WINTERING RAPTORS AND WATERFOWL ON THE MAURICE RIVER

CUMBERLAND COUNTY, NJ

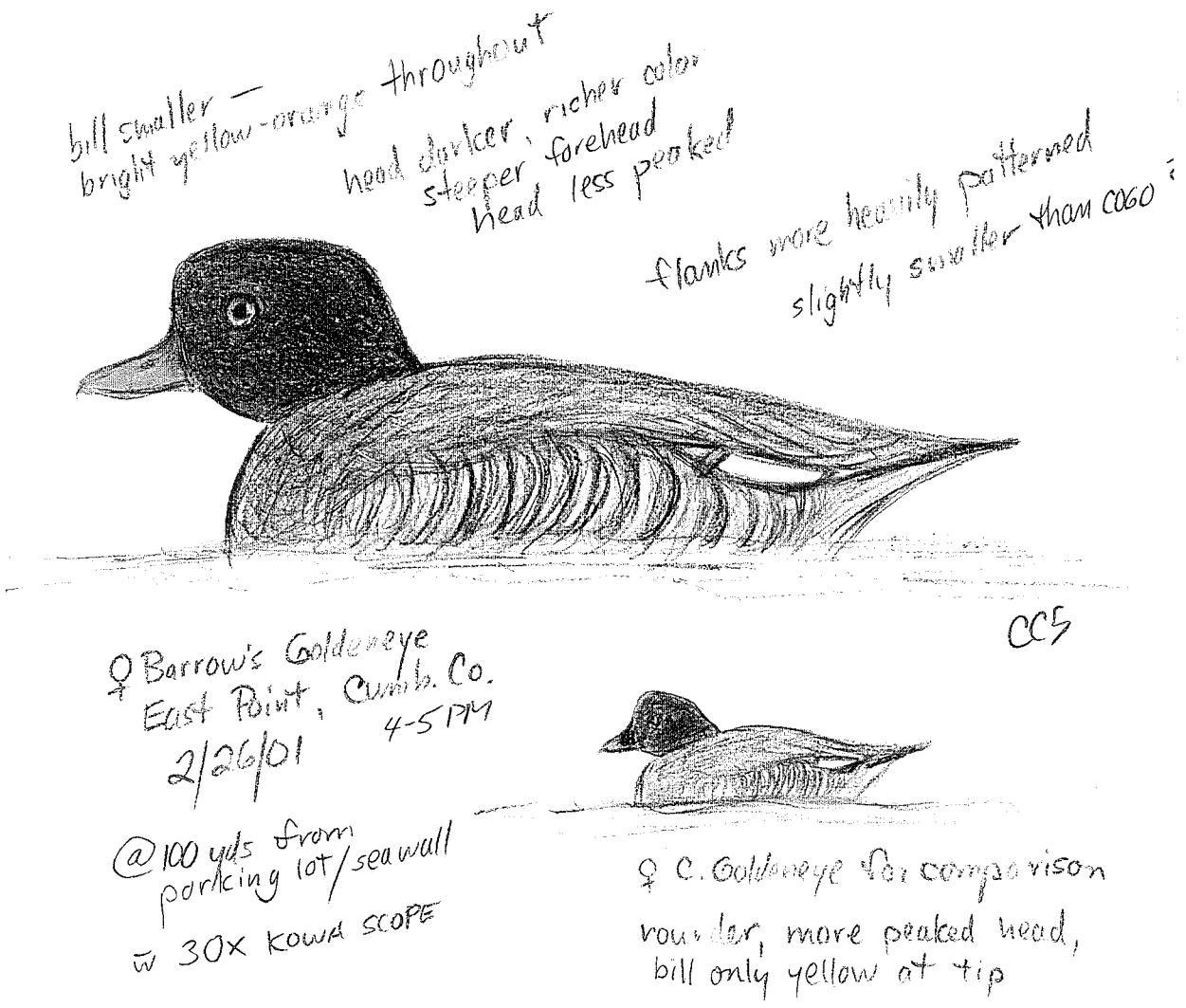
2000-2001

The FourteenthYear of an Ongoing and Long-term Study

Submitted to:
Citizens United to Protect the Maurice River and its Tributaries, Inc.

by Clay Sutton & James Dowdell

May 18, 2001



Female Barrow's Goldeneye at East Point (February 26, 2001).
First record for Cumberland County. Drawing by Clay Sutton

BACKGROUND and METHODS

Numerous studies have been conducted by Citizens United on the birds of the Maurice River region. These research efforts have taken place throughout the seasons, investigating the breeding birds of the river and it's tributaries (principally the Manumuskin), winter bird populations, and the use of the area by migratory birds in spring and fall. Also, key parcels of land have been specifically surveyed for bird use, an important aspect of assessing the preservation potential and priority of undeveloped or threatened lands.

