

Status and Trends of Raptors and Waterbirds on the Maurice River

Cumberland County, NJ

25-year Study Results
1987-2012

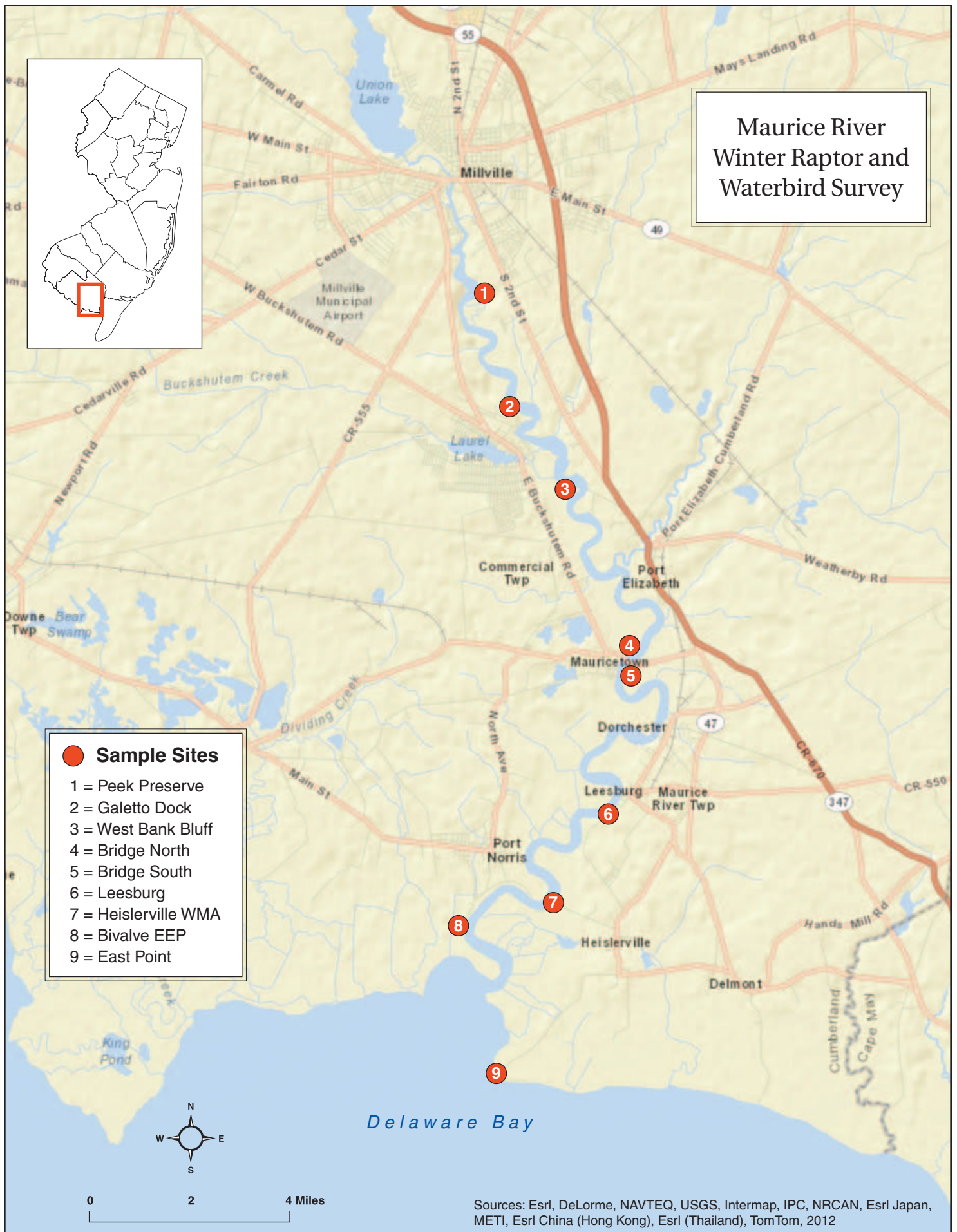
Clay Sutton and James Dowdell
October 2012



Long-term research sponsored by:

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





Introduction and Background

The Maurice River, including its important Menantico, Manumuskin, Muskee, and Buckshutem tributaries, is one of New Jersey's great river systems. The Maurice River joins the Mullica River/Wading River complex, the Tuckahoe and Great Egg Harbor Rivers, and the Cohansey River as one of the largest and most important river and estuary systems in southern New Jersey, and the Maurice system is the second largest river flowing into Delaware Bay after the Delaware River. Despite a long and storied history of settlement in the areas surrounding the river, as well as recent and substantial regional growth and development, much of the Maurice River remains wild and highly scenic, and many areas would qualify as pristine under most standards of review. Indeed, much of the river and several of its tributaries are designated and included in the National Park Service's Wild and Scenic River Program. The Maurice River is certainly one of South Jersey's gems, with pleasing vistas, rich natural resources, wildlife use, and recreation and ecotourism opportunities.

The Maurice River has a well-established reputation for substantial wildlife populations and avian resources, yet prior to 1987 surprisingly little systematic ornithological data had been gathered on the river. Most published avian use data was anecdotal at best — chance sightings or informal counts. Available records hinted at exceptional bird use of the Maurice River region, but offered biologists, planners, and conservation groups little definitive data or mapping for resource management, land use planning options, decision-making, and protection strategies.

