RAPTORS AND WATERBIRDS

ON THE GREAT EGG HARBOR RIVER

ATLANTIC COUNTY, NJ

WINTER, 2005 - 2006

The Third Season of a Systematic Study
of an Important Avian Wintering Area

and including Key Comparisons to the MULLICA RIVER

and an investigation of
SPRING and FALL MIGRATION
on the Great Egg

Submitted to: The Great Egg Harbor River Watershed Association

By Clay Sutton and James Dowdell

June 15, 2006

The Great Egg Harbor Watershed Association

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The water birds and raptors of the Great Egg Harbor River Watershed 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 continuing study provides information on the status and trends of water birds and raptors in the river corridor to assure their long-term protection and promote the importance of wild places in the American landscape.

The Great Egg Harbor Watershed Association (GEHWA) would like to recognize and thank the National Park Service and Conectiv Energy for their financial support of this stewardship project. Successful public-private partnerships like this are fundamental to the protection of the resources of the Great Egg Harbor and Mullica Rivers.

Special thanks to Clay Sutton and Jim Dowdell, who continue to bring their wealth of bird knowledge and years of professional expertise to the Great Egg Harbor and Mullica Rivers.

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On the Cover

Low level aerial view from the sampling site at Kennedy Park overlooking the Great Egg Harbor Bay, Drag Island, The Garden State Parkway and Route 9, the "Scenic" federally designated areas of the lower Great Egg Harbor River Estuary, and the B.L. England Generating Station at Beasley's Point. (Photograph taken by Steve Eisenhauer in 1992 from a kite).

GREAT EGG HARBOR RAPTORS AND WATERBIRDS

"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 his 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
From *Alexander Wilson: Naturalist and Pioneer,*
on Wilson's 1811 journey to Great Egg Harbor

Background and Introduction:

The Great Egg Harbor River and Bay has long been known for its abundance of birds. Their very name was 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, 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 recounts his adventures there, with birds and much more of nature, in his journal (*Ornithological Biography*, Volume 3, 1835) where he states in 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 direst sandbar, you may see insects of the most brilliant tints."*

The winter of 2005-2006 marked the third season of our "modern" ornithological investigations along the Great Egg Harbor River, continuing studies begun in winter 2003-2004 for the Great Egg Harbor Watershed Association. This report details the findings of the core winter raptor and waterfowl survey, as well as the results of key comparisons to the nearby and seemingly similar Mullica River and estuary. Also presented here are first-time looks at the "shoulder seasons" to the core winter period - the important autumn and spring migration seasons.

Because in-depth and extensive reports were presented following the first two seasons of study, 2005-2006 findings will be covered in an abbreviated format. This is possible due to the fact that this 2005-2006 report is to be posted on the Great Egg Harbor Watershed Association (GEHWA) web site following the previous two study season reports. Methodology and count locations in 2005-2006 were identical to those used during the previous two seasons of study, and goals and objectives of this field research remained the same as well. Accordingly, much of the discussion in the preceding reports remains applicable to this study and these 2005-2006 findings.

Importantly, due to the realities of the budget, this new effort to discover the depth of spring and fall avian migration was enabled by the fact that an in-depth report was not required in this third season - the midpoint of a projected five-year study of the Great Egg. Simply put, man-days that would have been devoted to an elaborate report were instead expended on spring and fall field time. This enabled us to stretch the count well beyond the calendar dates of the previous two years - and to make major discoveries regarding the extent of migration and migration staging on the Great Egg. It is anticipated that this will be the approach taken in 2006-2007 as well, and that a full, major in-depth summary report will be prepared at the conclusion of the planned five year study period.

Findings:

The results of the Great Egg Harbor River Winter Raptor and Waterbird Survey for winter 2005-2006 are shown in **Table 1**. Seven full surveys were carried out in the core time period between December, 2005 and March 14, 2006. In addition, two fall surveys were conducted (one a partial survey - a transect cruise), and four spring counts were carried out.

Table 1 also shows the core season 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 that birds spend on the river over the season (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 1,570 Brant recorded on December 30 far better reflects the number present than the 654 counted 18 days earlier. Weather, ice, cloud conditions, and access, as well; as local movements of birds, can greatly vary and alter the results of any given survey. This is why a minimum of 7-10 surveys are required to truly assess bird populations present in the system.

Wintering raptors - birds of prey - were again found to be a hallmark of the Great Egg Harbor River in winter. Peaks, averages, and temporal distribution can be seen in Table 1 and will be discussed more fully below. Winter waterfowl numbers were again found to be substantial, and by extending the time frame of the surveys into spring, we gained insight into the importance of the Great Egg as a spring migration stopover and staging area for ducks and geese.

Comparison to Previous Season's Findings:

The comparison of the core winter season 2005-2006 findings to the previous two seasons of study are shown in **Table 2**. Shown are peaks and averages for key species for all three seasonal studies. Either despite the mild winter, or even possibly because of it, both Northern Pintail and Green-winged Teal showed new yearly high peak and average counts.

Among raptors, vulture numbers continue to grow in the Great Egg region. Black Vulture posted both a new peak and average and Turkey Vulture showed a new high average. Red-tailed Hawk set a new seasonal average, and Sharp-shinned Hawk, Cooper's Hawk, and Golden Eagle set new average highs. Peregrine Falcon and Bald Eagles were the big winners. Both the peak and average Peregrine count bested the two previous seasons.

Bald Eagle, reflecting known regional trends and DFW findings, posted new seasonal peak and average highs. The 18 Bald Eagles counted on December 12, 2005 is a new high count for the Great Egg. It is interesting that this peak count occurred during a very mild winter. As eagle numbers grow throughout the east, predictably quite a few more than 18 may be seen during the next "harsh" winter when northern birds are pushed to coastal rivers by Canadian and northern U.S. freeze-ups.

Finally, the American Kestrel count is deceiving. Although a new high and average were accrued, a look at Table 1 shows the true story; all 4 birds seen on December 1, 2005 were late southbound migrants. Sadly, no kestrels wintered on the Great Egg, a bleak situation for this precipitously declining raptor.

Comparisons to the Mullica River:

As in 2004-2005, comparative studies were conducted on the Mullica River in an attempt to place the Great Egg findings in a greater regional perspective and context. Mullica River winter raptor and waterfowl daily totals are shown in **Table 3**. Peaks and averages are shown. These findings are shown in comparison to the previous winter season on the Mullica in **Table 4**. A number of new peaks and season average counts were accrued.

The important regional comparison of winter 2005-2006 raptor and waterfowl totals for the Great Egg Harbor River and the Mullica River are shown in **Table 5**. Avian populations of these two major river systems are remarkably similar in many ways. Among waterfowl, Northern Pintail, Green-winged Teal and Bufflehead appear to be far more common on the Great Egg, although the caveats expressed in last year's report (and particularly those regarding Forsythe NWR) need to be kept in mind during any data review.

The Great Egg bested the Mullica in vulture numbers, Sharp-shinned and Cooper's Hawk counts, and in the numbers of Red-tailed Hawks present. Significantly, and in reverse of the previous season, Bald Eagles were found in greater numbers on the Great Egg during the 2005-2006 winter season. Golden Eagles, a hallmark winter species of both rivers, were found more frequently on the Mullica, although the daily peak was the same for both rivers. It is believed that two adult Golden Eagles wintered on the Great Egg, and that three adults and one subadult wintered in the vast Mullica River complex.

Discussion:

There were many highlights to the 2005-2006 Great Egg Harbor River and Mullica River studies. "Year Three" results clearly confirm and corroborate previous findings on these important coastal rivers. The Great Egg Harbor River continues to support regional high and significant populations of raptors and waterfowl in winter.

Record warmth in January helped boost the winter of 2005-2006 to the fifth warmest on record for the continental United States and the east coast was no exception. Eastern Canada and the north-eastern U.S., the "sending district" for many or most of our wintering raptors and waterfowl, experienced an unusually warm winter. It is interesting that 2005-2006 waterfowl totals for some species showed a three-year high, as normally the coldest winters produce the largest number of waterfowl in our region.

So too, it is curious that Great Egg eagle totals were the highest in the three years of study. This may simply be due to regional and continent-wide trends in eagle populations, which are on the rise everywhere. Similarly, record vulture numbers mirror known regional trends. In the Egg Harbor City area, vultures have in some cases been considered as a public nuisance, and both Great Egg and Mullica counts show a continuing upward trend.

Again, because 2005-2006 marked the mid point in a projected 5 year study of Great Egg raptor and waterfowl (and all waterbird) population status and trends, additional in-depth discussion would be premature at this time. See the previous two seasonal reports for a more in-depth discussion of bird groups and species. The 2005-2006 study results clearly support and bolster previous findings on the importance of the Great Egg Harbor River to regional bird populations. Considerable use of the Great Egg by threatened and endangered species was observed and mapped in 2005-2006. Rare, threatened, and endangered species mapping is included here as **Appendix I**. As in the past, these specific site locations are provided for the purpose of meeting the goals of RTE species protection on the river as it relates to the land-use planning process.

An important element of 2005-2006 study efforts was the discovery and documentation that RTE use, as well as substantial raptor and waterbird use in general, extends well beyond the finite core winter season previously investigated.

Autumn and Spring Migration on the Great Egg Harbor River:

Migration season studies in spring and fall showed the Great Egg to be an important raptor and waterfowl area well beyond the winter season period previously studied. Table 1 includes results of coverage in October, November, late March, April, and May.

A transect cruise was done on October 15 as part of a Cape May Bird Observatory/GEHWA natural history outing and tour of the river. The route covered from Somers Point to Mays Landing. The cruise followed a cold front, and considerable raptor migration was noted along the river. 25 Osprey, 8 Bald Eagles, 20 Northern Harriers, 140 Sharp-shinned Hawks, 35 Cooper's Hawks, 15 Red-tailed Hawks, 25 American Kestrel, 3 Merlin and 3 Peregrine Falcons were counted. Almost all of these birds were judged to be migrants. Particularly noteworthy was the discovery that under strong northwest winds Sharp-shins, Cooper's, and Kestrel were reluctant to cross Great Egg Harbor Bay, and virtually all were counted moving west up the treeline. It was only near Mays Landing that birds were eventually noted crossing the now less than half-mile wide river. It is well-known that raptors do not like to cross open water, but to our knowledge, their reluctance to cross Great Egg Harbor Bay and river basin had never been documented and is a new discovery.

The importance of this is that it places new emphasis and importance on the forested buffer to the river -- the upland edges -- as an important migration diversion line and stopover habitat for raptors. Most raptors forage during migration, including opportunistic feeding during actual migratory flight, and the Great Egg forested buffer clearly exhibits heavy use by birds of prey during migration. It is important to note that migration is a particularly perilous and stressful part of the life cycle of raptor species.

Migratory use of the Great Egg was not limited to fall. Spring counts (using the same methodology as the winter counts) discovered waterfowl and waterbird use that extended well beyond the classic winter period. Wading birds (herons, egrets, and ibis) were abundant in spring, and waterfowl use for many species extended through April.

Particularly significant were the numbers of shorebirds found using Great Egg area mudflats, impoundments, and beaches in spring. Over 1,000 shorebirds (1,044) were found along the Great Egg in late May, mostly on mudflats east of the Garden State Parkway bridge. Of note, this is no doubt only a small portion of those probably present; the lower bay is large, viewing distances are great in many cases, and haze and heat waves preclude identification and counting to a great degree. We feel the May counts only hint at the shorebird use and potential of Great Egg Harbor Bay. The techniques and methodology used for raptors and waterfowl do not do shorebirds justice; precise counts of the lower bay could only be achieved by boat and by carrying out transects during the low tide cycle. None-the-less, 2005-2006 studies prove that the Great Egg Estuary is highly important to migratory shorebirds in spring and fall.

Other Sightings of Note:

Extensive coverage of such a significant area as the Great Egg can only lead to a number of "good" sightings. On the October 15 transect, over 4,000 Tree Swallows were estimated in a single flock near the Garden State Parkway. On November 17, an American White Pelican was seen soaring over the river from Jeffers Landing, and a White-faced Ibis was found by Dowdell on the April 16 survey. Both are very uncommon birds in New Jersey -- "Hotline Birds" which can only help to put the Great Egg on the birding map (and the economic ecotourism map too). Also seen on November 17 were an amazing 92 American Oystercatchers on "Malibu Beach" (Longport Sod Banks), a hint at the potential use of this site by shorebirds should this WMA ever eliminate dog use from the beach here.

An immature female Peregrine Falcon with a green color band on the left leg, with a numbered black band above it, and a USGS metal band on the right leg was seen on January 21 at the Tuckahoe River boat launch site; this may be a young Peregrine that fledged from the Tuckahoe artificial eyrie, but this is as yet unknown. On November 17 a dramatic Peregrine hunt was observed at Corbin City WMA when a young Peregrine hit (and injured) a Greater Yellowlegs. The Yellowlegs escaped only by diving into the water (underwater) and eventually swimming to shore. It then hid in *Phragmites* as the Peregrine continued to circle; we don't know if the shorebird survived. It was a dramatic example of the region's use by foraging raptors.

On January 24, 2006, a Sedge Wren was found at the Tuckahoe WMA impoundments, always a good find in New Jersey at any season (and proof of overwintering in the prime high marsh habitat found at Tuckahoe WMA). An "Ipswich Sparrow," the pale race of the Savannah Sparrow, was a good find at the south end of the Longport Bridge on February 21.

Evidence of the gains to be made by extending survey work into spring, on May 2 a "food pass" by an adult male Northern Harrier to an adult female was observed south of the Corbin City dike. Such a classic food pass is a confirmation of breeding for this state-listed endangered raptor. (An adult male Harrier was seen on May 24 as well.) Also on May 2, a young juvenile Bald Eagle was seen in the Gibson's Landing nest; although distance precluded learning if more than one juvenile was present. At "press time," it was yet unknown whether this nest successfully fledged young in 2006. A Yellow-crowned Night Heron (endangered) was seen near the Ocean City Somers Point Causeway rookery on May 24. They no doubt breed there, probably in some numbers.