The principal ongoing CU project is an investigation of the status and trends in wintering raptors and waterfowl on the Maurice River. This study is one of very few true long-term systematic monitoring studies conducted in the Delaware Estuary. The winter of 2000-2001 marked the fourteenth year of this study. The methodology employed was the same as the first 13 years: nine sites are surveyed for 50 minutes per site on an average of every ten days throughout the winter.

Waterfowl Studies

Ducks and geese have been counted along the tidal portions of the Maurice River for the past thirteen winters, beginning in 1987-1988. Surveys have been conducted between November 22 and March 22 each season, on an average of once every ten days. In this way, the status and trends of waterfowl on the Maurice River can be assessed. In all, 34 species of waterfowl have been recorded on the Maurice River prior to 2001. Key species on the Maurice River and its tributaries include Snow Goose, American Black Duck, Mallard, and Northern Pintail.

Snow Geese are found in the salt marshes on the lower river, with an average of 3,000 to 4,000 found each winter. The peak daily high count was 14,000 recorded early in 1990. Black Ducks are found in large numbers along the length of the river, with average counts between 1,000 and 3,000 each winter. Peaks have been as high as 8,000 birds for this species of special concern.

Mallards and N. Pintails are found primarily on the brackish marshes of the upper river, with largest numbers usually recorded in late winter and early spring. These species are found in highest numbers in the wild rice marshes north of the Maurice River Causeway. Average numbers vary considerably due to the severity of the winter, but peaks of nearly 4,000 Mallards and 3,000 N. Pintails have been recorded.

Raptor Studies

Raptors (hawks and eagles) have been monitored concurrently with waterfowl for thirteen winter seasons, beginning in 1987-1988. Raptor studies have yielded significant long-term data on the status and trends of birds of prey in the Maurice River region. Raptors are predators at the top of the food chain. Accordingly, raptor numbers are a good barometer of an area's environmental quality. The Maurice River system continues to support one of the largest wintering hawk and eagle concentrations known in New Jersey or the Delaware Estuary region. Fourteen species of raptors are recorded most winters.

Turkey Vultures are the most numerous species found. Regional Turkey Vulture roosts support up to 300 birds each winter. Vultures are near the northern limit of their winter range in southern New Jersey. Red-tailed Hawks are the second most numerous species on the winter river. Average counts of 40-50 birds are achieved along the 14 mile stretch of river surveyed. Northern Harrier, formerly known as "Marsh Hawk," are another representative species of the vast marshes of the Maurice River. Counts of up to 30 N. Harriers are found each winter.

The Bald Eagle is a hallmark species on the Maurice River and its tributaries. The numbers found here each winter are significant and generally the highest concentration in both New Jersey and in the entire Delaware Estuary region. Numbers have been growing over the thirteen years of study. Currently peak counts of up to 20 Bald Eagles are achieved each winter.

RESULTS: WINTER 2000 - 2001

The winter season of 2000-2001 marked the fourteenth season of the CU Raptor / Waterfowl Project on the Maurice River. Methodology used was the same as that used during the previous 13 years of the survey. All surveys were conducted by Clay Sutton and Jim Dowdell.

A total of 10 raptor surveys were conducted between December 15, 2000, and March 23, 2001. Waterfowl were counted on 9 occasions between the same dates (not counted on the raptor-only survey on January 13).

The winter of 2000-2001 was unusual, characterized by a very early freeze-up. Cold weather had already gripped the area by the first survey date (December 15) and by December 28 the river was mostly frozen. On January 7, the Delaware Bay at East Point was mostly frozen, but by January 13, most of the ice had broken up. Temperatures for the rest of the winter were about average. This "old-fashioned winter," the coldest in seven years, had major impacts on waterfowl (and raptor) distribution, although the freeze-up did not last long enough to lead to any major waterfowl mortality.

FINDINGS -- RAPTORS:

Maurice River Winter Raptor Survey results for 2000-2001 are shown in Table 1. Peak counts are highlighted. The averages for each species are shown as well.

Turkey Vulture

Turkey Vulture numbers in the Maurice River Region surged during the cold spell when, theoretically, birds were pushed into the region by snow cover farther north. The average of 96 is above recent averages, and the 195 counted on December 28 is a very good number.

Black Vulture

Average of 13.3 reflects a normal total. The peak of 31 on February 1 is far more indicative of the regional population.

Bald Eagle

The bitter weather, freeze-ups farther north, and stressed waterfowl brought a major number of Bald Eagles to the region. The average of 10.4 is higher than usual, the peak of 20 on January 25 ties the record for the Maurice River. A minimum of 25 Bald Eagles used the river during the winter season. Spring departure was deemed early.

Northern Harrier

The 38 on January 7 is a new daily record for winter. The 23.2 average is above normal as well.

Sharp-shinned Hawk

Both average and peak numbers recorded were usual for this small accipiter.

Cooper's Hawk

Cooper's numbers were also average in winter 2000-2001. Daily Maurice River counts for Sharp-shinned Hawk and Cooper's Hawk do not reflect true numbers present due to the secretive nature of these species. Due to the distribution of sightings and likely winter ranges, probably no fewer than 10 Cooper's Hawks wintered on the river.