Beginning in 1987, numerous studies have now been conducted by CU Maurice River on the birds of the Maurice River region. These research efforts have taken place throughout the seasons, and have investigated the breeding birds of the river and its tributaries, 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 on-going CU Maurice River project has been an investigation of the *status and trends of wintering raptors and waterfowl* on the Maurice River. This study is one of very few true long-term systematic biota monitoring studies conducted in the Delaware Estuary. The winter of 2011-2012 marked the twenty-fifth year of this study. It was initiated to document avian resources and ecovalues in response to major industrial barging and dredging proposals. The early focus was to provide data and input for crucial land-use decisions at the local, state, and federal (coastal zone) levels. Yet when these barging proposals were defeated, CU Maurice River looked well beyond the immediate sites, and well beyond the immediate time frame, to plan and maintain studies that would continue to monitor the health of the living resources of the river over time. Original studies were continued and expanded, based on a philosophy that conservation must be grounded upon in-depth study, sound data, and understanding. In fact, the importance of these surveys became apparent as early as 1994 when the New Jersey Division of Fish and Wildlife began citing them for the North American Wetlands Conservation Act funding of the Maurice River acquisition project. Since then, thousands of acres of wetland and wetland buffer have been added to the preserved project area and a variety of agencies make use of the data.

CU Maurice River has sponsored these studies since the outset, and we are grateful for the stalwart efforts of Clay Sutton and Jim Dowdell. We know there are few long-term avian studies of this kind, particularly any of such duration carried out by the same observers over time. Thank you for your interest in our research, the results of which are summarized in this document. The full report, including detailed tables, figures, references and commentary, can be found on CU Maurice River's website, www.cumauriceriver.org.



About the Core Winter Studies

Initially in response to potential threats to the Maurice River, and thereafter in an attempt to establish baseline data on raptor and waterfowl use, a systematic study was established during the winter of 1987-1988 and continued through 2011-2012 (and is ongoing at present). For this twenty-five year period, data was gathered at nine established point count sites on the 14.4 mile tidal portion of the lower Maurice River watershed. Raptors and waterfowl were counted concurrently for approximately forty-five minutes per site, at a rate of every 10-14 days during the period from the first week of December through the last week of March in order to assess winter populations (as well as spring staging) and distribution of raptors (hawks, eagles and vultures) and waterfowl (ducks and geese). All counts have been conducted by contract field biologists Clay Sutton and James Dowdell. *(Please see map on inside front cover.)*

With goals of discovery, documentation, conservation and protection, efforts were made to obtain information that over time could be used to determine status and trends in avian use and populations. Substantial avian ecovalues were discovered and extraordinary bird-use of the Maurice River was proven. Twenty-five years of systematic sampling of the Maurice has determined raptor use of the Maurice River to be substantial and highly significant for the Delaware Bayshore in New Jersey, and for the entire Mid-Atlantic Region. Principal raptor species include Bald Eagle, Red-tailed Hawk, and Northern Harrier among up to fifteen species observed annually. Winter waterfowl numbers were equally substantial and significant for both the Delaware Estuary and for New Jersey. Populations of Snow Geese, Canada Geese, American Black Ducks, Mallards, Northern Pintail, and Green-winged Teal were found to be substantial and represent some of the highest concentrations reported for the state. Numbers and a wide variety of diving ducks were noted as well, and a total of 35 species of waterfowl have been recorded over the 25 years of study.

In the early years of the study, wintry conditions were frequently encountered; here the upper river is covered with ice and snow.

During the 25-year study, 234 individual winter surveys have been carried out (an average of 9.36 surveys per season), creating a substantial and broad long-term database, and one equaled by few other avian studies in the Delaware Estuary or in New Jersey. Significant increases over the study period are shown for Bald Eagle, Peregrine Falcon, Cooper's Hawk, Black Vulture, Green-winged Teal and Canada Goose. Substantial declines are seen for American Kestrel, Rough-legged Hawk, American Black Duck, Mallard, and Northern Pintail. A moderate increase is found for one hallmark Delaware Bayshore species, the Northern Harrier, still known to many as the "Marsh Hawk."

While average counts and mean counts are of value in comparing data from year to year, and in part reflect the amount of time over the winter season that birds spend on the river (as well as the inevitable impacts of both daily and prolonged weather conditions upon count results), the peak seasonal count for many species far better reflects the true numbers present. For example, the peak of 8,120 American Black Ducks recorded in the winter of 1987-1988 far better reflects the true number present than the average seasonal count of 2,611. Weather, including snow, ice, cloud conditions, haze, and heat waves can greatly vary and alter the results of any given survey. Tide can be a key factor in waterfowl observability, and in our annual written reports, we have repeatedly noted that early winter season waterfowl hunting pressure tends to greatly disperse ducks and geese — leading to counts lower than the true numbers present. This is why a minimum of 7-10 surveys per season were required to truly assess bird populations within the system.

Observations were done at nine locations on the 14.4 mile tidal Maurice River; here Jim Dowdell scans Maurice River Cove at East Point.



