor Workshop Teacher/Associate. Southeastern Arizona Bird Observatory. Bisbee, Arizona. 2000 to present.

Natural History Workshop Coordinator. Cape May Bird Observatory. 1997 to present. Coordinate and teach five week-long workshops each year.

Natural History/Birding Tour Leader. New Jersey Audubon Society. 1990 to present. Co-leader (with Pat Sutton) of 1990 and 1992 trips to Venezuela; 1998, 1999, and 2000 trips to Veracruz, Mexico; 2001 NJAS/VENT (Victor Emanuel Nature Tours) Cruise to the Galapagos Islands on the Lindblad M.S. Polaris.

Birding Tour Leader. Focus on Nature Tours (FONT), Inc. and RAPTOURS, Inc., Wilmington, Delaware. Coleader of annual trips to Sweden and Spain. 1993 to 1997.

Instructor/Leader. The Nikon School of Birding, Cape May, NJ. 1995.

Chosen and named Sole Source Provider, Avian Diversity Studies. Federal Aviation Administration (FAA) Superfund Clean-up Team, Atlantic City International Airport. 2001-2002.

Publications Committee, *Cassinia.* A Journal of Ornithology of Pennsylvania, New Jersey, and Delaware. Delaware Valley Ornithological Club. 1998 (Vol. No. 68) to present.

Priority Species Working Group, The Landscape Project. New Jersey Endangered and Nongame Species Program, NJ Department of Environmental Protection. 1995 to 1997.

Research Associate. Cape May Bird Observatory. 1993 to 1997 (Seabird Migration Monitoring Project).

Regional Coordinator for Cumberland County area for The Atlas to New Jersey Birds Project. New Jersey Audubon Society. 1993 to 1997. Product, *The Birds of New Jersey,* published in 1999.

Bird Status Review Committee. "Delphi Process." New Jersey Endangered and Nongame Species Program, NJ Department of Environmental Protection. 1991 to 1993; 2003 to 2004.

Regional Coordinator for Cape May/Cumberland Counties, The Nature Conservancy's Eastern Heritage Task Force. The Neotropical Songbird Coastal Corridor Study. Contracted by cooperating agencies: Endangered and Nongame Species Program through the Cape May Bird Observatory. July-November, 1991. Published in August 1993.

Referee Committee for Feature Papers. *Hawk Migration Studies,* The Journal of the Hawk Migration Association of North America. 1989 to 1993.

Conference Chairman of the Hawk Migration Association of North America, Conference V. Five Year Hawk Migration Research Conference, Cape May, New Jersey. April 1988.

Appointed Member, Advisory Committee. National Wild and Scenic Rivers System Task Force on the Maurice, Manumuskin, and Manantico Rivers. Appointed by Cumberland County Board of Chosen Freeholders in cooperation with the United States National Park Service. 1988 to 1991.

Environmental Subcommittee Member. The Legislative Advisory Council of the Honorable Edward H. Sabnon, New Jersey Assemblyman. 1988 & 1989.

Chairman, Conservation Committee. Delaware Valley Ornithological Club. 1986 to 1991.

Compiler of Cumberland County, NJ, Christmas Bird Count (and June Bird Count). National Audubon Society; count reports published yearly in *Field Notes* (formerly *American Birds).* 1986 to present.

Mid-Atlantic Regional Editor. *Hawk Migration Studies,* The Journal of the Hawk Migration Association of North America. 1984 to 1993.

Chairman, Conservation Committee. New Jersey Audubon Society. 1981 to 1984.

Advisory Committee. Cape May Bird Observatory. 1981 to 1986.

Preserve Stewardship Committee for the Cape May Migratory Bird Refuge. The Nature Conservancy, New Jersey Chapter. 1981 to 1991.

Appointed Member, Cape May County Enviromnental Council. 1976 to 1986. Chairman, Pine Barrens Subcommittee, 1978 to 1982. Appointed by Cape May County Board of Chosen Freeholders.

Clay Sutton (and/or Clay and Pat Sutton) has been a keynote speaker or presenter at the following major Conferences and Festivals:

New England Hawk Watch Conference, Virginia Hawk Watch Conference, Delaware Ornithological Society, Maryland Ornithological Society, New Jersey Audubon Society Autumn Weekend, New Jersey Audubon Society Spring Weekend, Hawk Migration Association of North America Conference V, Eastern Bird Banding Association, Midwest Birding Symposium, American Birding Association Cape May Convention, The Nature Conservancy's Delaware Chapter, "Eagle Weekend" (Lake Barkley State Resort Park, Kentucky), Braddock Bay Raptor Research (NY), Hawk Ridge (Duluth, MN), Carolina Bird Club, Southwest Wings, Connecticut Audubon Society Eagle Festival, Godwit Days Festival (Arcata, CA), American Birding Association Annual Convention (Beaumont, Texas), Hummer Festival (Rockport, TX), Eastern Shore Birding Festival (Virginia), Salton Sea Birding Festival (CA), Wings Over Wilcox (AZ), etc.