Lastly, an amazing seven species of terns were recorded during the 2005-2006 survey efforts, highlighted by a juvenile Sandwich Tern found DOR (dead on the road) at the northern foot of the Longport Bridge on December 30. To our knowledge this is by far the "latest" record ever for Sandwich Tern in New Jersey. Sibley, 1997, in *The Birds of Cape May*, lists October 5 as the late date for Sandwich. It was perhaps a record *early* date (previous: March 25), as December 30 followed a warm, southerly wind period (and when a few Forster's Terns had reappeared around Cape May following a complete absence). While a "road-kill" (Hit by a car? Killed by a Peregrine? There are no overhead wires at this location), it was fresh -- very fresh -- proven by the fact that the bird's feather lice were still alive.

The hapless Sandwich Tern was just one more highlight of another year of amazing finds on the Great Egg Harbor River. We look forward to the coming fourth year of this projected five year survey, and plan to spend more time looking at spring and fall migration in addition to the important core season winter studies. Additional data is clearly and dramatically adding additional proof that the Great Egg Harbor is one of the prime avian use areas of Southern New Jersey, and expansion of studies beyond the winter season lead to a conclusion that the Great Egg is indeed a place for all seasons. Ornithological studies on the Great Egg may have begun nearly two centuries ago with the pioneering work of Alexander Wilson, yet there are still discoveries to be made.

We thank the friends, members, and supporters of the Great Egg Harbor Watershed Association for allowing us to be a part of these discoveries. It is because of all of you that there remain discoveries to be made, that there are still places for the unexpected.

We also heartily thank the U.S. Department of the Interior's National Park Service, Wild and Scenic Rivers Program, and Conectiv Energy, for their assistance to the Great Egg Harbor Watershed Association. Thank you for all of your important work in Southern New Jersey, and for your ongoing vision of a wild and scenic Great Egg Harbor River.

In Memoriam

This body of work, and this report, is dedicated in memory of **Belinda Irizarry**.

Belinda Irizarry was the Education and Outreach Coordinator for the Great Egg Harbor Watershed Association. She passed from among us on August 30, 2005.

I did not know Belinda well, yet I knew her well enough to know that this is my loss. I do know that her wide, warm, smile truly brightened any and every meeting room she walked into and every field trip she led or attended. Belinda was one of those rare people you truly looked forward to seeing -- even if the subject event was as depressing as a contested hearing.

Belinda was a fountain of energy, enthusiasm, and even more importantly, spirit. Her positive outlook and attitude were a lesson and inspiration for many, and for me. Thanks, Belinda, from all of us. I did not know Belinda particularly well, yet miss her deeply, as do many. But, also like many, I remember her fondly and often.

I thought of you, Belinda, today as I remembered the gleaming American White Pelican soaring effortlessly and gracefully high over your sparkling river. This study is for you, Belinda.

- Clay Sutton

June 26, 2006

TABLE 1-1
2005 -- 2006 Great Egg Harbor River Raptor and Waterbird Survey

	FALL		WINTER							SPRING				AVG.
DATE	10/15	11/17	12/1	12/12	12/30	1/24	2/9	2/21	3/14	3/30	4/16	5/2	5/24	12/1-3/14
LOONS to CORMORANTS														
Red-throated Loon		2	3	3	7	1	1	**8**	5	1	6	2		
Common Loon		9	15	1	13	9	7	9	**21**	8	10	10		
Pied-billed Grebe		**3**	2							2				
Horned Grebe			1	1	2	2		**10**	6	5				
Northern Gannet			**5**								2			
Double-cr Cormorant	225	133	131	60	127	97	63	96	139	258	491	**1205**	79	
Great Cormorant			**2**	1			1							
Am. White Pelican		1												
BITTERNS to VULTURES														
Least Bittern													1	
Great Blue Heron	8	7	12	13	20	**22**	21	20	12	8	1	6		17
Great Egret	25	1	2	2		1	1	1	2	15	**72**	56	49	
Snowy Egret	50									6	**79**	21	17	
Little Blue Heron										1		1	**2**	
Tricolored Heron											1	3		
Black-cr Nt-Heron				1		1						2		
Yellow-cr Nt-Heron													1	
Glossy Ibis										2	**229**	22	21	
White-faced Ibis											**1**			
Black Vulture	1	9	5	3	11			10	**16**	4	6	5	2	6.4
Turkey Vulture	100	106	54	88	84	106	89	76	105	97	**127**	78	67	86
WATERFOWL														
Snow Goose														0

10/15/05 – Transect Cruise by boat (Somers Point to Mays Landing)
Winter average computed for 12/1/05 to 3/14/06

Due to the mild winter and "early" spring, 3/30/06 was judged to be a spring survey, reflecting observed seasonal status.

TABLE 1-2
2005 – 2006 Great Egg Harbor River Raptor and Waterbird Survey

	FALL		WINTER							SPRING				AVG.
DATE	10/15	11/17	12/1	12/12	12/30	1/24	2/9	2/21	3/14	3/30	4/16	5/2	5/24	12/1-3/14
Canada Goose	4	6	80	234	**474**	455	214	236	176	115	92	80	73	267
Brant		630	849	654	**1570**	1125	480	690	886	516	790	746	32	893
Mute Swan		63	75	77	77	98	117	126	107	109	105	70	89	
Tundra Swan			6	8	19	27	25	24	5					
Wood Duck								6						
Gadwall			2	2		2	10	8	16	24	27			
American Wigeon					3		6	10	28	28	8			
Am Black Duck	105	41	79	138	768	552	613	868	348	233	122	157	13	481
Mallard	3	3	27	53	43	44	97	203	110	37	24	16	26	82
Blue-winged Teal									2	4	12			
Northern Shoveler									17	12	10			
Northern Pintail		6	2	3	78	164	327	644	264	65	8			212
Green-winged Teal		40	65		25	62	251	389	1140	575	308	10		276
Common Teal							1		1					
Ring-necked Duck								3	11					
Greater Scaup					1				1					
Lesser Scaup			1	7	2	1	1	10	2		3			
Scaup (sp.)				150	750	20	30	21	185	20				
Surf Scoter					100	15		15	15	4				
Black Scoter					60	8		3	10					
Scoter (sp.)			6	5	800	125	300	20	60					
Long-tailed Duck		10	11	14	45	48	2	66	58	30				35
Bufflehead		55	83	283	284	815	409	539	511	623	45			418
Com. Goldeneye				3	5	2	2	56	9	6				

10/15/05 – Transect Cruise by boat (Somers Point to Mays Landing)
Winter average computed for 12/1/05 to 3/14/06.

Due to mild winter and early spring, 3/30/06 was judged to be a spring survey, reflecting observed seasonal status.

TABLE 1-3
2005 – 2006 Great Egg Harbor River Raptor and Waterbird Survey

	FALL		WINTER							SPRING				AVG.
DATE	10/15	11/17	12/1	12/12	12/30	1/24	2/9	2/21	3/14	3/30	4/16	5/2	5/24	12/1-3/14
Hooded Merganser			82	1	40	149	102	90	8	2				67
Com. Merganser					6	19	48	41	4	3				17
Red-br Merganser			8	41	46	103	165	124	69	74	117	9		79
Ruddy Duck		33	24	6										
DIURNAL RAPTORS														
Osprey	25	4	1						6	52	73	53	31	
Bald Eagle	8	10	3	18	6	8	13	5	9	5	10	10	5	8.9
Northern Harrier	20	34	16	31	32	37	25	27	19	23	17	8	1	27
Sharp-sh Hawk	140	10	1	5	5	1	1	3	1	1	1			2.4
Cooper's Hawk	35	2		2	3	4	2	3		4	2	4	1	2
Red-sh Hawk		3	1	1					1					0.43
Broad-wing. Hawk											1	1		
Red-tailed Hawk	15	40	21	53	42	59	23	58	37	40	43	40	33	42
Rough-leg. Hawk		1	5	1	5	3	2							2.3
Golden Eagle				1	2									0.43
American Kestrel	25		4								2			
Merlin	3										1			
Peregrine Falcon	3	4	3	4	4	2	2	1	3	1	2	2	3	2.7
GROUSE to SHOREBIRDS														
Ring-nk Pheasant			3	1	1					1				
Wild Turkey						12				1	1			
Clapper Rail									1	1	3	8	7	
Black-bellied Plover		20	11	4							4	7	5	
Semipalmated Plover												1	22	

10/15/05 – Transect Cruise by boat (Somers Point to Mays Landing)
Winter average computed for 12/1/05 to 3/14/06

Due to the mild winter and "early" spring, 3/30/06 was judged to be a spring survey, reflecting observed seasonal status.

TABLE 1-4
2005 – 2006 Great Egg Harbor River Raptor and Waterbird Survey

	FALL		WINTER							SPRING				AVG.
DATE	10/15	11/17	12/1	12/12	12/30	1/24	2/9	2/21	3/14	3/30	4/16	5/2	5/24	12/1-3/14
Killdeer										1	1	1		
Am Oystercatcher		92	50	54	12	40	21	7	16	10	26	14	20	
Greater Yellowlegs		3	1	2		1		4	36	60	195	33	4	
Lesser Yellowlegs		20							2	4	42			
Willet											17	76	40	
Spotted Sandpiper													3	
Whimbrel												60		
Marbled Godwit				1										
Ruddy Turnstone													2	
Red Knot												10		
Sanderling			6	19	27			15			7		210	
Semipalmated Sdp													36	
Western Sandpiper			3											
Least Sandpiper		2								1	10	1	88	
Dunlin		60	249	686	206	6	440	380		26	85		9	
Sh-billed Dowitcher												4	5	
Lg-billed Dowitcher		1												
Wilson's Snipe				2					5		1			
Unid. Shorebird (sp.)													600	
JAEGERS to ALCIDS														
Laughing Gull	x	x								22	x	x	x	
Bonaparte's Gull			1											
Ring-billed Gull	x	x	x	x	x	x	x	x	x	x	x	x		
Herring Gull	x	x	x	x	x	x	x	x	x	x	x	x	x	

10/15/05 – Transect Cruise by boat (Somers Point to Mays Landing)
Winter average computed for 12/1/05 to 3/14/06.

Due to mild winter and "early" spring, 3/30/06 was judged to be a spring survey, reflecting observed seasonal status.

TABLE 1-5
2005 – 2006 Great Egg Harbor River Raptor and Waterbird Survey

	FALL		WINTER							SPRING				AVG.
DATE	10/15	11/17	12/1	12/12	12/30	1/24	2/9	2/21	3/14	3/30	4/16	5/2	5/24	12/1-3/14
Lesser Bl-bkd Gull										1				
Gt Bl-backed Gull	x	x	x	x	x	x	x	x	x	x	x	x	x	
Gull-billed Tern													1	
Caspian Tern											2			
Royal Tern		2												
Sandwich Tern					1									
Common Tern												2	40	
Forster's Tern	100									2	270	215	207	
Least Tern													8	
Black Skimmer													6	
PIGEONS to WOODPECKERS														
E. Screech-Owl								1						
Great Horned Owl						1								
Short-eared Owl			1		1	5								
Belted Kingfisher	2	3	10	2	5	1	2	3	2	1	2		1	

10/15/05 – Transect Cruise by boat (Somers Point to Mays Landing)
Winter average computed for 12/1/05 to 3/14/06.

Due to mild winter and "early" spring, 3/30/06 was judged to be a spring survey, reflecting observed seasonal status.

TABLE 2

Comparison of Winter Raptor / Waterfowl Totals

Great Egg Harbor River

2003-2004, 2004-2005, and 2005-2006

	2003-2004		2004-2005		2005-2006	
	Peak	**Avg.**	**Peak**	**Avg.**	**Peak**	**Avg.**
Canada Goose	764	322	906	359	474	267
Brant	2,425	985	5,440	3,125	1,570	893
Am. Black Duck	1,238	365	1,115	647	868	481
Mallard	220	73	172	74	203	82
Northern Pintail	497	106	484	132	**644**	**212**
Green-winged Teal	1,032	172	859	229	**1,140**	**276**
Bufflehead	1,168	467	599	343	815	418
Red-breasted Merganser	172	86	180	92	165	79
Black Vulture	5	1.5	5	3.2	**16**	**6.4**
Turkey Vulture	120	61	110	76	106	**86**
Bald Eagle	14	8.25	11	7.3	**18**	**8.9**
Northern Harrier	41	31	47	36	37	27
Sharp-shinned Hawk	3	0.88	7	1.7	5	**2.4**
Cooper's Hawk	3	1.13	5	1.9	4	**2.0**
Red-shouldered Hawk	4	0.9	3	0.63	1	.43
Red-tailed Hawk	57	40	56	45	**59**	42
Rough-legged Hawk	9	3.38	10	4.6	5	2.3
Golden Eagle	1	0.38	2	0.8	2	**.43**
Am. Kestrel	0	0	3	0.3	**4**	**.57**
Merlin	1	0.11	2	0.3	0	0
Peregrine Falcon	3	1.38	3	1.6	**4**	**2.7**

New **high counts** (peak and averages) that were set in 2005-2006 are shown in **Bold Face**.