FINDINGS: Waterfowl

Diving ducks can be abundant on the lower river and in Maurice River Cove, yet variations in numbers no doubt have more to do with food resources than seasonal temperatures or climate change. In some winter seasons, large numbers of scoter and scaup are present near the mouth of the river, attracted by exceptional “sets” of mollusks — small clams and oysters — that vary greatly from year to year in quantity and location. The 1998-1999 winter season was exceptional, when over 5,000 scaup and 5,000 scoter were present in Maurice River Cove. Common Goldeneye numbers vary greatly as well, but this seems more related to the amount of ice in the Delaware Bay; Goldeneye are known to be present in the bay in good numbers every year, but highest counts occur in colder winters when offshore ice in the bay pushes them to ice-free waters in Maurice River Cove. To a lesser degree, this is true of Red-breasted Merganser, a signature but variable species of the Maurice River Cove area. Common Merganser numbers are also highly variable, present on the upper tidal river in large numbers only in cold winters when ice pushes them south from lakes and rivers far to the north. Among diving ducks, Bufflehead seem to exhibit a clear increasing trend, as numbers have grown considerably over the five-year segments of this study (for unknown reasons). Bufflehead are found mainly at Heislerville WMA, on the lower river, and in Maurice River Cove. **Table 1** shows all-time peak one-day counts for waterfowl species on the Maurice River over the twenty-five years of study, and what follows is commentary on the most common and abundant species.



A Black Duck springs into the air, a representative and always appreciated sight on the Maurice River — in winter and at all seasons.

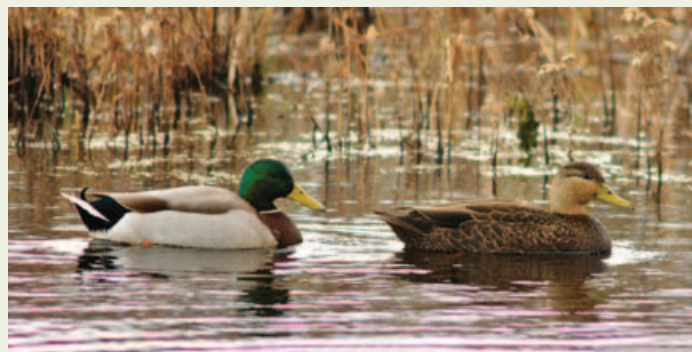
DISCUSSION: Winter Waterfowl of the Maurice River

The well-known trend toward the milder falls and winters associated with accelerating climate change has generally meant that waterfowl numbers are lower today than historically. Twenty-five years of data shows that the largest numbers of ducks and geese occur during the colder winters when birds are pushed here by harsh conditions — snow cover and freeze-ups to our north. During milder winters, many waterfowl simply remain north of the Delaware Bay region. In the later two five-year segments of the study, most winters have seen above average temperatures, and some winters have been well above average, particularly the last season of study — winter 2011-2012 — one of the warmest over-all winter seasons ever recorded.

A second clear observable trend is the loss in numbers of upper river waterfowl from the low salinity areas dominated by wild rice. This drop in waterfowl numbers is presumed to be due to both the impacts of increasing salinity on wild rice and the effects of Canada Goose herbivory on wild rice stands. Canada Geese are well-known to feed heavily on the shoots (and seeds) of wild rice, and booming populations of “local” (non-migratory) Canada Geese have decimated many stands of rice on the upper tidal regions of the Maurice River. The increasing salinity — the “salt line” moving steadily north up the Maurice — is linked in part to increasing fresh water withdrawals upstream but more emphatically to sea level rise associated with climate change. Also, the increasingly more frequent drought conditions seen in the mid-Atlantic, including southern New Jersey (also linked to climate change), mean far less fresh water moving down the river, another factor in the moving salt line and loss of wild rice.

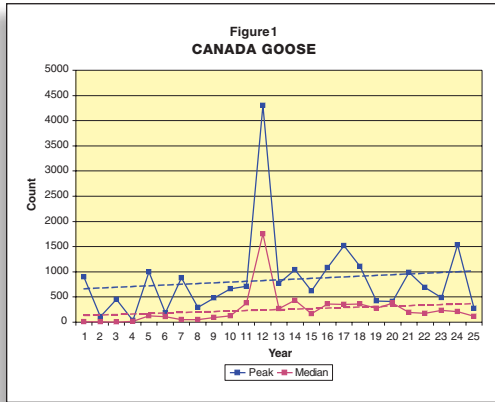
TABLE 1
Peak One-Day Counts of Wintering Waterfowl
on the Maurice River in
Twenty-five Years of Study: 1987-2012

Species	WINTER
	Peak One-Day Count
Gr. White-fronted Goose	1
Snow Goose	14,000
Ross's Goose	1
Brant	25
Canada Goose	1,538
Tundra Swan	19
Mute Swan	76
Wood Duck	22
Gadwall	565
American Wigeon	260
Eurasian Wigeon	1
American Black Duck	8,120
Mallard	3,896
Blue-winged Teal	12
Northern Shoveler	154
Northern Pintail	3,293
Green-winged Teal	5,850
Common Teal	2
Canvasback	51
Redhead	1
Ring-necked Duck	703
Greater Scaup	930
Lesser Scaup	140
scaup species	5,100
Common Eider	2
Harlequin Duck	1
Black Scoter	100
Surf Scoter	2,160
White-winged Scoter	200
scoter species	5,008
Long-tailed Duck	28
Bufflehead	482
Common Goldeneye	900
Barrow's Goldeneye	1
Hooded Merganser	81
Common Merganser	102
Red-breasted Merganser	331
Ruddy Duck	102
Unidentified diving ducks	4,000



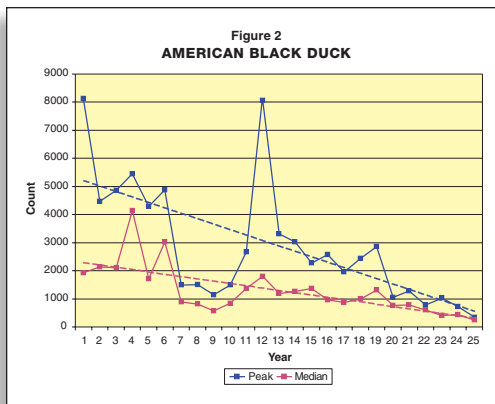
Mallard (left) and Black Duck (right) numbers on the Maurice River in winter have seen clear and disturbing downward trends.