Northern Goshawk

Only one sighting was accrued; an immature on December 27, a non-survey date sighting near Heislerville.

Red-shouldered Hawk

Only two were recorded, an adult and an immature, both on February 13. Red-shouldered Hawk is also a non-conspicuous, somewhat secretive raptor in winter.

Red-tailed Hawk

This large buteo was present in slightly above average numbers. The peak of 52 on December 15 is a good count and the average of 41.5 easily bests last years' 38.3.

Rough-legged Hawk

This northern buteo was also pushed into the Maurice River region by harsh weather to the north, yet departed early. Five sightings were accrued, two on non-survey dates. Probably 3 individual birds were present: two dark morph and one light morph.

Golden Eagle

Probably the same immature Golden Eagle was recorded on both January 13 and January 25. The Maurice River normally hosts one or two of these magnificent raptors each winter.

American Kestrel

Probably three individuals were present, and the average of 1.3 per survey is slightly better than the past few seasons. It is still well below the 1.9 average for the first ten years of the study

Merlin

At least one, possibly two Merlin wintered this season, an average number for this speedy falcon.

Peregrine Falcon

Only two were recorded on official surveys, but there were three other non-survey date sightings as well. Probably a record three individuals wintered: an adult and an immature on the lower river and another, unusually, on the upper river (seen by several people, including Sutton, hunting pigeons, gulls, and starlings at the Cumberland Mall).

Table 1

Raptors Recorded on the Maurice River
Winter of 2000-2001

SPECIES	DATE: 12/15	12/28	1/7	1/13	1/25	2/1	2/13	2/26	3/8	3/23	Avg.
Black Vulture	8	13	30	1	11	**31**	18	4	11	6	13.3
Turkey Vulture	44	**195**	126	55	92	107	96	56	68	120	96.0
Osprey										(31)	- - -
Bald Eagle	6	13	14	14	**20**	12	11	5	6	3	10.4
N. Harrier	26	24	**38**	21	35	17	24	16	14	17	23.2
Sharp-shinned Hawk	4	4	2	**6**	2	3	3	1	2	1	2.8
Cooper's Hawk	2	2	**5**	2	3	2	3	1	2		2.2
Red-shouldered Hawk							**2**				- - -
Red-tailed Hawk	**52**	32	49	30	48	39	47	43	45	30	41.5
Rough-legged Hawk	1	1	1								- - -
Golden Eagle				1	1						- - -
American Kestrel	2	1	1	2	1	1	2	1	1	1	1.3
Merlin	1					1					- - -
Peregrine Falcon			1							1	- - -
Total Raptors	148	285	267	132	213	213	206	127	149	210	195.0

Average was 195 raptors / survey. 1,950 total raptor sightings accrued. Peak counts shown in **bold face**.

NON-SURVEY DATE SIGHTINGS:

N. Goshawk - 1 im. recorded on 12/27
Peregrine Falcon - also recorded 12/26, 2/3, 3/28
Rough-legged Hawk - also recorded 1 / 2, 2/3

FINDINGS -- WATERFOWL:

Maurice River winter waterfowl totals are shown in Table 2. Peak counts are highlighted. Twenty-four species were recorded during the nine surveys. The early freeze-up clearly brought waterfowl into the region, yet was not severe enough to drive them out as has happened during some severe winters.

Snow Goose

The average and peak numbers were below normal in 2000-2001. Most Snow Geese did temporarily leave during the December freeze-up, but soon returned following the thaw. Most Delaware Bayshore Snow Geese were concentrated in western Cumberland County and Salem County this season.

Canada Goose

Peaks and averages were up continuing the recent trend. Most were concentrated on the Upper Maurice River. (Expanded upon later in this report.)

American Black Duck

The peak of 3027 on December 28 reflected birds concentrating in open water on the river (at a time when there was little regional open water), but is a modest total. The average is below normal also.

Mallard

Mallard posted another poor season, with peaks and averages well below the early years of the survey.

Northern Pintail

The peak of 810 on March 8 was low when compared to those peaks recorded during the early years of the project. The average of 327 reflects the fact that expected spring build-up never occurred for Pintail. (Pintail, Mallard, and Canada Geese are discussed in greater detail later in this report.)

Other Waterfowl

The PSE&G Estuary Enhancement Project at Bivalve continued to concentrate regional waterfowl. Large numbers of waterfowl were present there through the end of the survey period.

Green-winged Teal were present in record numbers. The 4071 counted on March 23 is a new

river record for winter. They were spread out along the Maurice River, but the bulk of Green-winged Teal were at the Bivalve site.

Good numbers of diving ducks were concentrated along the lower river and in Maurice River Cove in early winter, with 482 **Bufflehead** on January 7 and 308 **Red-breasted Mergansers** on December 15. The peak for **Canvasback** (35) and **Ring-necked Duck** (81) were on the non-survey date of March 14.