TABLE 3.1
Mullica River
Raptor and Waterbird Survey
2005 – 2006

DATE	12/10	12/20	1/6	1/22	1/25	2/15	3/3	AVG.
LOONS to CORMORANTS								
Red-throated Loon	3	14	3		1	**21**	1	
Common Loon	9	10	9	1	4	**16**	2	
Pied-billed Grebe	1							
Horned Grebe	4	**12**	5		2	1	1	
Red-necked Grebe	1							
Double-cr Cormorant	1		3		1	1	**5**	
BITTERNS to VULTURES								
American Bittern		**2**			1			
Great Blue Heron	**21**	19	16	7	12	15	9	15.3
Great Egret	3	3	3	2	1	1		
Black-cr Nt-Heron	1				1			
Black Vulture	5	**8**	4	4	3	1	2	3.8
Turkey Vulture	48	52	63	20	89	**114**	59	71
WATERFOWL								
Snow Goose	8	50	**1000**	250	506			261
Canada Goose	**980**	590	429	100	201	273	303	463
Brant	**1785**	425	520	100	770	560	176	706
Mute Swan	4		7	4	**8**	**8**	4	
Tundra Swan	**461**	22	4		4			
Wood Duck	4						**24**	
Gadwall	4	**15**	3		1			
Am Black Duck	393	**892**	334	250	328	244	462	442
Mallard	**334**	189	175	25	257	128	234	220
Northern Pintail	9		**20**		4		10	7
Green-winged Teal	2		2		2	1		1
Canvasback		**5**	1					
Ring-necked Duck			4			**28**	6	
Greater Scaup	1	**50**	6		13		**50**	
Lesser Scaup	1		1					
Scaup (sp.)	25	**700**	400				340	
Surf Scoter	1		11		**47**	4	2	
Black Scoter						**2**	1	
Scoter (sp.)	**50**	15	2		20			
Long-tailed Duck	28	154	88		84	35	**155**	91
Bufflehead	87	**365**	352		247	99	227	230

1/22/06 – partial survey, middle section of river only. Not used in average. **Peak Counts** shown in **Bold Face.**

TABLE 3.2
Mullica River
Raptor and Waterbird Survey
2005 -- 2006

DATE	12/10	12/20	1/6	1/22	1/25	2/15	3/3	AVG.
Com. Goldeneye		4	**16**		4		6	
Hooded Merganser	10	11	60	10	96	**131**	90	66
Com. Merganser	6		1		1		**27**	5.8
Red-br Merganser	6	76	70	5	**98**	40	92	64
Ruddy Duck	1				**7**			
DIURNAL RAPTORS								
Bald Eagle	5	9	6	5	**11**	10	7	8
Northern Harrier	35	44	46	20	**48**	28	29	38
Sharp-sh Hawk	1	2	2		2	**4**	2	2.2
Cooper's Hawk	**4**	1		1	2	1		1.3
Red-sh Hawk								0
Red-tailed Hawk	26	**42**	37	12	30	28	38	34
Rough-leg. Hawk	6	9	**12**	3	3	5	2	6.2
Golden Eagle	2	2		2			2	1
American Kestrel								0
Merlin					1			0.17
Peregrine Falcon	3	3	**4**	2	4	1	**4**	3.2
GROUSE to CRANES								
Ring-nk Pheasant	1	1	1					
Clapper Rail			1					
American Coot	1							
SHOREBIRDS								
Black-bellied Plover		2	2		2			
Killdeer		1					1	
Greater Yellowlegs	**8**	1			3	4	1	
Sanderling		**25**					6	
Dunlin	380	**412**	120		52		46	
Wilson's Snipe	1							
JAEGERS to ALCIDS								
Ring-billed Gull	x	x	x	x	x	x	x	
Herring Gull	x	x	x	x	x	x	x	
Gt Bl-backed Gull	x	x	x	x	x	x	x	
PIGEONS to WOODPECKERS								
Barn Owl			1					
Short-eared Owl				1				
Belted Kingfisher	4	4	4	3		3	1	

1/22/06 – partial survey, middle section of river only. Not used in average. **Peak Counts** shown in **Bold Face.**

TABLE 4

Comparison of Winter Raptor and Waterfowl Totals

Mullica River
2004-2005 and 2005-2006

	2004-2005		2005-2006	
	Peak	**Average**	**Peak**	**Average**
Canada Goose	366	174	**980**	**463**
Brant	1,421	793	**1,785**	706
Am. Black Duck	530	312	**892**	**442**
Mallard	365	196	334	**220**
Northern Pintail	-	-	20	7
Green-winged Teal	22	8	2	1
Bufflehead	150	67	**365**	**230**
Red-breasted Merganser	410	116	98	64
Black Vulture	9	5.2	8	3.8
Turkey Vulture	119	70	114	**71**
Bald Eagle	20	10.8	11	8
Northern Harrier	42	31	**48**	**38**
Sharp-shinned Hawk	2	1.2	**4**	**2.2**
Cooper's Hawk	3	1.6	**4**	1.3
Red-shouldered Hawk	3	1.0	0	0
Red-tailed Hawk	39	31	**42**	**34**
Rough-legged Hawk	21	10.6	12	6.2
Golden Eagle	2	0.8	2	**1.0**
Am. Kestrel	2	0.8	0	0
Merlin	2	0.4	1	0.17
Peregrine Falcon	5	4.0	4	3.2

New **high counts** (peak and averages) that were set in 2005-2006 are shown in **Bold Face**.

TABLE 5

Comparison of Winter 2005-2006 Raptor and Waterfowl Totals

Great Egg Harbor River and Mullica River

	Great Egg		Mullica	
	Peak	**Average**	**Peak**	**Average**
Canada Goose	474	267	980	463
Brant	1,570	893	1,785	706
Am. Black Duck	868	481	892	442
Mallard	203	82	334	220
Northern Pintail	644	212	20	7
Green-winged Teal	1,140	276	2	1
Bufflehead	815	418	365	230
Red-breasted Merganser	165	79	98	64
Black Vulture	16	6.4	8	3.8
Turkey Vulture	127	86	114	71
Bald Eagle	18	8.9	11	8
Northern Harrier	37	27	48	38
Sharp-shinned Hawk	5	2.4	4	2.2
Cooper's Hawk	4	2.0	4	1.3
Red-shouldered Hawk	1	.43	0	0
Red-tailed Hawk	59	42	42	34
Rough-legged Hawk	5	2.3	12	6.2
Golden Eagle	2	.43	2	1.0
Am. Kestrel	4	.57	0	0
Merlin	0	0	1	0.17
Peregrine Falcon	4	2.7	4	3.2

Corrigenda:

Following are **Table 2** and **Table 4** from the **previous 2004-2005 Final Report**.
Inadvertently, Red-shouldered Hawk was omitted from these tables (pages 21 and 28 of the May 18, 2005 report). Our apologies.

Corrigenda for 2004-2005 Report
Revised Table with Red-shouldered Hawk added

TABLE 2

Comparison of Winter Raptor/Waterfowl Totals

Great Egg Harbor River
2003-2004 and 2004-2005

	2003-2004		2004-2005	
	Peak	**Avg.**	**Peak**	**Avg.**
Canada Goose	764	322	906	359
Brant	2,425	985	5,440	3,125
Am. Black Duck	1,238	365	1,115	647
Mallard	220	73	172	74
Northern Pintail	497	106	484	132
Green-winged Teal	1,032	172	859	229
Bufflehead	1,168	467	599	343
Red-breasted Merganser	172	86	180	92
Black Vulture	5	1.5	5	3.2
Turkey Vulture	120	61	110	76
Bald Eagle	14	8.25	11	7.3
Northern Harrier	41	31	47	36
Sharp-shinned Hawk	3	0.88	7	1.7
Cooper's Hawk	3	1.13	5	1.9
Red-shouldered Hawk	4	0.9	3	0.63
Red-tailed Hawk	57	40	56	45
Rough-legged Hawk	9	3.38	10	4.6
Golden Eagle	1	0.38	2	0.8
Am. Kestrel	0	0	3	0.3
Merlin	1	0.11	2	0.3
Peregrine Falcon	3	1.38	3	1.6

Corrigenda for 2004-2005 Report
Revised Table with Red-shouldered Hawk added

TABLE 4

Comparison of Winter 2004-2005 Raptor and Waterfowl Totals

Great Egg Harbor River and Mullica River

	Great Egg		Mullica	
	Peak	**Average**	**Peak**	**Average**
Canada Goose	906	359	366	174
Brant	5,440	3,125	1,421	793
Am. Black Duck	1,115	647	530	312
Mallard	172	74	365	196
Northern Pintail	484	132	-	-
Green-winged Teal	859	229	22	8
Bufflehead	599	343	150	67
Red-breasted Merganser	180	92	410	116
Black Vulture	5	3.2	9	5.2
Turkey Vulture	110	76	119	70
Bald Eagle	11	7.3	20	10.8
Northern Harrier	47	36	42	31
Sharp-shinned Hawk	7	1.7	2	1.2
Cooper's Hawk	5	1.9	3	1.6
Red-shouldered Hawk	3	0.63	3	1.0
Red-tailed Hawk	56	45	39	31
Rough-legged Hawk	10	4.6	21	10.6
Golden Eagle	2	0.8	2	0.8
Am. Kestrel	3	0.3	2	0.8
Merlin	2	0.3	2	0.4
Peregrine Falcon	3	1.6	5	4.0

APPENDIX 1.

GREAT EGG HARBOR RIVER

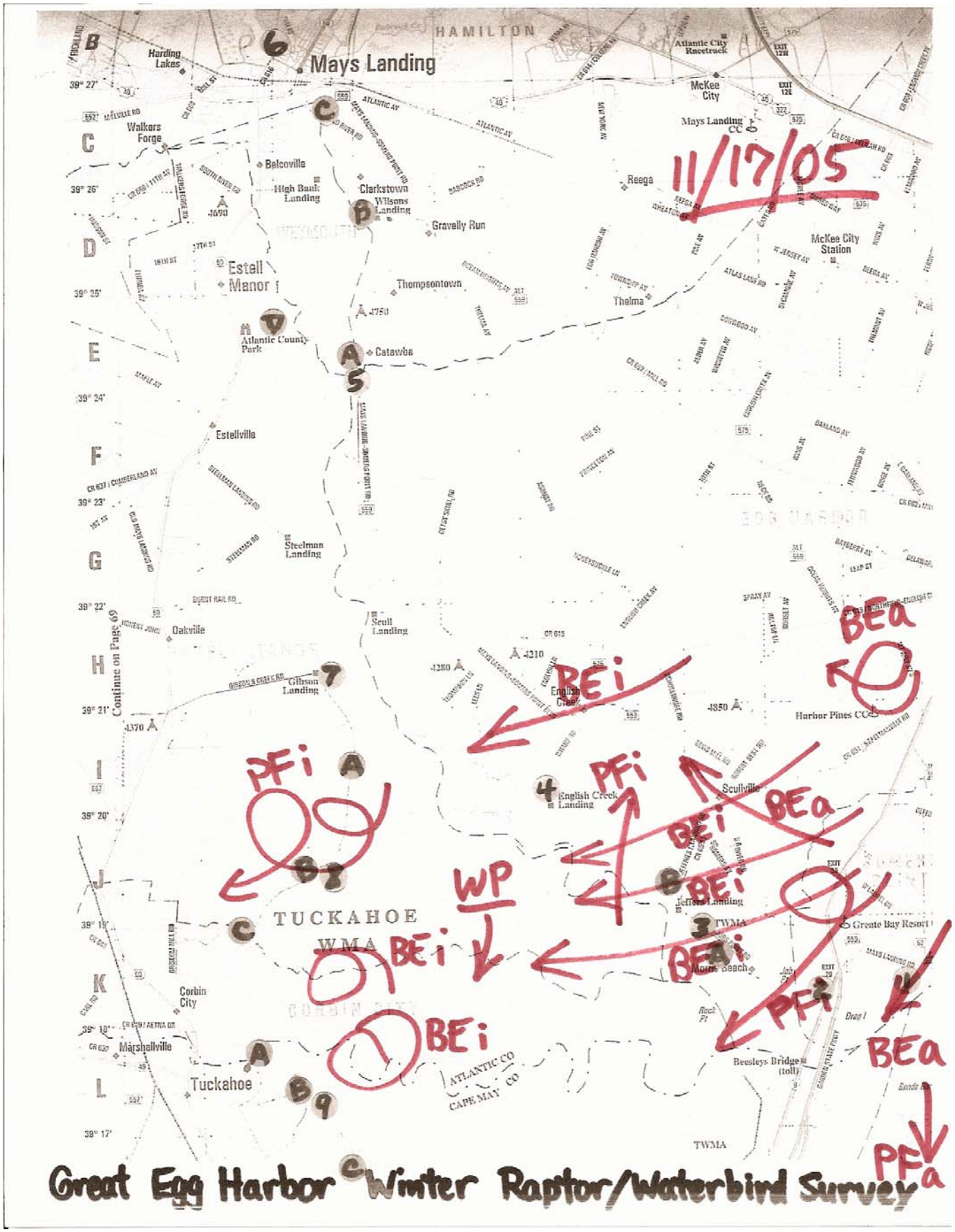
Rare, Threatened, and Endangered Species Locations

FIELD MAPS

Winter 2005-2006

KEY:

BE	**Bald Eagle**
NH	**Northern Harrier**
CP	**Cooper's Hawk (also: Coop.)**
NG	**Northern Goshawk**
RS	**Red-shouldered Hawk**
GE	**Golden Eagle**
PG	**Peregrine Falcon**
SE	**Short-eared Owl**
AB	**American Bittern**
RH	**Red-headed Woodpecker**
a	**Adult**
i	**Immature**