FINDINGS: Waterfowl, by Species



Canada Goose is widespread along the river, but usually most numerous on the brackish upper river. Canada Geese show a clear increasing trend, with best counts, highest average peak count, and highest average of average (mean) counts coming in 2002-2007. **Figure 1** shows the trends in peak and median counts on the Maurice River for Canada Goose populations for all twenty-five years of study. A moderate increasing trend is observed (see trend line), perhaps cited as moderate only because most of the burgeoning Canada Goose population in the Maurice River region is usually found in daylight hours on the vast Bayside State Prison grounds and not within the main river survey route.

Snow Goose is a flagship or signature species of the Delaware Estuary. In any given season, Snow Goose numbers vary greatly from survey to survey as these somewhat nomadic geese range widely up and down the Delaware Bayshore. Snow Geese are characteristically found in the salt marshes on the lower river. An average of 3,000 to 4,000 Snow Geese are found each winter. The peak daily high count was 14,000 recorded in 1990. Numbers and use have remained remarkably steady on the Maurice River over time, with no trend seen — an interesting finding in light of frequent references in other publications to growing Snow Goose populations in the Delaware Estuary region.



American Black Ducks are a key species on the Delaware Bay marshes. Numbers have declined precipitously during 25 years of monitoring on the Maurice River.



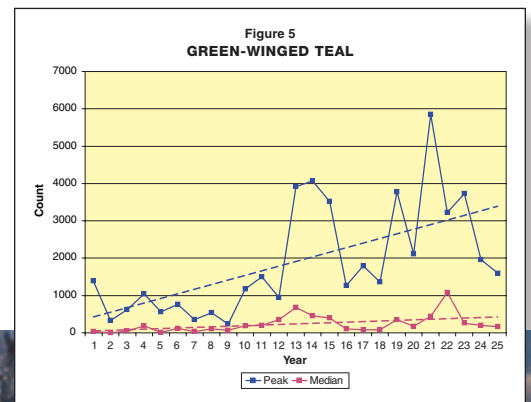
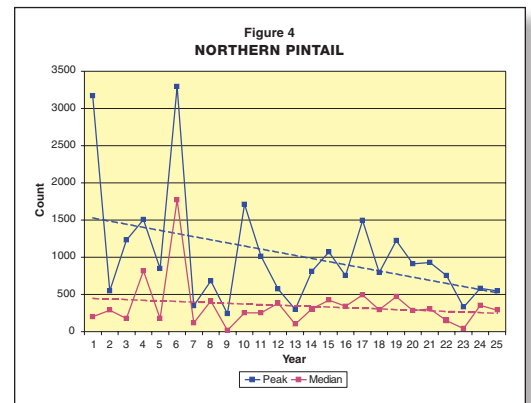
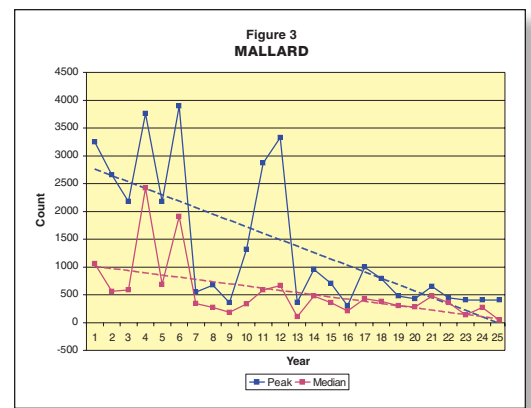
Northern Pintail, while still seen in numbers in winter, has shown a marked downward trend as brackish marshes decline on the upper tidal Maurice as a result of a number of factors.



Mallard and Northern Pintail are highly representative species of the low-salinity brackish tidal (wild rice) marshes of the Maurice River. Mallard and Northern Pintail are found primarily on the upper tidal river, with largest numbers usually recorded in late winter and early spring. Pintails, along with Green-winged Teal, are also numerous at the tidal impoundments of the Commercial Township PSEG Estuary Enhancement Program (EEP) site at Bivalve. Early March is generally best — the time of peak spring migration build-up or “staging” for these handsome ducks. Average numbers vary considerably due to the severity of the winter, but peaks of nearly 4,000 Mallards and 3,000 Pintails have been recorded. Both have shown considerable declines. **Figure 3** shows the long-term trend in peak and median counts for Mallard on the Maurice River over twenty-five years. Over the course of the study, Mallard peak counts have declined 83%. Average counts have declined by 80%. Unlike Pintail, Mallards have not just moved to the lower river impoundments — Mallards are simply gone. Numbers today are a shadow of those recorded in the early years of the study. **Figure 4** presents the trend in Northern Pintail peak and median numbers on the Maurice over time. For Pintails, an overall steady decline is observed. More than any species, Pintails seem to have left the dwindling rice marshes of the upper river, but have instead gravitated down-river to the emergent EEP mudflats and shallow waters at Bivalve. Pintails peak counts have declined by 56%, and average counts by 48% in the Maurice River study area.