One species new to the survey was found. A female **Barrow's Goldeneye** was studied by Sutton at East Point on February 26 and was a glowing highlight of the study. It was the first record for Cumberland County, thought to be the first record for the Delaware Bay, and apparently the first confirmed record for southern New Jersey away from the Delaware River. It was present the following day and seen by several people, but subsequently not seen again. The Barrow's Goldeneye has a northerly distribution and in New Jersey would be at the extreme southern end of its winter range. A sketch of the Barrow's Goldeneye (by Sutton) is on the cover of this report.

Table 2
Waterfowl Recorded on the Maurice River: Winter 2000-2001

SPECIES	DATE: 12/15	12/28	1/7	1/25	2/1	2/13	2/26	3/8	3/23	Avg.
Mute Swan	7	2	2	6	16	16	13	15	**26**	- - -
Snow Goose	450	13	350	**4,300**	3,500	1,550	3,425	1,500	600	1,743
Canada Goose	543	113	145	**1,038**	465	515	437	431	241	436
Wood Duck								**2**		- - -
Green-winged Teal	462	1	15	51	106	582	665	870	**4,071**	758
Am. Black Duck	1,382	**3,027**	938	1,634	879	1,156	1,276	875	1,265	1,381
Mallard	533	242	698	610	**958**	286	480	196	216	469
N. Pintail	89	2	24	273	342	306	629	**810**	465	327
Blue-winged Teal									**2**	- - -
N. Shoveler					3		2	2	**20**	- - -
Gadwall	67		2	8	65	64	81	15	**270**	- - -
American Wigeon	1				1		**8**	1	2	- - -
Canvasback				2	17	22	**23**	19	10	- - -
Ring-necked Duck	**1**									- - -
Greater Scaup	**160**	35	119			13				- - -
Lesser Scaup									**1**	- - -
Scaup (spp.)				15	**135**		1			- - -
Oldsquaw	**1**									- - -
Common Goldeneye	9	44	**160**	30	2	33	35	23	4	- - -
Barrow's Goldeneye							**1**			- - -
Bufflehead	106	20	**482**	16	70	128	80	109	95	123
Hooded Merganser	6	5	2		1	9	5	**10**	2	- - -
Common Merganser		5	31	**47**				3	1	- - -
Red-breasted Merg.	**308**	39	161	91	110	172	78	75	42	120
Total Waterfowl	4,125	3,548	3,129	**8,121**	6,670	4,852	7,239	4,956	7,333	

1 hybrid Common Teal x Green-winged Teal recorded 2/13 & 3/8. Peak counts are shown in **bold face**.

NON-SURVEY DATE SIGHTINGS:
35 Canvasback and 8 Ring-necked Ducks recorded on 3/14.

OTHER RELATED STUDIES

Because of scheduling conflicts, bad weather (wind and rain) and tide stage timing, and because normal and expected spring waterfowl staging was well below average (see above), planned censuses of waterfowl on the Maurice River tributaries were not carried out.

One count was made on March 14 at the Manumuskin Railroad Bridge and 222 waterfowl were recorded (130 Mallard, 40 Black Duck, 20 Green-winged Teal, 2 Common Merganser, and 30 Canada Geese). This total indicates that considerable tributary use occurs; the 130 Mallard are 66% of the Mallards counted on the entire river one week before. It is another clear indication that the entire Maurice River system holds many more waterfowl than are recorded at the standard sampling locations alone.

Because tributary work was not possible, the approved hours of study were transferred to other census efforts as follows.

Fall Raptor Migration Count

Four days of autumn raptor migration counts were carried out at East Point. 324 migrant raptors of 12 species were counted or about 20.3 hawks per hour. Anticipated Red-tailed Hawk flights never materialized, yet counts at East Point continue to confirm and corroborate previous CU studies there. Five Bald Eagles were recorded as migrants over East Point on October 15. Fall migration counts are shown in Table 3.

Table 3

Fall Migration at East Point and Along the Lower Maurice River
Autumn 2000

SPECIES	DATE:	9/14	10/15	11/18	12/6
Black Vulture		3	3	3	**8**
Turkey Vulture		30	50	36	**60**
Osprey		8	2		
Bald Eagle		1	**5**	1	1
N. Harrier		2	4	6	**20**
Sharp-shinned Hawk			**30**	2	1
Cooper's Hawk			**10**	2	1
Red-shouldered Hawk				**3**	1
Red-tailed Hawk		1	5	**12**	9
American Kestrel			1		
Merlin					1
Peregrine		1			1
Total Raptors		46	110	65	103

Peak Counts **bold faced.**

Peregrine also seen along Upper Maurice River on 11/26.

Approximately 4 hours observation each date; about 20.3 hawks per hour.

Lower Maurice River Waterbird Survey

In conjunction with the raptor migration count, waterbird surveys (herons, egrets, waterfowl, shorebirds, and gulls) were tallied along the lower river on eight dates in 2000-2001 (seven fall migration dates and one spring migration date).