HAMILTON
Mays Landing
Harding Lakes
Atlantic City Racetrack
McKee City
Walkers Forge
Belcoville
High Bank Landing
Clarkstown
Wilsons Landing
Gravelly Run
Reega
Mays Landing CC
11/17/05
McKee City Station
Estell Manor
Thompsontown
Thelma
Atlantic County Park
Catawba
Estellville
Steelman Landing
Oakville
Scull Landing
Gibson Landing
English Creek
English Creek Landing
Harbor Pines CC
Scullville
Jeffers Landing
TWMA
Great Bay Resort
North Beach
TUCKAHOE WMA
Corbin City
Marshallville
Tuckahoe
ATLANTIC CO
CAPE MAY CO
Beesleys Bridge (toll)
Rock Pt
Drag I
TWMA
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BEa
BEi
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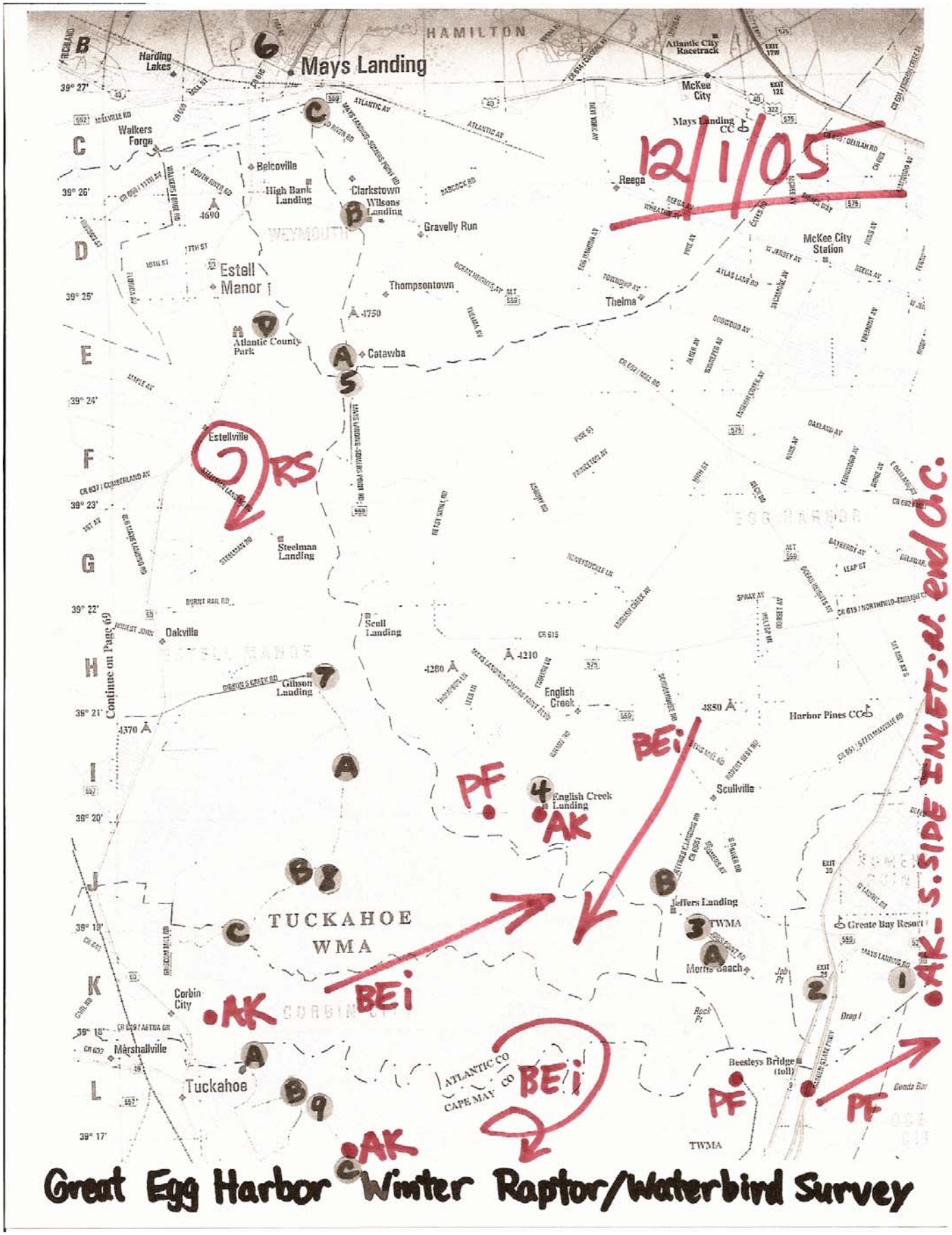
PFa
Great Egg Harbor Winter Raptor/Waterbird Survey


Great Egg Harbor Winter Raptor/Waterbird Survey
12/1/05
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Harding Lakes
Walkers Forge
Belcoville
High Bank Landing
Clarkstown
Wilsons Landing
Gravelly Run
Estell Manor
Atlantic County Park
Catawba
Estellville
Steelman Landing
Oakville
Scull Landing
Gibson Landing
English Creek
English Creek Landing
Scullville
Harbor Pines CC
Jeffers Landing
TWMA
Greate Bay Resort
Morris Beach
Beesleys Bridge (toll)
TUCKAHOE WMA
Corbin City
Marshallville
Tuckahoe
Mays Landing CC
McKee City
McKee City Station
Reega
Thelma
Thompsontown
Atlantic City Racetrack
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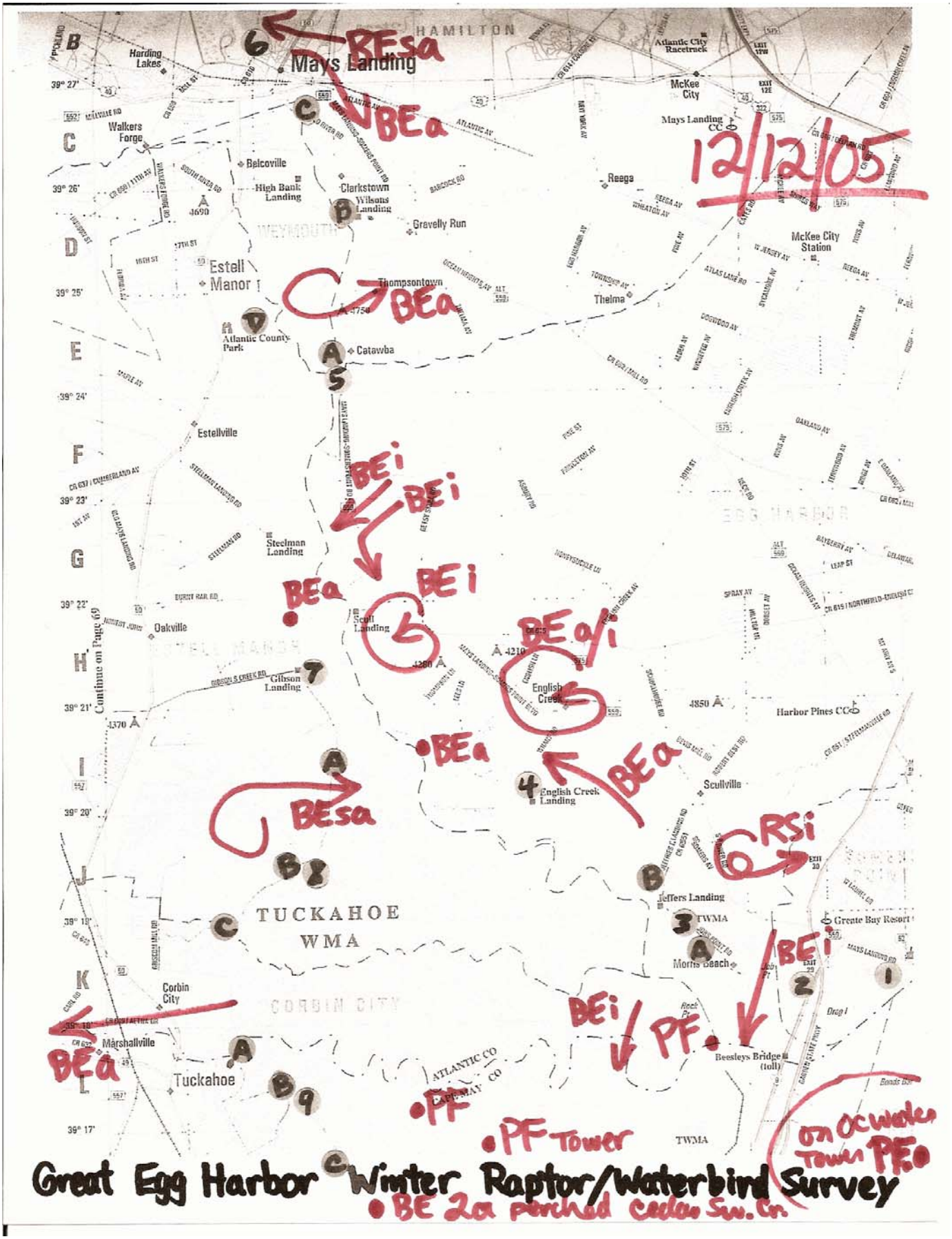
Great Egg Harbor Winter Raptor/Waterbird Survey
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Walkers Forge
Belcoville
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Estell Manor
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Atlantic County Park
Catawba
Estellville
Steelman Landing
Oakville
Gibson Landing
Scull Landing
English Creek
English Creek Landing
Scullville
Jeffers Landing
Harbor Pines CC
Mays Landing CC
McKee City
McKee City Station
Atlantic City Racetrack
Reega
Thelma
Atlantic City Racetrack
Grente Bay Resort
Morris Beach
Beesleys Bridge (toll)
TUCKAHOE WMA
TWMA
Corbin City
Marshallville
Tuckahoe
ATLANTIC CO
CAPE MAY CO
HAMILTON
WEYMOUTH
EGG HARBOR
CORBIN CITY
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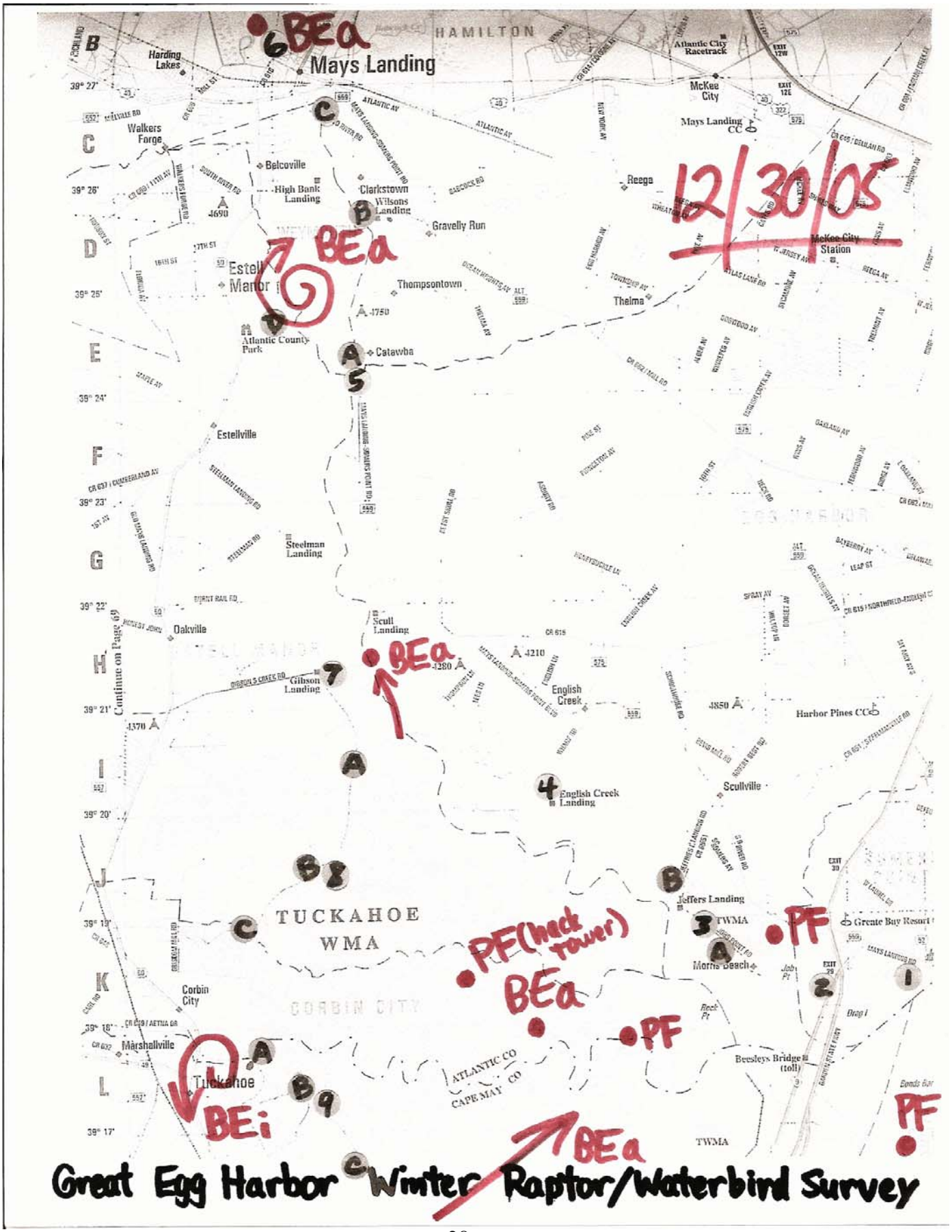
On Oceanic Tower PF