Green-winged Teal peak and median counts have increased substantially over time as is seen in **Figure 5**. Green-winged Teal show a clear upward trend, particularly in peak counts. At one time widely and evenly distributed along the river (and usually numerous at Heislerville WMA), today very large numbers are consistently present at the Bivalve EEP site. The increasing numbers are perhaps primarily linked to the quality shallow water and emergent mudflat habitat now offered at Bivalve, although the trend toward milder winters no doubt plays a role in more teal remaining farther to the north (in New Jersey as opposed to more southern states) in the winter.

Snow Geese, migrants from the far north, are a signature species of the Maurice River and Delaware Bay in winter. Numbers are remarkably stable.



FINDINGS: Raptors

TABLE 2

**Peak One-Day Count of Wintering Raptors
on the Maurice River
in Twenty-five Years of Study: 1987-2012**

Species	WINTER
	Peak One-Day Count
Turkey Vulture	266
Bald Eagle	48
Northern Harrier	43
Sharp-shinned Hawk	18
Cooper's Hawk	10
Northern Goshawk	1
Red-shouldered Hawk	26
Red-tailed Hawk	87
Rough-legged Hawk	4
Golden Eagle	2
American Kestrel	10
Merlin	2
Peregrine Falcon	4

The Northern Harrier is a hallmark species of the Maurice River and the Delaware Bayshore.



A hunting Bald Eagle flushes a flock of Pintail near Bivalve. Raptors and waterfowl were counted concurrently; often the best waterfowl counts were taken on days of intense eagle activity, as hunting eagles flushed ducks that might otherwise have remained unseen in hidden guts and coves.



Fifteen species of raptors have been documented in winter on the Maurice River, with all but one (Osprey) being true wintering species. At least thirteen, and sometimes fourteen, species are encountered every winter season. **Table 2** shows all-time peak one-day counts of raptors over the twenty-five winter seasons of study. Four species show clear and strong increasing trends, four show stable or moderate increasing trends, and two species exhibit precipitous declines over the twenty-five year period. As with waterfowl, the figures below present all twenty-five years of data for both peak counts and median counts. Trend lines were created in Microsoft Excel.

DISCUSSION: Winter Raptors of the Maurice River

Twenty-five years of systematic winter counts of vultures, hawks, and eagles have greatly contributed to our understanding of these signature symbols of the wintertime Maurice River marshes as clear pictures of status and trends have emerged. Findings have documented the Maurice River to be exceptional and important raptor habitat by any criteria or measures. As with waterfowl, it can be difficult to ascertain whether patterns and trends are linked to true changes in the overall population or to more localized changes and impacts that may be affecting distribution in the region and/or in the flyway. Sometimes the picture is clear: with Osprey, Bald Eagle and Peregrine Falcon, nationwide populations are booming as these better-known species recover from the ravages of DDT.

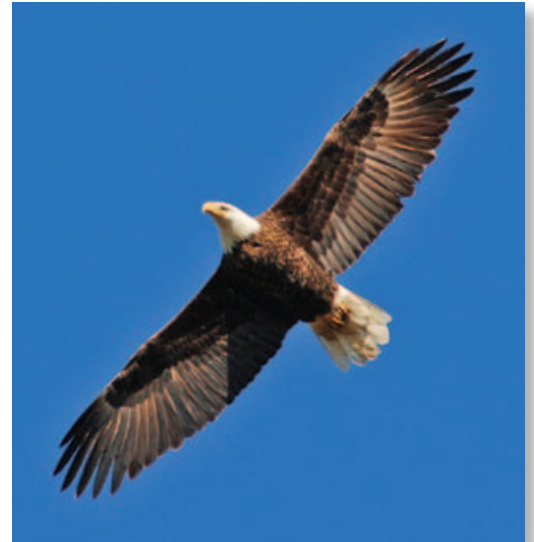
For other species the picture is less clear. Rough-legged Hawk, a far northern breeder, is thought to be remaining largely north of the Mid-Atlantic region in recent winters, as less snow cover means they simply do not travel as far south to find hunting opportunities. But as noted in the species accounts to follow, the preferred winter habitat for Rough-legs in the region — high marsh and meadow/pastureland — is rapidly disappearing due to the loss of salt hay farms, open marsh water management (mosquito control), and to a greater, more pervasive degree, sea level rise. The loss of Rough-legged Hawks in our region is seen in these twenty-five years of winter data, as well as in fall migration counts.

Likewise, the American Kestrel is well-known to be declining nation-wide, and particularly in the East, as habitat loss, perhaps combined with loss of its prey base due to pesticides, has resulted in many regions almost completely losing the kestrel as a breeder. On the Delaware Bayshore there remains a lot of open space, but precious little of it today is preferred Kestrel habitat. Mechanized agriculture, no-till practices, the loss of dairy farms and pastureland, the proliferation of nurseries, and of course suburbanization, combine to leave little if any classic Kestrel habitat in much of the region. And, as Rough-legged Hawks and Short-eared Owls once did, Kestrels also used salt hay farms for hunting to a great degree in winter. The Kestrel is virtually extirpated on the Delaware Bayshore as a breeding bird and as a wintering bird. It is a great loss of a beautiful and beneficial hawk that once, and in the very near past, helped enliven and define the Bayshore countryside.