The results of this waterbird survey are shown in Table 4. These numbers are primarily a census of the PSE&G Estuary Enhancement Program Bivalve Site, although because birds travel back and forth between sites, adjacent Heislerville WMA mudflat counts are included in the totals.

Totals of shorebirds and waterfowl and other waterbirds at Bivalve are highly significant both in the Delaware Bayshore Region and for New Jersey. The Wood Stork seen on 11/13-14/00 is the first record for Cumberland County. The 56 Brown Pelican on August 10 and the 2 White Pelicans on October 8 (fide Karen Johnson) are both Cumberland County maxima.

While not a "waterbird," the 200-300 Common Nighthawks recorded by Karen Johnson on September 4 at Bivalve and Port Norris are the highest total for South Jersey in anyone's memory, a highly significant migration event.

A Greater White-fronted Goose was reported to CMBO by "L. Keeney," seen March 10 on the Maurice River near Spring Garden and Buckshutem Road. This would constitute a first record for the Maurice River if confirmed, but we never sighted it on the regular survey dates.

Table 4 (page 1 of 2)
Lower Maurice River Waterbird Survey: Fall 2000 and Spring 2001

SPECIES	DATE: 8/4	8/10	8/25	9/14	10/15	11/18	12/6	3/28	4/27	5/2
Brown Pelican	21	56		1						
Double-cr. Cormorant	100	200	1,000	100	300			1	56	15
Great Blue Heron	2	4	4	50	20	10	11	4		
Great Egret	750	1,000	1,500	500	200	1		5	42	8
Snowy Egret	750	1,00	2,500	500	50				38	4
Little Blue Heron		1	1							
Green-backed Heron	2	1	1	2						
Black-cr. Nt. Heron		4	2	45	50		23			
Yellow-cr. Nt. Heron				1						
Glossy Ibis	200	100	60	1					326	100
Mute Swan	50	75	125	100	60		8	21	24	2
Snow Goose								700		
Canada Goose							180	106	69	4
Green-winged Teal				30	50	1,120	170	2,050	1,140	50
Common Teal								2		
Am. Black Duck		250	3	800	150	300	600	1,373	210	175
Mallard	2	4		4	2		9	34	5	
N. Pintail					200		5	242	5	
Blue-winged Teal		10						16	10	
N. Shoveler					20	2		25	7	
Gadwall		2		10	20		8	261	60	
American Wigeon								10	2	
Canvasback								5		
Bufflehead							116	100		
Hooded Merganser								2		
Common Merganser								2		
Red-breasted Merg.							2	13	1	
Ruddy Duck					8					
Wild Turkey			6							
N. Bobwhite		2								
Clapper Rail		4		25					3	2
Black-bellied Plover	2	1	20	35	500	200	50	4	40	300
Semipalmated Plover	250	250	250	150					3	2
Killdeer	4	3	1	2		25	1	3	9	
Greater Yellowlegs	400	200	100	50		5		72	815	3
Lesser Yellowlegs	200	150	100	25			2	63	125	

Table 4 (page 2 of 2)
Lower Maurice River Waterbird Survey: Fall 2000 and Spring 2001

SPECIES	DATE: 8/4	8/10	8/25	9/14	10/15	11/18	12/6	3/28	4/27	5/2
Solitary Sandpiper	2	1								
Willet	2	2	2	1					8	25
Upland Sandpiper		1								
Ruddy Turnstone	4			20						
Red Knot				15						
Semipalmated Sandpiper	10,000	10,000	5,000	1,000					15	20
"peep" sp.					50					
Western Sandpiper	20	20	4	2	2					
Least Sandpiper	1	4	4	50					51	20
White-rumped Sandpiper	4	1		3						
Dunlin					12,000	3,000	2,000	950	6,300	1,000
Short-billed Dowitcher	1,000	2,000	150	50					241	1,500
Long-billed Dowitcher		3					2			
Laughing Gull	1,000	1,000	3,500	1,000	50			2	39	100
Bonaparte's Gull								40		
Ring-billed Gull						✓	✓	✓	237	50
Herring Gull	400	300	500	500	500	✓	✓	✓	115	30
Great Black-backed Gull	50	25	50	500	100	✓	✓	✓	20	4
Gull-billed Tern									2	
Caspian Tern			2	3						
Royal Tern				2	35					
Forster's Tern	150	250	500	250	125				116	40
Black Skimmer	3	4	4	2					139	26

Survey Area = Bivalve, Heislerville WMA, & East Point, excepting April 27 (Bivalve ONLY) and May 2 (Heislerville WMA ONLY)

NON-SURVEY DATE SIGHTINGS:
White Pelican -- 2 on October 8 (fide Karen Johnson)
Wood Stork -- 1 on November 13-14 (fide Bob Barber/Jim Dowdell)
Eurasian Wigeon -- 1 on April 25 (fide "many observers")
possible hybrid ♀ Garganey x Green-winged or Common Teal -- 1 on March 28 (seen by Sutton & Dowdell)
Reeve (♀ Ruff) -- 1 on April 28 (fide Pete Dunne)
Black-headed Gull -- 1 on April 25 (fide "many observers")
Gull-billed Tern -- 8 on August 5 (fide David Mizrahi, CMBO)