6 BEa
Mays Landing
HAMILTON
Harding Lakes
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McKee City
Walkers Forge
Belcoville
High Bank Landing
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Wilsons Landing
Gravelly Run
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Mays Landing CC
12/30/05
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BEa
Estell Manor
Thompsontown
Thelma
Atlantic County Park
Catawba
Estellville
Steelman Landing
Scull Landing
Oakville
Continue on Page 69
Gibson Landing
BEa
English Creek
Harbor Pines CC
English Creek Landing
Scullville
Jeffers Landing
TUCKAHOE WMA
PF(neck tower)
BEa
PF
Greate Bay Resort
Morris Beach
Corbin City
CORBIN CITY
Marshallville
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ATLANTIC CO
CAPE MAY CO
Beesleys Bridge (toll)
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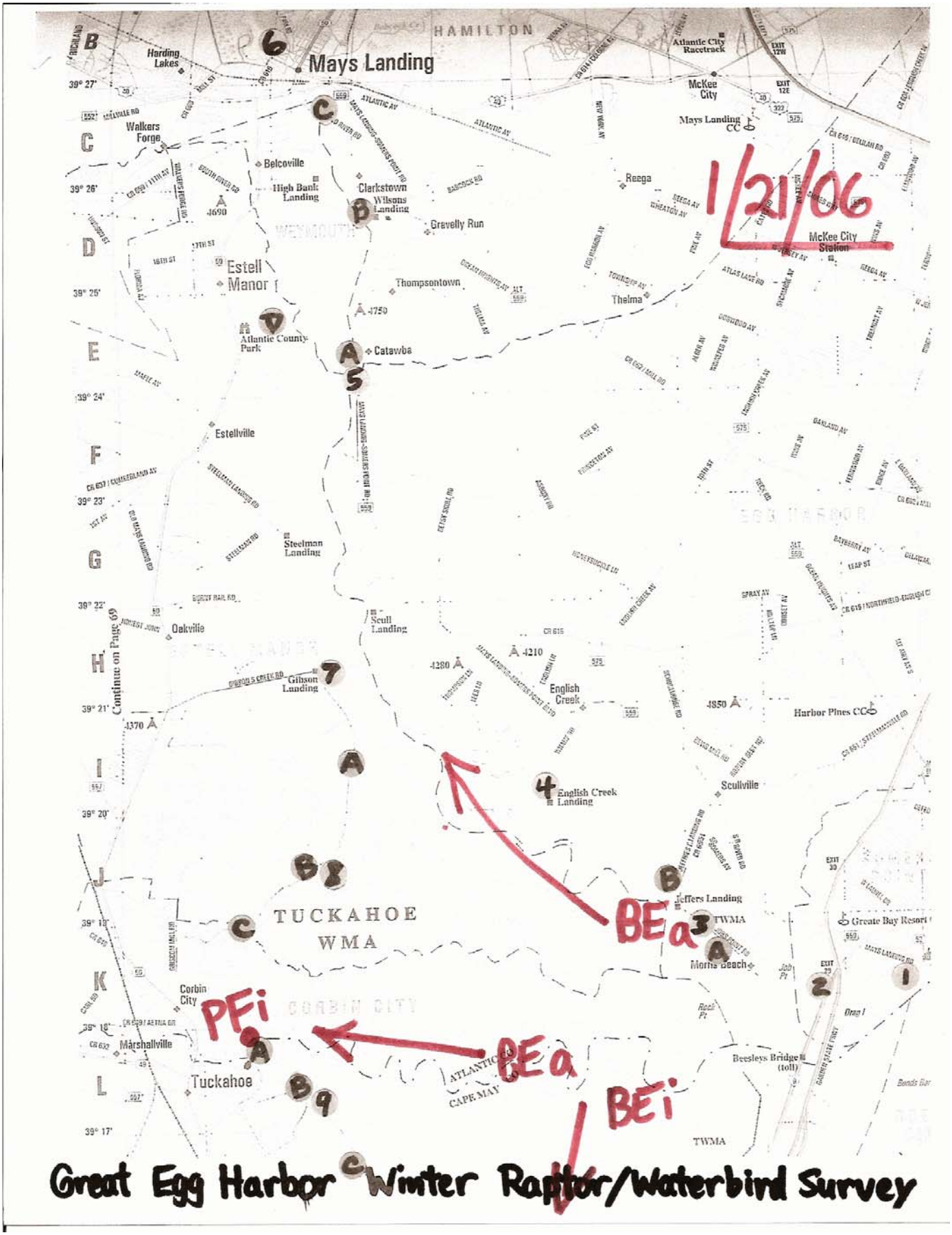
Great Egg Harbor Winter Raptor/Waterbird Survey


Mays Landing
HAMILTON
Harding Lakes
Atlantic City Racetrack
McKee City
Mays Landing CC
Walkers Forge
Belcoville
High Bank Landing
Clarkstown
Wilsons Landing
Gravelly Run
Reega
1/21/06
McKee City Station
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Thompsontown
Thelma
Atlantic County Park
Catawba
Estellville
Steelman Landing
Oakville
Scull Landing
Gibson Landing
English Creek
Harbor Pines CC
English Creek Landing
Scullville
Jeffers Landing
TWMA
Great Bay Resort
Morris Beach
TUCKAHOE WMA
Corbin City
CORBIN CITY
Marshallville
Tuckahoe
ATLANTIC CO
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Beesleys Bridge (toll)
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PFi
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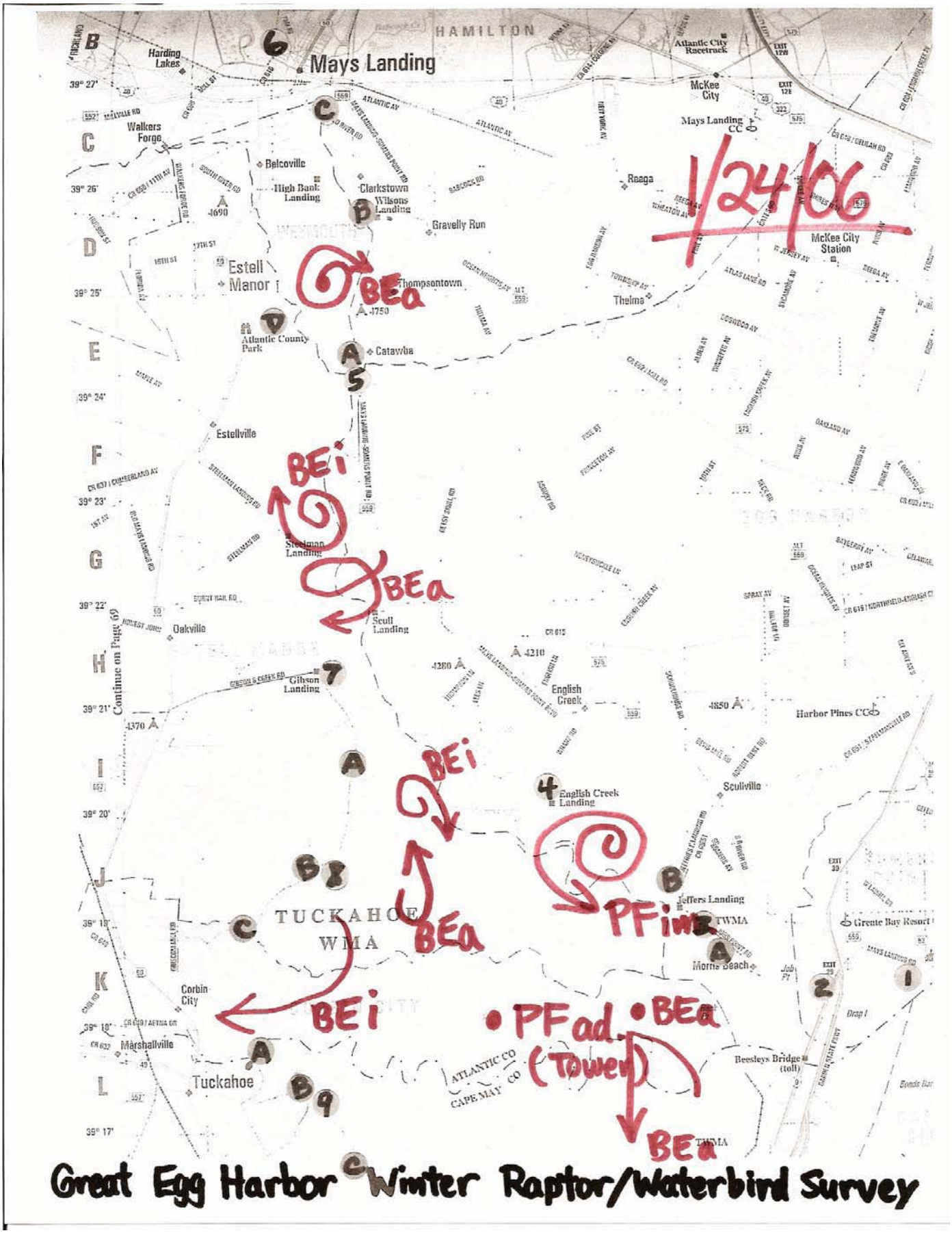
Great Egg Harbor Winter Raptor/Waterbird Survey