Fortunately, many other raptor species are doing far better. Red-tailed Hawks and Northern Harriers, two other hawks that are so highly representative of the Maurice River, appear to be remarkably stable and even increasing over time. Turkey Vulture numbers are steadily increasing, and Black Vultures are in fact booming on the Bayshore. Cooper's Hawks are completing a comeback from near regional extirpation, and are a principal wintering raptor of the Maurice River once again. Bald Eagle and Peregrine Falcon require little comment, but maybe some quiet reflection. Both have seen a comeback from the dark days of DDT that few wildlife managers or biologists expected. As this twenty-five year data set and many others amply illustrate, Bald Eagles and Peregrines again grace the Bayshore skies in large numbers. Maurice River studies show a remarkable upward trend for these raptors over time; in fact these studies chart the return of the Bald Eagle almost in its entirety, from the absolute lows of the mid 1980s to the large groups sometimes seen today. The Bald Eagle is back as a wintering bird, a migrant, and a breeding species. And while we don't know what impact the continuing trend toward milder winters may have on Bald Eagle long-term average numbers in the future (by far the most eagles are present during the coldest winters), for now, documenting the return of the Bald Eagle to Maurice River skies has been the most heartening and rewarding aspect of these long-term studies.



American Kestrel has shown an alarming downward trend both locally and regionally. Except during fall migration, they are nearly absent from the Bayshore today.



A remarkable increase has been found in Bald Eagle numbers — as wintering birds, migrants, and breeders on the Maurice and throughout the Bayshore region.

A view from Survey Site 2, Galetto dock, in winter



FINDINGS: Raptors, by Species



A Bald Eagle in winter perched on an Osprey's summertime home

Turkey Vulture is by far the most numerous raptor species present on the Maurice River in winter or at any season. Vulture populations are known to have increased substantially in both the Mid-Atlantic and the Northeast in recent decades, and the Maurice River is no exception. In fact, it is long-term studies like these on the Maurice River that underpin our broader knowledge of increases or decreases in the status of birds. Turkey Vultures have increased slowly in our study area — from an average 72 in 1987-1992 to 99 in 2007-2012. While not showing a visibly steep trend line in our studies, it is important to note that Turkey Vulture median counts have doubled over this long-term study.

Black Vulture, formerly thought of as the “southern vulture,” has rapidly increased its range in the northeastern states. Black Vulture populations have exploded, with theories ranging from climate change/global warming (increasing temperatures allowing for increased feeding success due to the increased thermal activity and soaring that supports searching for food) to the burgeoning White-tailed Deer population that offers greatly increased feeding opportunities through road kills and sport hunting. **Figure 6** gives a clear picture of the steady increase of Black Vultures over time. The trend lines show a strong and significant increase in both peak and median numbers. Also, average counts have increased steadily over twenty years — from an average 4.92 Black Vultures present in 1987-1992 to an average of 22.4 Black Vultures present in 2007-2012, an increase of 355%. Peak counts have shown an increase of 95%.

Bald Eagle is a hallmark species on the Maurice River, and has shown the most dramatic and remarkable increase among raptors. Peak and average counts have steadily risen throughout all five segments of study. **Figure 7** presents trends in peak and median counts for Bald Eagle over all twenty-five years. When comparing the first five years of study to the most recent five years, Bald Eagle peak counts show a 284% increase, and average counts show a 441% increase. Today an average of over 25 Bald Eagles are seen on the river most days in winter. The recovery on the Maurice River mirrors and at the same time strongly represents the Bald Eagle's comeback in New Jersey and throughout North America from the ravages of the DDT era.

Northern Harrier is an icon of the Delaware Bayshore winter marshes. Harriers have shown a moderate increasing trend in these studies, a somewhat surprising find. The fact that Harriers have remained steady, and have in fact increased over the twenty-five years of study, despite the many habitat changes observed in the Maurice River system during this time, is welcome news. We speculate that the trend toward mild winters may be off-setting both sea level rise and the loss of high marsh habitat for Harriers by allowing for greater winter survivability.

Sharp-shinned Hawk wintering numbers have remained quite steady over twenty-five years, as is discerned by the complete lack of a trend in either peak and median counts. A secretive, forest-dwelling hawk, this small accipiter is more numerous than recorded daily counts indicate. Great fluctuations in peak counts are due only to those years when an early winter official count (early December) coincided with a late “fall migration” event, with numerous migrant Sharp-shins encountered along the lower river.

Cooper's Hawk shows a significant increasing trend on the Maurice River over twenty-five years. As **Figure 8** shows, Cooper's Hawks have increased steadily and dramatically, and today are over twice as common on the Maurice River than at the outset of these studies. This reflects known region-wide trends as this bird completes a recovery from population declines linked to the DDT era, and before that to the