ALSO:
Common Nighthawk -- 200-300 on September 4 at Bivalve and Port Norris (fide Karen Johnson)
Red Knot -- 4 seen at Bivalve on the unusual date of February 26 (seen by Dowdell & Sutton)

Natural Lands Trust, Inc. Peek Preserve Sightings

The NLT has been a CU cooperator and partner for many years and the northernmost regular winter count site is conducted from the Peek Property overlook. For NLT interest, site-specific raptor totals are included here as Table 5, and Peek waterfowl counts are included as Table 6.

Cohansey River Winter Survey

In the past, counts have been done along the Cohansey River as a comparison to the Maurice River counts. This was again done in 2001 (as an adjunct study, at no cost to CU), but only on a single date, January 14, 2001, as part of the Annual CMBO / ENSP Winter Eagle Survey. Raptor totals are shown in Table 7, and waterfowl counts are shown in Table 8. Results confirm and corroborate previous findings.

Table 5

Raptor Sightings -- Natural Land Trust Peek Property
Winter 2000 - 2001

SPECIES	DATE:	12/15	1/7	1/25	2/1	2/13	2/26	3/8	3/23
Black Vulture		7	1						
Turkey Vulture		4	15	5	2	8	6	12	12
Osprey									(4)
Bald Eagle									
immature			2			1			
adult		1	2	2	1		1	1	
N. Harrier			3	1	1				
Sharp-shinned Hawk		1		1		1		1	
Cooper's Hawk			1	1	1	1			
Red-tailed Hawk		4	6	4	5	5	4	4	3

Table 6

Waterfowl Sightings -- Natural Lands Trust Peek Property
Winter 2000-2001

SPECIES	DATE: 12/15	1/7	1/25	2/1	2/13	2/26	3/8	3/23
Canada Goose		28	90	40	120	73	80	**125**
Green-winged Teal			1	6	15	50	150	**250**
Am. Black Duck	15	**125**	30	75	60	40	25	10
Mallard	310	375	200	**525**	175	170	40	55
N. Pintail	2	14		**150**	25	20	125	25
Hooded Merganser	2					2		
Common Merganser			**13**					1

High Counts are **bold faced.**

Table 7

Cohansey River Winter Raptor Survey
January 14, 2001

SPECIES	1/14/01
Black Vulture	2
Turkey Vulture	13
Bald Eagle	9
N. Harrier	45
Sharp-shinned Hawk	4
Cooper's Hawk	5
Red-shouldered Hawk	1
Red-tailed Hawk	41
Rough-legged Hawk	1
American Kestrel	2
Merlin	1
Total Raptors	**124**

Table 8

Cohansey River Winter Waterfowl Survey
January 14, 2001

SPECIES	1/14/01
Mute Swan	5
Snow Goose	23,501
Canada Goose	3,089
Am. Black Duck	209
Mallard	131
Hooded Merganser	2
Common Merganser	49
Total Waterfowl	**26,986**

Upper Maurice River Mallard and Northern Pintail Decline

A serious and long-term decline in the numbers of dabbling ducks on the upper Maurice River have been documented by the previous 13 seasons of this study. This drop in ducks (principally Mallard and N. Pintail, but also American Black Ducks) continued in winter 2000-2001. (See previous reports, particularly the 1998 ten-year summary).

This decline in waterfowl use was historically first noted north of the Maurice River Bridge, and then seems to have "spread" to include the northern three sampling stations (Sweet Meadow, Galetto, and Peek). The reasons for this decline have been well debated, centering on:

1. Rise in sea level and increased salt-water intrusion into formerly brackish areas, and

2. Depletion of freshwater inflow to the river system due to increased ground water use in headwaters region (leading also to loss of fresh and brackish habitats due to saltwater intrusion / in-flow and the tidal head moving upriver).

3. Loss of ducks themselves -- Pintails have seemingly bucked the trend of 1990's nationwide waterfowl recovery successes.

4. Increased hunting efforts. In 1987 when the study was begun, there was a 40-day duck season; from 1988 to 1993 a 30-day season; in 1994 a 40-day season; in 1995 and 1996 a 50-day season, and from 1997 to 2000 a 60-day season. Increased duck and goose hunting use of the river could have an adverse impact by driving ducks off of favored upriver use areas.

5. Canada Goose depredation (herbivory) on wild rice. Wild rice is a favored food of Mallards and Pintails (and geese . . .), and no doubt the reason for the former major concentrations on the upper Maurice River.

Exploding regional non-migratory Canada Goose populations are rapidly depleting and destroying the Wild Rice on the upper Maurice River, and this phenomenon is the subject of a major study by the NJ DEP DFW. This could well be the major cause of the decline in duck use of the upper river. Decimation of the wild rice, a keystone plant species on the river, by geese has been reported as 90% between 1995 and 1999 by DFW.