PROFESSIONAL ASSOCIATIONS:

Raptor Research Foundation
Association of Field Ornithologists
Cape May Bird Observatory / New Jersey Audubon Society
American Birding Association
North American Butterfly Association (founding member)
Hawk Migration Association of North America
Delaware Valley Ornithological Club
Carolina Bird Club
American Littoral Society
Coastal Conservation Association

The Wildlife Society, New Jersey Chapter (past member)
Delaware Ornithological Society (past member)
Pennsylvania Society for Ornithology (past member)
Society For Conservation Biology (past member)
New Jersey Association of Enviromnental Consultants (past member)
American Society of Ichthyologists and Herpetologists (past member)

AWARDS AND HONORS:

Certificate of Appreciation and Outstanding Service Award, presented in recognition of long term contributions. Herpetological Associates, Inc. 2002.

Co-recipient (with Patricia Sutton) of an awarded Life Membership in the New Jersey Audubon Society, presented in recognition of outstanding long-term support of NJAS. 1997.

Co-recipient of the Annual Conservation Award, recognizing contributions to the Atlas to New Jersey Birds Project. New Jersey Audubon Society. 1995.

Outstanding Service Award, for furthering raptor migration studies and conservation. Hawk Migration Association of North America. 1995.

Annual Conservation Award (Conservationist of the Year). honoring long-term achievements and commitment to conservation. New Jersey Audubon Society. 1993.

Co-recipient (with Patricia Sutton) of the Julian K. Potter Award, for outstanding contributions to field ornithology in the tri-state area. Delaware Valley Ornithological Club. 1987.

The Mayor's Award for Outstanding Civic Contribution. City of Wildwood (Cape May County), NJ. 1984.

Witmer Stone Award, for excellence in research in the tri-state area. Delaware Valley Ornithological Club. 1982.

Fellow. Delaware Valley Ornithological Club. Elected 1978.

National Honorary Biological Fraternity, Beta Beta Beta. Inducted 1971.

Clay was honored by having *The Wmd Masters. The Lives of North American Birds of Prey,* by Pete Dunne and illustrated by David Sibley, dedicated to him. (Houghton Mifflin Company, 1995)

Clay was profiled by Pete Dunne in "Audufocus," *New Jersey Audubon,* Autumn 1993.

Clay and Pat Sntton are prominently featured in Jack Connor's book, *Season at the Point.* (Atlantic Monthly Press, 1991)

Third Place Overall, *The World Series of Birding.* The Cape May Bird ObservatorylBird Watcher's Digest Team (181 species in Cape May, Cumberland, and Atlantic Counties). 1986. Clay was Team Captain, Cape May Bird Observatory Team in the *"World Series of Birding,"* Annual "Big-Day" 24-hour Bird-A- Thon Fund Raiser of the New Jersey Audubon Society. 1985 to 1993.

LGA Award (highest *World Series of Birding* "Big Day" total for a limited geographic area). CMBO/Wheelabrator Team took top honors in this inaugural category with 170 bird species seen in Cape May County. 1993.

Member of two person team which set an (informal) American Birding Association all time *"One Spot" Record* for most species of birds seen in a single location in a 24 hour period, 118 species from Cape May Point State Park hawkwatch platform. September 26, 1988. (record broken in 1996)

---~

EDUCATION:

M.A. 1973 Rowan University, Glassboro, New Jersey: Environmental Education

B.A. 1971 Gettysburg College, Gettysburg, Pennsylvania: Biology

Continuing Education:

2001 Federal Aviation Administration (FAA). Hazardous Waste Operations and Emergency Response, Health and Safety Training. (OSHA Compliance Class) TRC, Inc., Pomona, NJ.

1988 Northeast Raptor Management Symposium and Workshop: "Raptor Management Techniques." The Institute for Wildlife Research, National Wildlife Federation, Syracuse, NY.

1981 Environmental Health and Law, Cook College, Rutgers University, New Brunswick, NJ. Certified as Registered Environmental Health Specialist. (Also: numerous short courses in land-use planning, pollution monitoring, soils science, hydrology, information processing and management).

1974 Environmental Land Use, Graduate Environmental Science Program, Course taught by Dr. Gary Patterson, Rowan University, Glassboro, NJ

MAJOR PUBLICATIONS:

The Scientific Characterization of the Delaware Estuary. Sutton, Clay, J. o 'Herron, and R. Zappalorti. 1996. Delaware Estuary Program, USEPA. 228 pp.

Cumberland County Delaware Estuary Study. Zappalorti, R., Clay Sutton, and R. Radis. 1993.
Vol. I: Rare, Threatened and Endangered Species Study. 151 pp.
Vol. II: Appendices and Mapping. 270 pp.
Vol. III: Land Use Recommendations. 105 pp.
The products of a USEPA Delaware Estuary Program Grant to Cumberland County;
Cumberland Co. Department of Planning and Development, Bridgeton, NJ.

A Birding Guide to Cumberland County, NJ. Sutton, Clay. 1993. The product of a USEPA Delaware Estuary Program Grant to Cumberland County, Cumberland County Department of Planning and Development. Bridgeton, NJ. 62 pp.

PAPERS:

Clay Sutton is the author or coauthor of over 40 papers and reports in over 25 scientific journals, publications, and conference proceedings. SEE ATTACHMENT C.

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