Figure 6
BLACK VULTURE

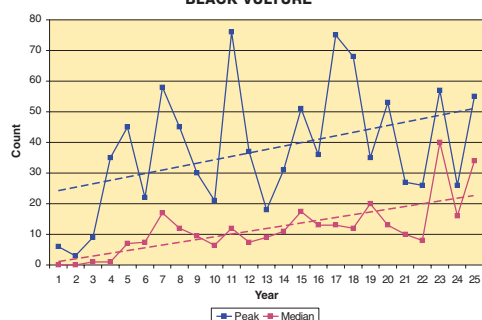


Figure 7
BALD EAGLE

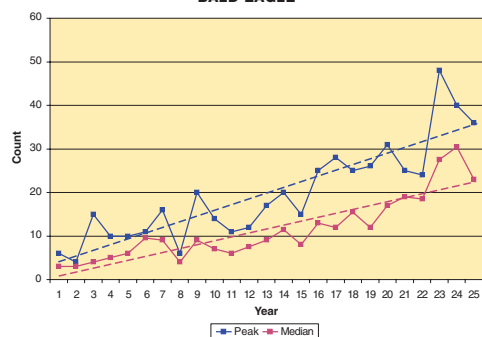
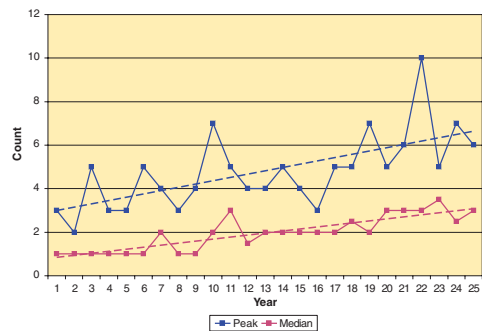


Figure 8
COOPER'S HAWK



persecution of hawks in the 1930s-1950s. Like Sharp-shinned Hawks, Cooper's Hawks are furtive and secretive in winter, and far less detectable than Red-tailed Hawks or Northern Harriers, which readily hunt in open areas in daylight. Actual Cooper's Hawk numbers present in the area are no doubt considerably higher than recorded averages would suggest.

Red-tailed Hawk, the most encountered and most conspicuous of all Maurice River winter hawks, has shown a slight increase over time. This trend may well be linked to warmer fall and winter seasons, and resultant delayed late migration into the region. The exceptional all-time high daily winter count of 87 in December 2003 was likely due to the scheduled winter survey coinciding with a very late fall migration movement. The opposite can occur as well; recently, the extremely warm fall of 2011 brought very few migrants, and therefore fewer wintering birds, leading to an all-time low winter median count. Highest Red-tailed Hawk counts are usually in early December or in late March and may exceed 50 birds, at a time when migrants mix with local resident Red-tails.

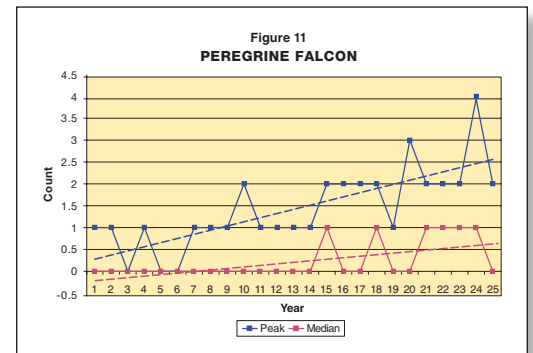
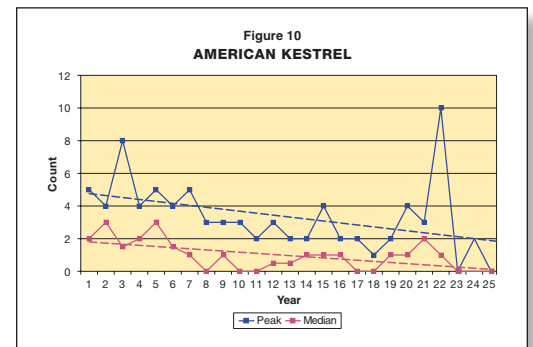
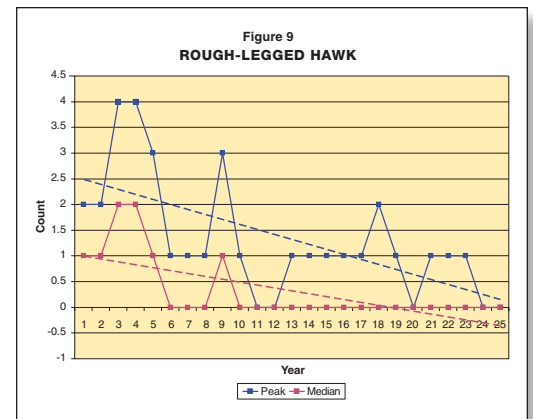
Rough-legged Hawk, a migrant to our area from high Arctic breeding grounds, has shown a serious decline over twenty-five seasons of study. Initially it was an expected bird, albeit in small numbers/low density, but today it is a peripheral species; in fact not recorded during the final two winters of our survey (see **Figure 9**). When comparing the first five years to the last five years, Rough-legged peaks have seen an 81% decrease, and average numbers have decreased by 95%. This steady decline is in part linked to climate change and has been noted throughout the Mid-Atlantic region (as many birds remain north of us during mild winters). However the more localized Maurice River area decline is likely due in part to the near complete loss of their preferred high marsh, salt hay (*Spartina patens*) habitat at Thompson's Beach, East Point, Bivalve, Robbinstown, etc. The creation of the EEP impoundments, formerly high marsh, has had significant adverse impacts on near-obligate (in our area) high marsh habitat hunters such as Rough-legged Hawk and Short-eared Owl, at the same time benefiting other species such as shorebirds and waterfowl.