In an attempt to assist in these DFW studies, 2000-2001 CU efforts included the following:

Canada Goose totals shown during current and previous CU winter counts are only a portion of the Canada Geese using the river. The major regional goose concentration is at Bayside State Prison near Leesburg, and many if not most of the geese which spend the day there move to the Maurice River at night, coming in at dusk to potentially feed there.

With a belief that goose increases / impacts are far greater than daytime counts have shown, we counted geese at Bayside State Prison during winter 2000-2001. The results are as follows:

12/5 ..... 940 Canada Geese / 300 Snow Geese
12/28 ..... 700 Canada Geese
1/13 ..... 700 Canada Geese
1/25 ..... 1,150 Canada Geese / 30 Snow Geese
2/1 ..... 850 Canada Geese
2/13 ..... 800 Canada Geese
2/26 ..... 650 Canada Geese
3/8 ..... 350 Canada Geese
3/23 ..... 350 Canada Geese

Therefore, total regional Canada Goose numbers would be the sum of Maurice River numbers and Bayside State Prison census totals. On January 25, the combined total for regional Canadas was 2,188 Canada Geese. All no doubt feed on Maurice River rice at times.

Analysis of Duck Decline and Canada Goose Increase

As a part of this season's project we analyzed all 14 years of data for Mallard, N. Pintail, and Canada Goose. Although totals as presented show numbers for the entire river, it is important to remember that over 95% of the populations of all three species occur on the upper river. Very few Mallards, Pintails, or Canada Geese are recorded south of the three northernmost sampling sites.

Table 9 shows peak and average numbers of Mallard, Pintail, and Canada Goose for all 14 seasons of study. Figure 1 depicts Canada Goose population growth over the 14 years of study, and Figure 2 depicts Mallard and Pintail population decline over the 14 years of study. Both figures are based on data from Table 9.

The scatter diagram showing Canada Goose wintering population on the Maurice River from 1987 through 2001 demonstrates a distinct and significant ($p<0.01$) increase in the numbers of these birds that winter on the river within the survey area. The r value indicates that there is a strong (and positive) relationship between year and numbers of geese present. For average numbers, a definite increase in population is indicated. Sample size = number of years (14).

The scattergrams for both Mallard and Pintail (shown on a single graph) demonstrate negative trends for declining populations, although for average numbers the correlation is only -0.45 and -0.35. The first is marginally significant at the $p<0.05$ level, but the second is not significant at this level. However, if you look at peak values, the r value is -0.70 for Mallard -- which is highly significant -- and 0.34 for Pintail, which is not significant.

A valid interpretation, when looking at the numbers, is that from 1987 through about 1994 there seem to be fewer Canada Geese and more Mallards and Pintails than in the years 1994-2001.

At some point, it may be possible to do some different statistical analysis, and perhaps show that there are relationships in the database -- and at worst we may be able to say there is a strong trend that is not significant for one of the species (although other tests may show a stronger relationship). Overall, these data strongly suggest a downtrend of the two dabblers and a strong increase of geese, and when used in conjunction with DFW research efforts, it appears that there is little question that Canada Geese are impacting Mallard and Pintail use of the upper Maurice River. The probable direct cause is the herbivory which eventually results in loss or complete elimination of the rice which are a prime winter food source for the dabblers, but elimination of cover and interspecies interactions may play an additional role as well.

Table 9

Peak and Average Numbers -- Species of Concern, Wintering Waterfowl on the Maurice River
1987 - 2001