1/24/06
Great Egg Harbor Winter Raptor/Waterbird Survey
Mays Landing
HAMILTON
Harding Lakes
Walkers Forge
Belcoville
High Bank Landing
Clarkstown
Wilsons Landing
Gravelly Run
Estell Manor
Thompsontown
Atlantic County Park
Catawba
Estellville
Steelman Landing
Scull Landing
Oakville
Gibson Landing
Continue on Page 60
English Creek
English Creek Landing
Sculliville
Harbor Pines CC
Jeffers Landing
TWMA
Morris Beach
Grente Bay Resort
TUCKAHOE WMA
Corbin City
Marshallville
Tuckahoe
ATLANTIC CO
CAPE MAY CO
Beesleys Bridge (toll)
Mays Landing CC
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McKee City Station
Thelma
Atlantic City Racetrack
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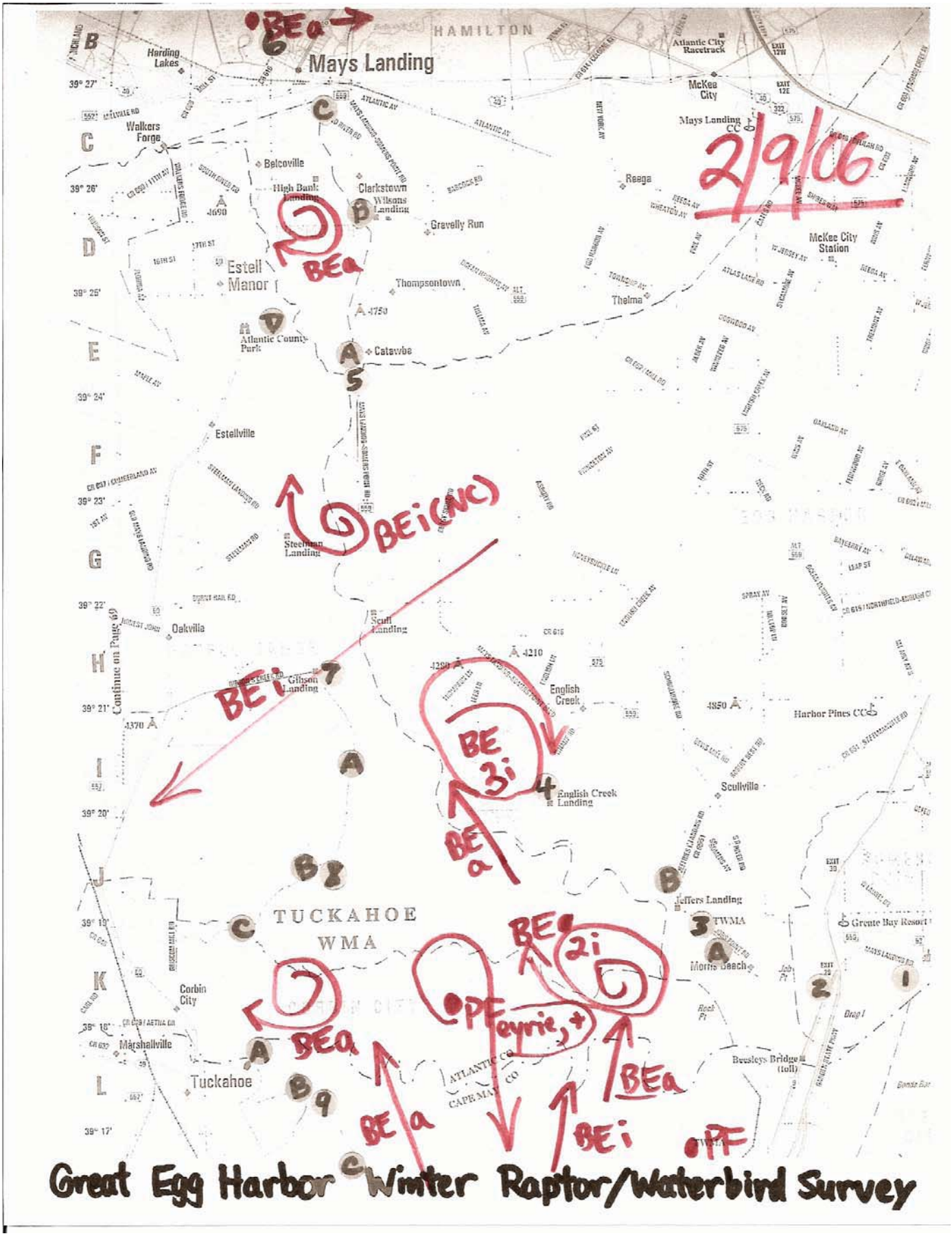
Great Egg Harbor Winter Raptor/Waterbird Survey
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Mays Landing
HAMILTON
Harding Lakes
Atlantic City Racetrack
McKee City
Mays Landing CC
Walkers Forge
Belcoville
High Bank Landing
Clarkstown
Wilsons Landing
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McKee City Station
Estell Manor
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Atlantic County Park
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English Creek
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Harbor Pines CC
Sculliville
Jeffers Landing
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TUCKAHOE WMA
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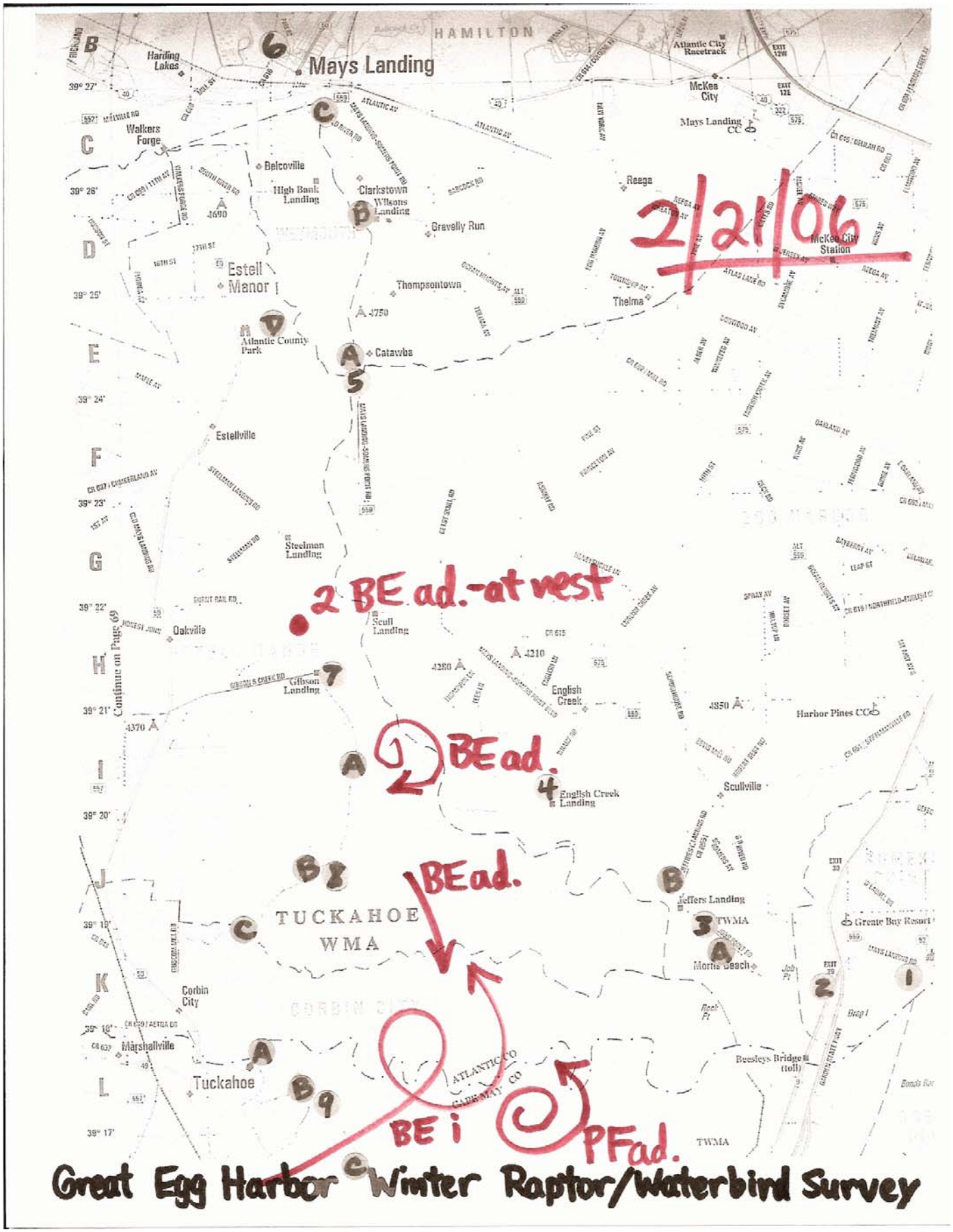
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Great Egg Harbor Winter Raptor/Waterbird Survey
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Atlantic County Park
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Steelman Landing
Scull Landing
Oakville
Gibson Landing
English Creek
English Creek Landing
Scullville
Harbor Pines CC
Mays Landing CC
McKee City
Atlantic City Racetrack
McKee City Station
Reega
Thelma
Jeffers Landing
TWMA
Grente Bay Resort
Morris Beach
Beesleys Bridge (toll)
TUCKAHOE WMA
Corbin City
Marshallville
Tuckahoe
ATLANTIC CO
CAPE MAY CO
HAMILTON
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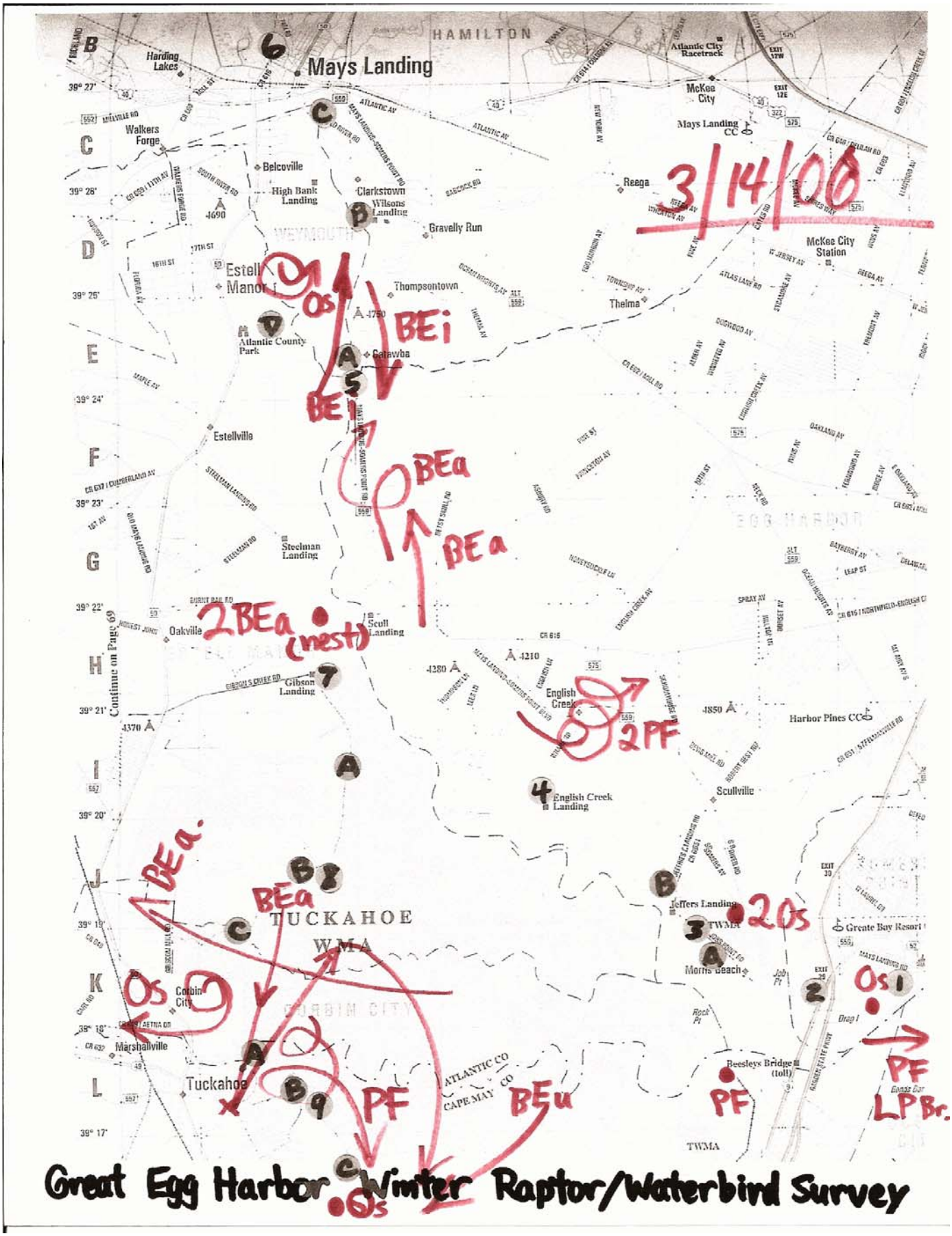
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Great Egg Harbor Winter Raptor/Waterbird Survey
Mays Landing
HAMILTON
Harding Lakes
Atlantic City Racetrack
McKee City
Mays Landing CC
Walkers Forge
Belcoville
High Bank Landing
Clarkstown
Wilsons Landing
Gravelly Run
Reega
McKee City Station
Estell Manor
Thompsontown
Thelma
Atlantic County Park
Catawba
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Steelman Landing
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Scull Landing
Gibson Landing
English Creek
English Creek Landing
Harbor Pines CC
Scullville
Jeffers Landing
Morris Beach
Grente Bay Resort
TUCKAHOE WMA
Corbin City
Marshallville
Tuckahoe
Beesleys Bridge (toll)
TWMA
ATLANTIC CO
CAPE MAY CO
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2BEa (nest)
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BEa.
BEi
2PF
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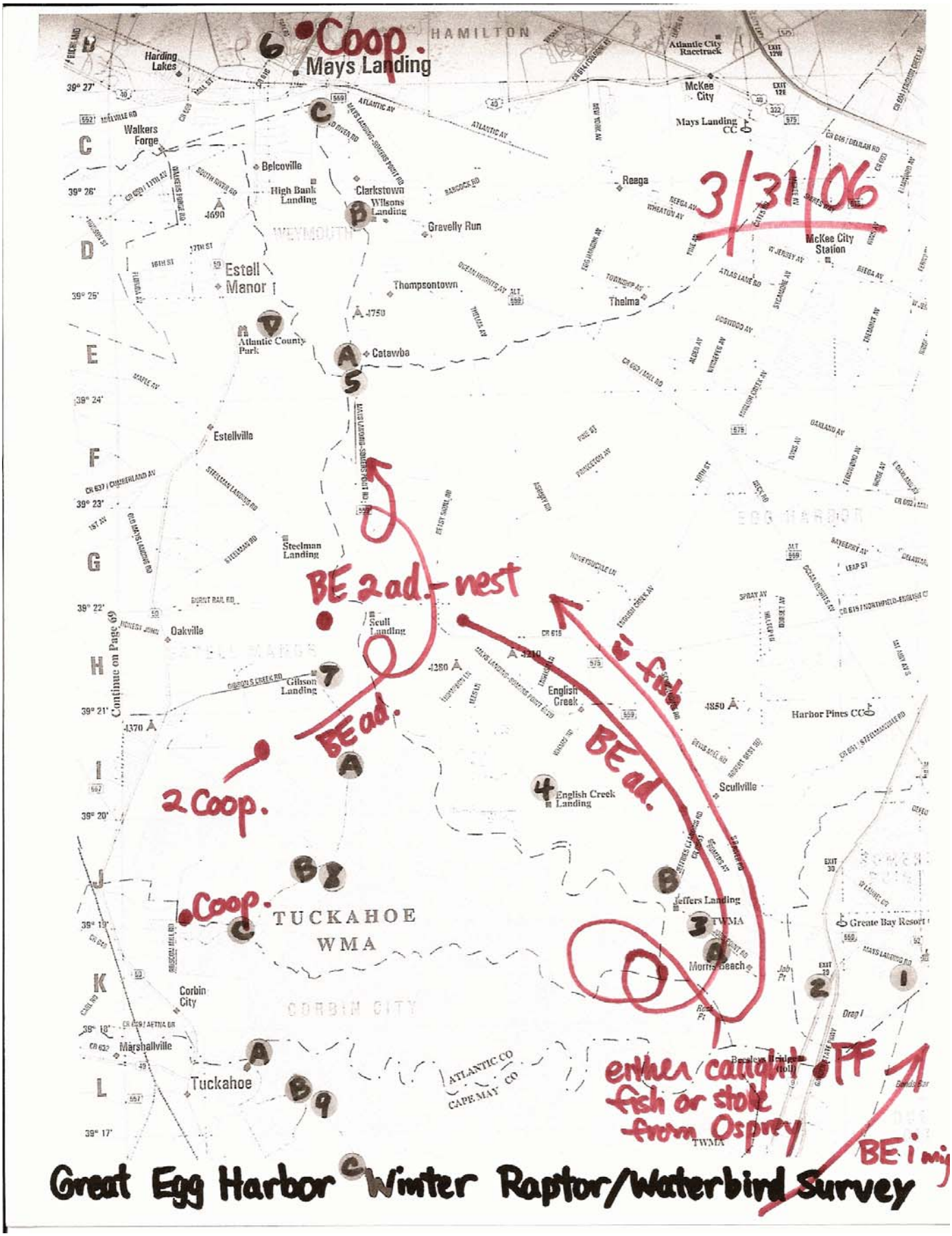
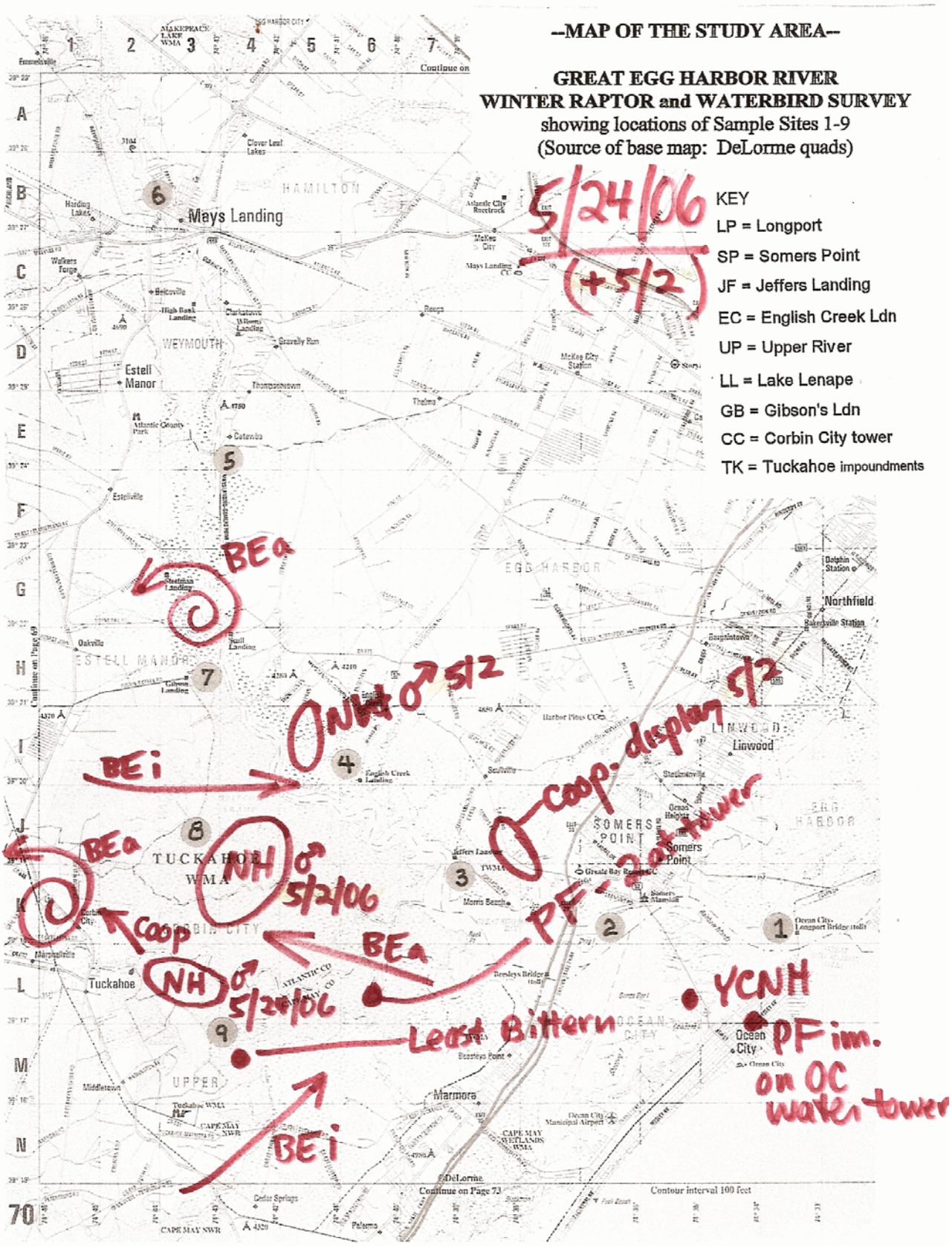