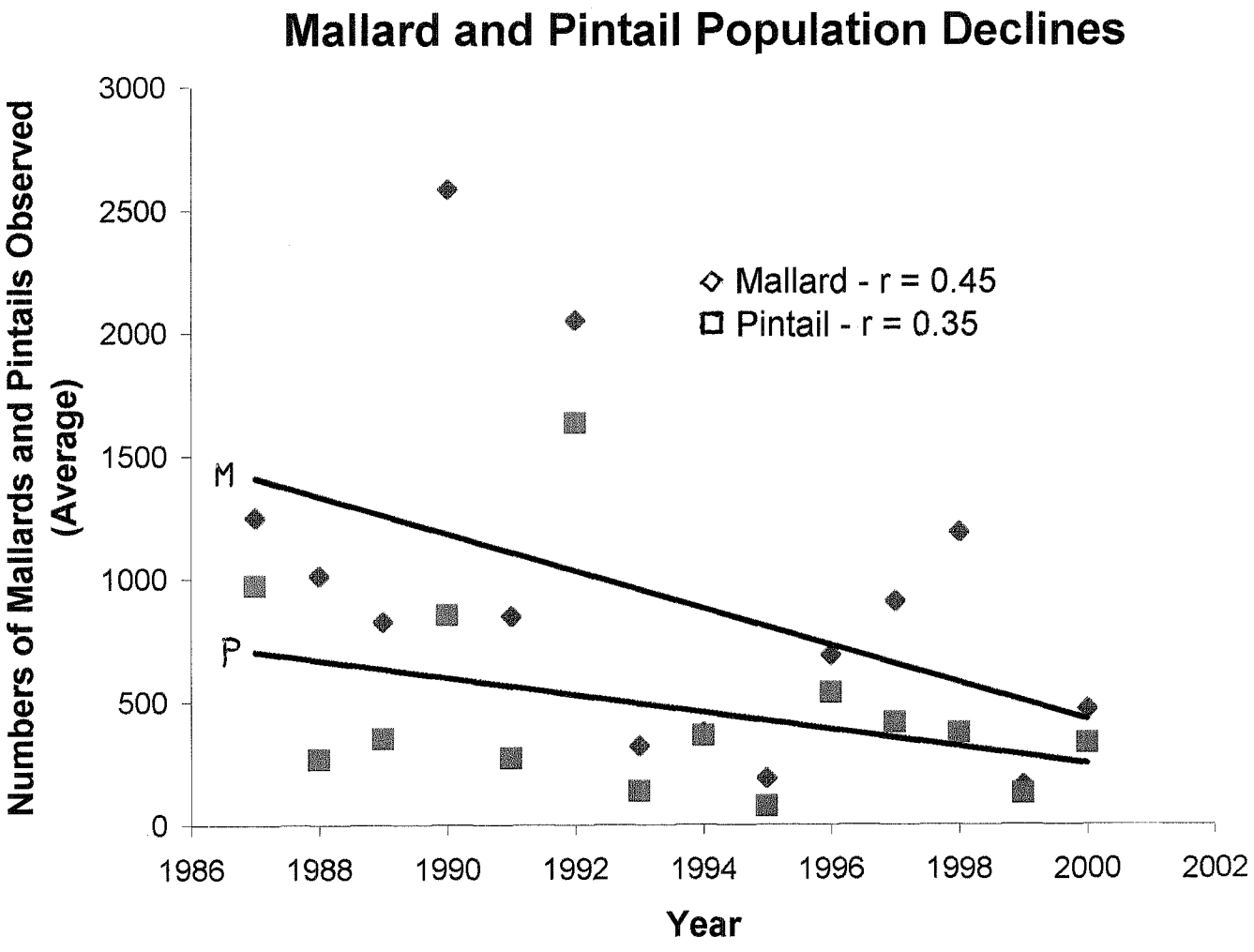
SPECIES	1987-1988 PEAK	1987-1988 AVG	1988-1989 PEAK	1988-1989 AVG	1989-1990 PEAK	1989-1990 AVG	1990-1991 PEAK	1990-1991 AVG	1991-1992 PEAK	1991-1992 AVG	1992-1993 PEAK	1992-1993 AVG
Canada Goose	899	112	110	30	450	110	37	21	1,000	249	187	96
Mallard	3,250	1,247	2,660	1,010	2,179	825	3,758	2,585	2,180	846	3,896	2,048
N. Pintail	3,020	968	547	261	1,227	348	1,503	852	850	266	3,293	1,630

SPECIES	1993-1994 PEAK	1993-1994 AVG	1994-1995 PEAK	1994-1995 AVG	1995-1996 PEAK	1995-1996 AVG	1996-1997 PEAK	1996-1997 AVG	1997-1998 PEAK	1997-1998 AVG	1998-1999 PEAK	1998-1999 AVG
Canada Goose	880	144	290	96	475	134	660	193	709	337	650	262
Mallard	547	318	671	375	356	185	1,320	687	2,868	906	3,325	1,189
N. Pintail	347	131	680	360	240	72	1,712	532	1,012	410	569	369

SPECIES	1999-2000 PEAK	1999-2000 AVG	2000-2001 PEAK	2000-2001 AVG
Canada Goose	775	326	1,038	436
Mallard	370	160	958	469
N. Pintail	300	122	810	327

Figure 2

Maurice River



We sincerely thank Paul Kerlinger, PhD, of Curry-Kerlinger LLC for his gracious assistance in analyzing the Mallard / Pintail / Canada Goose data, and for creating the associated figures herein. We thank Jim Watson, Pat Sutton, and Doyle Dowdell for their assistance on certain surveys.

We also warmly thank Jane Galetto and all the folks of CU for enabling us to continue this ongoing long-term study, one now going into its 15th year. Thank you for the privilege and opportunity to work with CU on the waterfowl and raptor project on the Wild and Scenic Maurice River.

Clay Sutton *
129 Bucks Avenue
Cape May Court House, NJ 08210

James Dowdell
405 Beachwood Avenue
Villas, NJ 08251

* Corresponding author

For Further Reference

All Maurice River ornithological studies 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. Principal publications resulting (either wholly or in part) from the above studies (either funded or co-funded by CU) 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. al. 1988-2000. "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. (Thirteen 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 Research*, 31 (1): 54-58. The Raptor Research Foundation.

Sutton, C., V. Elia, and J. 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.