6 Coop. Mays Landing
3/31/06
BE 2 ad. - nest
BE ad.
2 Coop.
Coop.
BE ad.
either caught OFF fish or stole from Osprey
Great Egg Harbor Winter Raptor/Waterbird Survey
Continue on Page 69
TUCKAHOE WMA
Harding Lakes
Walkers Forge
Belcoville
High Bank Landing
Clarkstown
Wilsons Landing
Gravelly Run
Reega
McKee City
McKee City Station
Mays Landing CC
Atlantic City Racetrack
Estell Manor
Thompsontown
Thelma
Atlantic County Park
Catawba
Estellville
Steelman Landing
Oakville
Scull Landing
Gibson Landing
English Creek
English Creek Landing
Sculliville
Harbor Pines CC
Jeffers Landing
TWMA
Morris Beach
Great Bay Resort
Corbin City
Marshallville
Tuckahoe
ATLANTIC CO
CAPE MAY CO
HAMILTON
WEYMOUTH
EGG HARBOR
CORBIN CITY


--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)
5/24/06
(+5/2)
KEY
LP = Longport
SP = Somers Point
JF = Jeffers Landing
EC = English Creek Ldn
UP = Upper River
LL = Lake Lenape
GB = Gibson's Ldn
CC = Corbin City tower
TK = Tuckahoe impoundments
Mays Landing
HAMILTON
WEYMOUTH
ESTELL MANOR
EGG HARBOR
SOMERS POINT
LINWOOD
TUCKAHOE WMA
UPPER
Tuckahoe
Marmora
Linwood
Somers Point
Ocean City
Northfield
BEa
BEi
NH 5/24/06
NH 5/20/06
Coop
BEa
PF - 2nd tower
Coop. display 5/2
NW 5/2
Least Bittern
YCNH
PF im. on OC water tower
Continue on Page 73
Contour interval 100 feet

APPENDIX 2.

Methodology and Sampling Site Maps

GREAT EGG HARBOR RIVER METHODOLOGY:

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.

Additional birds, most often raptors, observed *between* official count sites were recorded if and only if the observers were confident it had not 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; 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 would allow the observers to confidently assess that it could 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 viewed or 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 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 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.

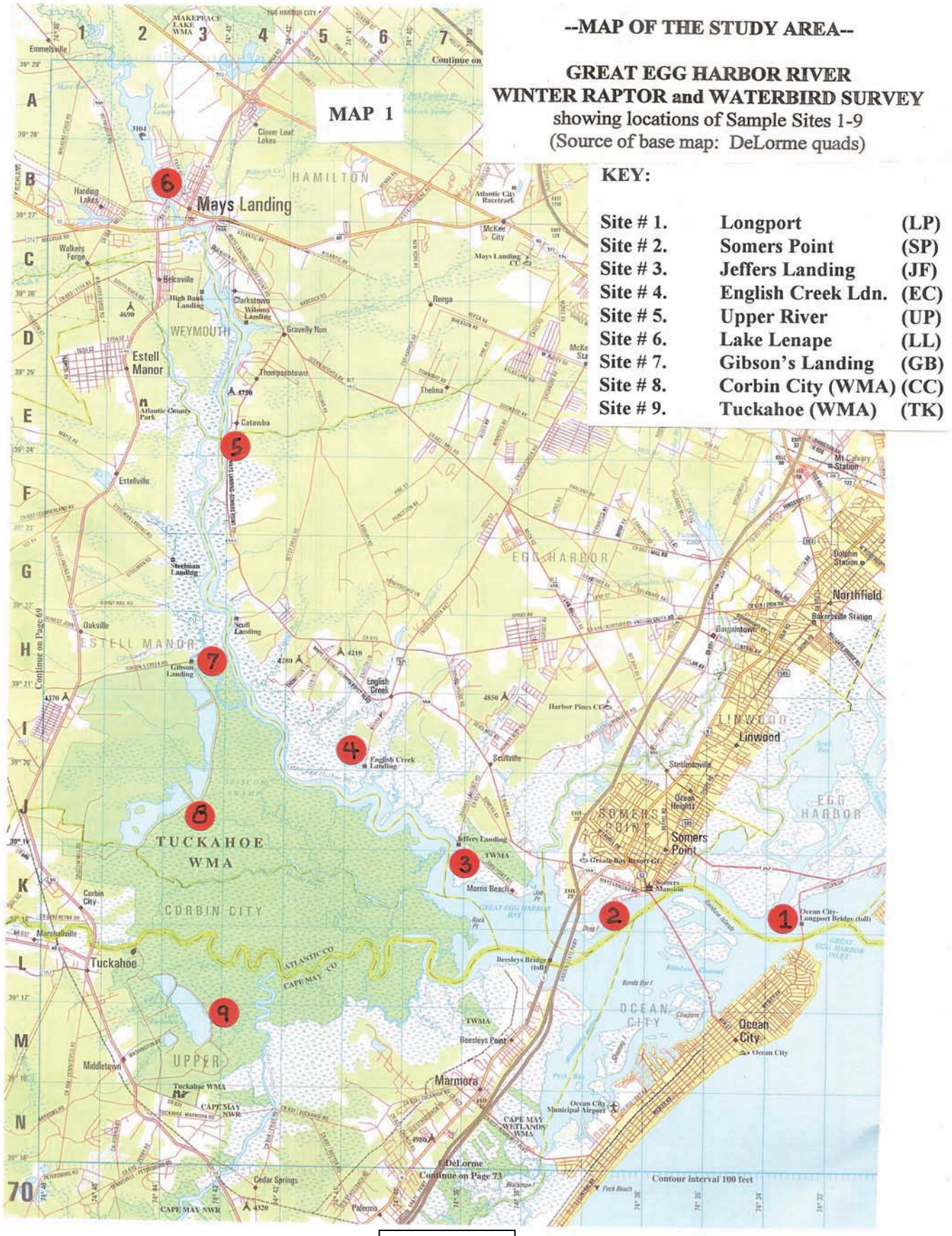
(6) Lake Lenape. Observations were conducted from the spillway in Mays Landing.

(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 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 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 therefore often are out of sight).



--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:

Site # 1.	**Longport**	**(LP)**
Site # 2.	**Somers Point**	**(SP)**
Site # 3.	**Jeffers Landing**	**(JF)**
Site # 4.	**English Creek Ldn.**	**(EC)**
Site # 5.	**Upper River**	**(UP)**
Site # 6.	**Lake Lenape**	**(LL)**
Site # 7.	**Gibson's Landing**	**(GB)**
Site # 8.	**Corbin City (WMA)**	**(CC)**
Site # 9.	**Tuckahoe (WMA)**	**(TK)**

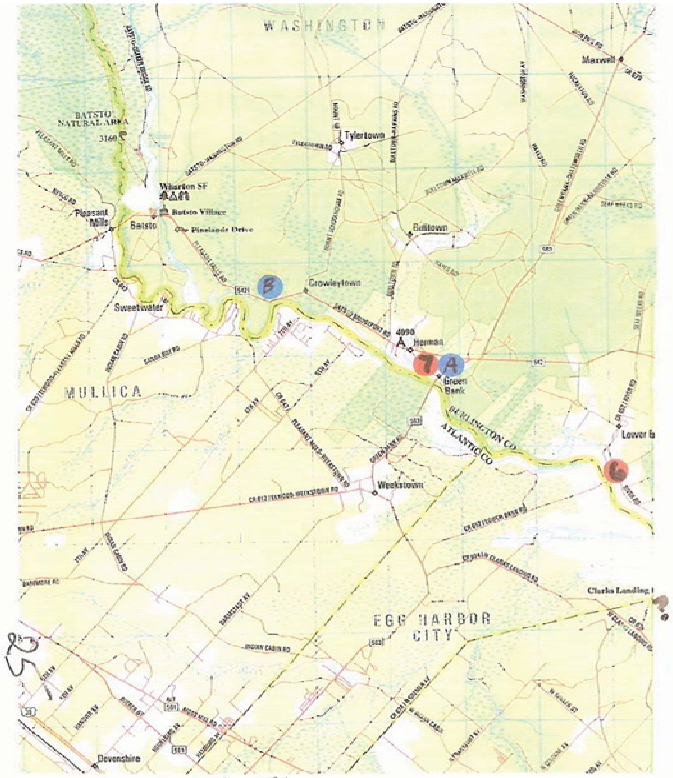
MULLICA RIVER METHODOLOGY:

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 approximately 45 minutes each during a given survey. Sampling direction was reversed every other survey to avoid time-of-day bias. There is some difference in the geographical scope of the study areas. The Great Egg River, from Lake Lenape east to the Longport Bridge constitutes about 12 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 longer, no attempt has been made (as yet) to compare width or acreage (or habitat types) of the comparative study areas. This can be carried out in future years as part of future in-depth comparisons.

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/geographically in the study area, it exerts a tremendous influence on the birds of the region - particularly waterfowl. Just as the quality impoundments at Corbin City and Tuckahoe WMAs attract and concentrate ducks and geese (and as the Bivalve EEP does on the Maurice River), Brigantine by its sheer size and quality of habitat (vast impoundments) attracts and concentrates vast numbers of Mullica River region waterfowl. But where Corbin/Tuckahoe can be counted because they are "within" the study area, the impoundments at Brig are adjacent to Reeds Bay, Little Bay, and Brigantine Inlet - and are not really a part of Great Bay or the Mullica River system.

None-the-less, Forsythe exerts a massive influence on Mullica 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 birds from the Mullica. As one person aptly put it, "Brigantine simply 'sucks in' most of the area's waterfowl." And while many return to the nearby Mullica River to feed at night, 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 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 virtually no Pintails were counted on Mullica surveys, but at the same time, just two miles away, perhaps 10,000 teal and 10,000 pintails were known present. It is a dilemma with no real answer - to count Brig birds would be to bias the count beyond comparability (plus it would take 6-8 hours each survey to truly census the Refuge...) 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 country, and the implications when attempting hard comparisons to the Great Egg Harbor River.



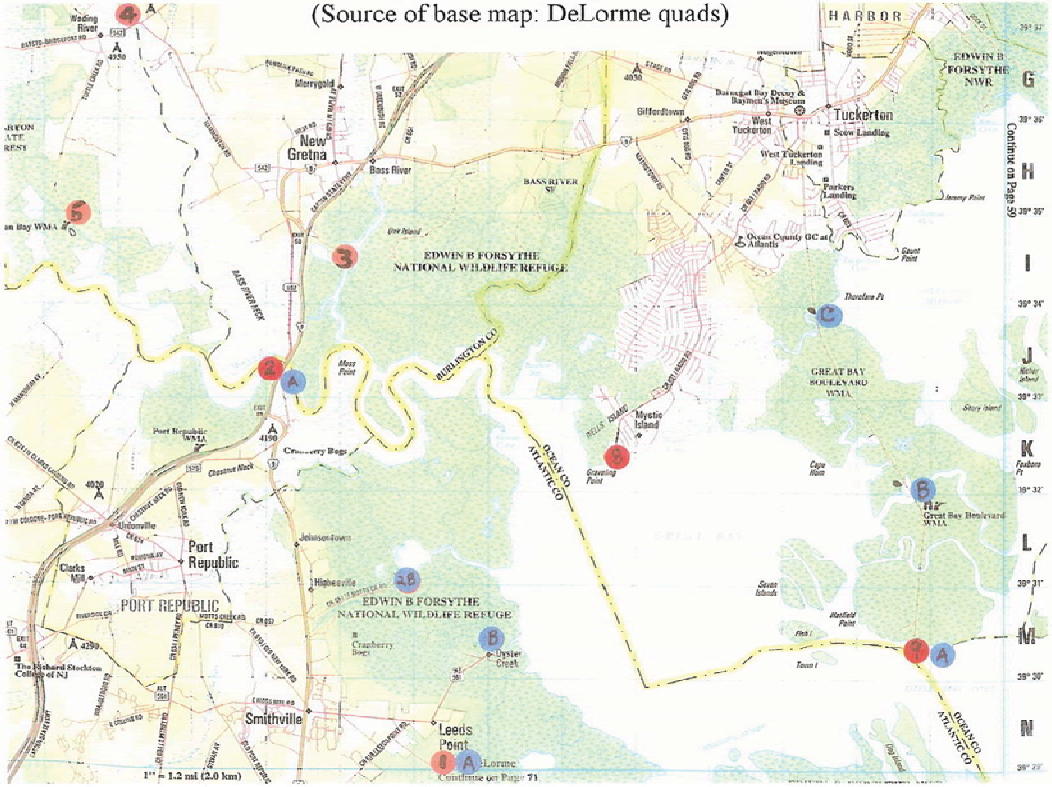
KEY:

Site # 1.	**Leed's Point**	**(LD)**
Site # 2.	**GSP Bridge**	**(BR)**
Site # 3.	**Amassas Landing**	**(AM)**
Site # 4.	**Wading River Bridge**	**(WD)**
Site # 5.	**Swan Bay WMA**	**(SW)**
Site # 6.	**Lower Bank**	**(LB)**
Site # 7.	**Green Bank**	**(GB)**
Site # 8.	**Graveling Point**	**(GP)**
Site # 9.	**Seven Bridges Road (Great Bay Blvd. WMA)**	**(SB)**

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)



APPENDIX 3

"Wintering Raptors on the Mullica-Great Bay Estuary"

Michael Britt

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New Jersey Audubon Society's "Winter 2006 New Jersey Birds

New Jersey Birds

NEW JERSEY AUDUBON SOCIETY

Winter 2006 — Volume XXXII, Number 1

Wintering Raptors on the Mullica River-Great Bay Estuary

By MICHAEL BRITT

The Mullica River-Great Bay Estuary hosts impressive numbers of wintering raptors. During the winter of 2004-2005, for example, high counts of 20 Bald Eagles, 42 Northern Harriers, 21 Rough-legged Hawks, and 15 Short-eared Owls were recorded. The Mullica River is approximately 55 miles in length, originating in East Berlin, Camden County, coursing on an east-southeasterly track, flowing through Wharton State Forest and acting as the dividing line between Burlington and Atlantic counties, before it reaches Great Bay at its mouth. Along the way, the Mullica drains a number of smaller watersheds including those of the Batsto River, Atsion River, Sleeper Branch, Nescochague Creek, Hammonton Creek, Bull Creek, Wading River, Bass River, Landing Creek, and Nacote Creek. The Mullica is the largest watershed in the Pine Barrens, draining an area of 569 square miles, representing roughly 8 percent of the area of the state. Tremendous stretches of salt marsh are found along the lower reaches of the Mullica.

The Mullica River-Great Bay Estuary is thought to be the cleanest between Boston and Washington, D.C., likely a result of most of the watershed being protected state and federal land (see website 1 listed below). The marshes are preserved as part of the Edwin B. Forsythe National Wildlife Refuge, Swan Bay Wildlife Management Area, Great Bay Boulevard Wildlife Management Area, and Bass River State Forest. The 22,206 acres of salt marsh in this complex comprises a substantial amount of high marsh containing Salt-meadow Grass *(Spartina patens)* , Spike Grass *(Distichlis sPicata)* , and Black Grass *(Juncus gerardii).* High marsh receives tidal inundation only during the higher high tides. For the most part, it persists as a wet grassland, where rodents and passerine prey dwell. Wintering waterfowl can be found in the tidal creeks and the river itself. It is the vastness of this marsh combined with the abundance and diversity of prey that make it a prime wintering area for raptors. Also noteworthy is the fact that the milder winter temperatures along the southern New Jersey coast coupled with the semi-diurnal tidal flow result in an ideal habitat-climate gradient (Bosakowski 1992). These coastal, south Jersey marshes are rarely covered with deep snow (which conceals prey) for prolonged periods of time. Thus, the Mullica River-Great Bay Estuary is a regionally important wintering area for raptors along the mid-Atlantic coast. Wintering areas are as vital as breeding areas for the survival of species: these raptors may spend at least a third of the year at these wintering grounds.

The Mullica River estuary is also crucial habitat for a number of nesting species, including Northern Harrier, Osprey, Bald Eagle, Peregrine Falcon, Clapper Rail, Seaside Sparrow, and Saltmarsh Sharptailed Sparrow; Black Rails were present formerly during the atlas project in the 1980s (Walsh et al. 1999).

Raptor Totals Along the Mullica

On 18 December 2004, I observed 15 Short-eared Owls behind the Mott's Creek Inn, during the Oceanville Christmas Bird Count. A few owls were already hunting when I arrived at 1:15PM. By late afternoon, I observed all 15 birds in the air at once, but by dusk, most had settled back onto the marsh. These numbers persisted through the winter, for 11 Short-eared Owls were reported here on 15 February 2005 (New Jersey RBA, 17 February 2005). My personal high count for Rough-legged Hawks was 11 individuals on 5 February 2005. On 25 January 2005, however, a systematic survey along the Mullica River, from Green Bank to Little Egg Inlet conducted by Clay Sutton and James Dowdell to provide comparative data for the Great Egg Harbor Watershed Association yielded 20 Bald Eagles, 42 Northern Harriers, 21 Rough-legged Hawks (18 on 11 February), 1 Golden Eagle, 2 Merlins, and 5 Peregrine Falcons. Most of the Rough-legged Hawks were found between Mott's Creek and Swan Bay. Twenty Rough-legged Hawks have been counted here three times previous: 15 January 1978, 20 January 1979, and 18 December 1982 (Sutton and Dowdell 2005).

This view over the Mullica River-Great Bay Estuary from Leed's Point shows the extensive stands of relatively dry "high marsh" found there. This habitat is prime for raptor foraging. Photo/Michael Britt

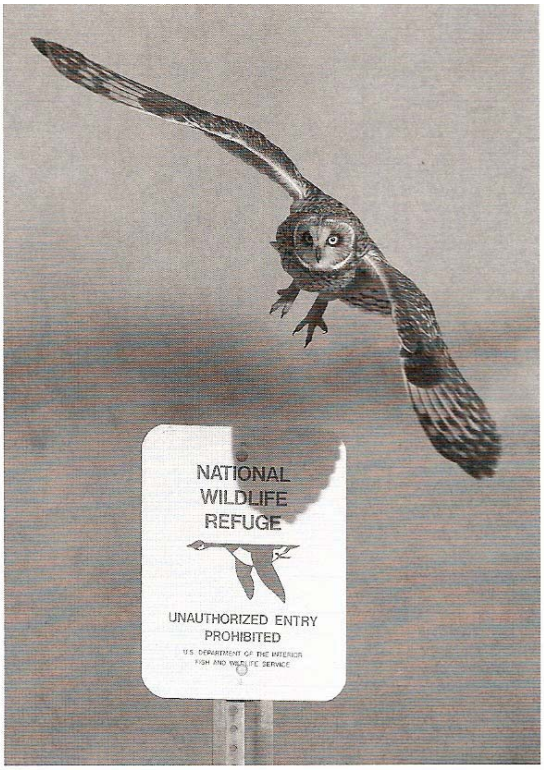
Also noteworthy, 50 Northern Harriers were tallied on 4 January 1976 (Sutton and Dowdell 2005) and four Golden Eagles were seen during the 1994 mid-winter Bald Eagle survey (Cape May RBA, 13 January 1994). One should not expect to encounter these numbers of raptors on any single visit, however: they were probably the result of not only the very large area covered by the survey but also of a tremendous snowfall a few days earlier that apparently caused a major mid-winter flight of birds. Such mid-winter raptor incursions have been well documented over the years, but can be short-lived, with good numbers of Rough-legged Hawks being particularly ephemeral (c. Sutton, pers. comm.).

Although these are very impressive numbers, how do they compare to those of other premiere wintering raptor sites along the Atlantic Coast in New Jersey? Below, I provide comparative data between the Mullica River and Great Egg Harbor River for the winter of 2004-2005. In addition, historical Mullica data from 1974-1984 (courtesy of Akers, Sutton, and Dowdell) are compared to the 2004-2005 data.

Both sites have seen an upward trend in the number of wintering Bald Eagles, probably a result of the species' recovery as a breeding bird in New Jersey and elsewhere. Short-eared Owls were counted when encountered,

The Mullica River—Great Bay Estuary supports a healthy population of Northern Harriers. Single-day winter counts there have topped 40 individuals, and the species is known to nest there as well. This bird was photographed in late October 2005. Photo/scottelowitzphotography.com

but there was not a targeted search for the species at dusk. This species can sometimes be adequately surveyed during a diurnal count period. An estimated 17 - 20 Short-eared Owls wintered along the lower Great Egg River during 2004- 2005, whereas 15 Short-eareds were seen from a single point along the Mullica. Who knows how many wintered at the latter site?! Two years earlier, 20 Short-eareds were reported behind the Mott's Creek Inn in January 2003 (New Jersey RBA, 23 January 2003).



The Mullica River and Great Egg River complexes are also home to a substantial number of wintering Short-eared Owls. Single-day (dusk) counts have reached 15-20 individuals at both sites, although this species occurs in notoriously variable numbers from year to year. Major sections of this marsh are preserved as part of Edwin B. Forsythe National Wildlife Refuge. This Short-eared was photogrpahed on 1 January 2004. Photo/scottelowitzphotography.com

Visiting the Mullica River Complex

There are several excellent vantage points overlooking different sections of the Mullica River complex. Here are three suggestions:

- Amasa's Landing Road: reached from Exit 50 off the Garden State Parkway in Burlington County. Travel east on this road until it dead-ends and start scanning. Here you can view a large portion of marsh east of the parkway and north of the Mullica River.

- Old New York Road: is the first left off Route 9 South, after taking Exit 48 of the Garden State Parkway. This road will take you through the Chestnut Neck Marina and eventually dead-ends on the west side of the Garden State Parkway, offering a commanding view of the Swan Bay Wildlife Management Area portion of the complex.

- Mott's Creek Road (my favorite): From Exit 48 of the Garden State Parkway, travel south on Route 9 about a mile or so until you reach Mott's Creek Road (CR 657). Head east on this road, until you reach the Mott's Creek Inn. The inn is currently closed and up for sale. The inn and adjacent parking lot offer a view of the marsh east of the parkway and south of the Mullica River; you can see the T uckerton marshes off to the east, which is also part of this system. It is from the inn that I have had some of my most memorable days watching wintering raptors in New Jersey.

In addition, the end of nearby Leeds Point Road is always worth a visit.

Following are several tips to make your visit more productive.

- Dress appropriately for the cold and possible wind.

- Bring a spotting scope; it is essential for finding distant birds and to accrue better, more accurate totals.

- Do not look for birds only in flight, but also perched on the many wildlife refuge signs, various other structures, or in the marsh itself.

Even during non-flight years this marsh tends to support at least a few Rough-legged Hawks and Shorteared Owls, whereas other south Jersey marshes may not. Golden Eagles winter here regularly. Any time between Thanksgiving and late February is best. And a visit to this marsh is the grand sequel to a trip around the dikes at nearby Brigantine (Forsythe) National Wildlife Refuge.

Conclusion

The Mullica River-Great Bay Estuary is clearly a regionally important wintering area for a variety of open-country raptors. The Mullica River marshes have long been known as a terrific site to view wintering birds of prey. Until recently, however, only ancillary census data existed, aside from the yearly Mid-Winter Bald Eagle surveys and state breeding bird atlas, which were narrower in scope. Unfortunately, the Mullica was not blessed with comparable funding for avian research as the Maurice River or the Barnaget Bay marsh complex received--that is, until the Great Egg Harbor Watershed Association (GEHWA) stepped to the plate providing key funding and concern for this and several other southern New Jersey gems. Future funding should be sought from a number of different sources to gather additional data on this superb marsh system. In the meantime, we as birders should assist in this endeavor by adding our own observational data and other support to these studies.

Table 1. Comparative Winter 2004-2005 Raptor Numbers on Mullica and Great Egg Rivers

	Mullica River		*Great Egg River*	
	Avg.	Peak	Avg.	Peak
Bald Eagle	**10.8**	**20**	**7.3**	**11**
Northern Harrier	**31**	**42**	**36**	**47**
Rough-legged Hawk	**10.6**	**21**	**4.6**	**10**
Golden Eagle	**0.8**	**2**	**0.8**	**2**

Table 2. Comparative Winter Raptor Averages on Mullica'River

	1974-1984	2004-2005
Bald Eagle	**1.8**	**10.8**
Northern Harrier	**14.1**	**31**
Rough-legged Hawk	**6.22**	**10.6**
Golden Eagle	**1.32**	**0.8**

Acknowledgments

I would like to thank Fred Akers (Director, GEHW A), James Dowdell, and Clay Sutton for allowing me to use data from their surveys. Clay Sutton also provided helpful comments on an earlier draft of the manuscript.

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web_link/text/mr~be.htm (see: "Significant Habitats and Habitat Complexes of the New York Bight Watershed: Mullica River-Great Bay Estuary COMPLEX #5")

http://gehwa.org

http://www.state.nj.us/pinelands/mullica/overview.htm

http://www.nationmaster.com/encyclopedias/Mullica-River

APPENDIX 4

Press Release and picture from Conectiv Energy's donation in support of the 2005-2006 "Raptors and Waterbirds on the Great Egg Harbor River"

October 31, 2005

For more information, contact
Bill Yingling (302) 283-5811
bill.yingling@conectiv.com

CONECTIV ENERGY SUPPORTS WINTER BIRD SURVEY

Donates $4,000 to Great Egg Harbor Watershed Association

CORBIN CITY, N.J. – Conectiv Energy has donated $4,000 to the Great Egg Harbor Watershed Association to help support the organization's 2005-06 Winter Raptor and Waterfowl survey. The survey is creating baseline data on the various species of birds that use the estuary in the winter.

"Environmental stewardship is a core value at our company and we recognize our role in preserving the environmental resources from which we all benefit," said Andrew C. Shawl, Environmental Coordinator at the nearby B.L. England Generating Station, which is operated by Conectiv Energy.

"The Great Egg Harbor Watershed Association has been working for the past 15 years to promote the long-term protection of the natural and cultural resources connected to the Great Egg Harbor River system," said Fred Akers, Administrator of the Great Egg Harbor Watershed Association. "This financial support will go a long way to help us broaden our efforts.

Last year, Conectiv Energy provided us with critical support when we needed help with the publication of our new brochure. This financial support today will help us to broaden our ongoing efforts to scientifically document the presence and abundance of bird species in both the Great Egg Harbor and Mullica River estuaries."

"The Great Egg Harbor Watershed Association is doing important work to help maintain the wildlife that depends upon this valuable estuary. We applaud and support this effort," said Marilyn Booth, Senior Environmental Consultant at Conectiv Energy.

For the past two years, the Great Egg Harbor Watershed Association has been undertaking winter bird surveys to discover and provide cornerstone avian resource data to be used in river management and protection, Akers said. The organization plans to establish an avian database determining areas of key use by birds, identifying rare, threatened or endangered species and bringing recognition and publicity to the considerable avian resources of the Great Egg Harbor and Mullica watersheds.

This will be the third year of a minimum five-year survey program, Akers said. The overall cost of this program annually is about $8,000 and Conectiv Energy's support of this effort will help to ensure that the program goals are realized.

# # #

Conectiv Energy is a competitive subsidiary of Pepco Holdings Inc. (NYSE: POM). The company is an asset-backed merchant energy business using risk management tools, regional expertise within the PJM Interconnection power pool and intellectual capital to optimize the value of its energy portfolio in the wholesale energy marketplace.

Andrew Shawl (left) and Marilyn Booth (Right) from Conectiv Energy present $4,000 to Fred Akers of the Great Egg Harbor Wathershed Association to support the annual bird survey on the Great Egg Harbor and Mullica Rivers.

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