American Kestrel, once a common daily bird on the Delaware Bayshore, has declined alarmingly over the twenty-five years of study. When comparing the first five years to the last five years of this study, the Kestrel peak counts have declined by 44%, and the average count per season has declined 69%. This severe downward trend in both peak and median numbers is shown in **Figure 10**. American Kestrel has declined precipitously as a breeding species and a wintering species in New Jersey and throughout the Northeast and Mid-Atlantic states. On the Maurice River (and the Delaware Bayshore) its disappearance is probably linked to the loss of farmland, fallow fields and pastures, as well as the loss of high marsh habitats. The American Kestrel is in grave trouble, as this and many other studies attest.

Peregrine Falcon. While the picture for American Kestrel, our smallest falcon, appears quite dim, that of our largest, the Peregrine, is much brighter. Peregrines have increased dramatically as DDT has been slowly eliminated from the marshes and as the New Jersey Endangered and Nongame Species Program reintroduction effort has come to fruition. **Figure 11** shows the steady upward trend for Peregrine Falcon on the Maurice River over time. When comparing the first five years to the most recent five years, Peregrines have shown a 200% increase in their peak numbers, and an amazing 791% increase in the average number per winter survey. Two pairs of Peregrines currently nest in the Maurice River region, and one or two other individuals usually winter in the area prior to returning to northern nesting territories. This comeback has meant that Peregrines are almost a daily sight on the Maurice (in winter and at all seasons), generally on the lower river where they are frequently seen hunting shorebirds or teal at Heislerville WMA or at Bivalve — an always spectacular sight.



The Red-tailed Hawk is the most numerous and conspicuous hawk seen on the Maurice River in winter. Numbers appear stable.



Supplemental Expanded Studies

In addition to the 25 years of core winter studies, CU Maurice River has also supported adjunct and expanded seasonal studies that looked beyond only the winter, and that examined avian use year round. The following briefs are expanded upon in the full report.

Spring and Fall Waterbird Migration

The term waterbirds is generally applied to wetland and open water species such as loons, cormorants, wading birds (herons, egrets, and ibis), rails, terns, and gulls. Prior to the 2000-2001 season, during the regular raptor and waterfowl surveys only anecdotal records had been kept regarding Maurice River waterbird numbers, and these records were generally of rare or unusual bird sightings. Beginning in the summer and fall of 2001, information was gathered and recorded regularly and systematically on all waterbirds as a formal adjunct to the core winter raptor and waterfowl studies.

In the 2003-2004 season, the seventeenth year of Maurice River long-term studies, research efforts were expanded to encompass the full seasonal cycle. Autumn migration period counts were undertaken, beginning in July and August and running through November, when the core winter sampling period began anew. Spring migration was monitored as well, from the beginning of April through early June. While the frequency of sampling is not as intense as in the core winter period, the Maurice River has been monitored at least once a month from fall 2003 up to the present time (and usually more often during peak migration periods such as May and October). To date, in addition to the 234 days spent investigating core winter raptor and waterfowl use, 187 days of expanded studies effort have now been carried out in fall (a total that includes 70 days of targeted hawk migration counts in 1989 and 1990) and 54 days of effort in spring. This is a total of 241 days of expanded seasonal investigations to date, with a grand total of 475 days of Maurice River avian studies over the past twenty-five years. Spring and fall data for the Maurice River study area supplement the substantial and significant existing winter bird-use information. Most importantly, these findings validate core winter studies by confirming that significant bird use of the Maurice occurs at all seasons.

Our surveys indicate that waterbird use of the Maurice River is substantial and significant, yet varies considerably from season to season and from year to year. Loons and cormorants use the river from fall through spring, and Double-crested Cormorants now nest at Heislerville WMA as well. Northern Gannets also use Maurice River Cove in fall and spring. Gull numbers are large at all seasons, including a noteworthy annual late winter-early spring gathering of Bonaparte's Gulls at East Point and Heislerville WMA. The endangered Least Tern uses the area in small numbers in spring and summer, and a sizable flock of Black Skimmers (endangered) stages at Heislerville WMA each year in May before moving to Atlantic coastal barrier islands to breed. Clapper Rail are abundant spring through fall (far more abundant than survey numbers show for this extremely shy species), and many remain in winter — particularly during milder years. The Maurice River has long been well-known too for the large fall concentrations of Sora in the upriver wild rice marshes, but survey methods/protocol do not allow for counting this tiny and highly secretive "railbird." Heron and egret use is substantial throughout the seasons. Great Egrets, Snowy Egrets, and Black-crowned Night-Herons use the river early spring through late fall, and now nest in a large rookery at Heislerville WMA. Great Blue Herons are found at all seasons in numbers.

Autumn Hawk Migration

One of the outstanding features of the Delaware Estuary, and a phenomenon that gives the region a national significance and notoriety, is the autumn hawk migration that first sweeps west along the shore of New Jersey's Delaware Bay and then south across the narrowing Bay and on through the Delmarva peninsula. A major concentration or bottleneck for this annual hawk flight occurs around East Point at the mouth of the Maurice River.

As long as it has been known that major hawk concentrations occur at Cape May, it has also been well known that not all raptors recorded there cross the Delaware Bay. Many return north up the western side of the Cape May peninsula and west along the upland edge of the Delaware Bay — particularly during the strong northwest winds of autumn cold fronts. It is theorized that, rather than risk being blown to sea during a water crossing of Delaware Bay, many hawks instead return north up the peninsula, and finally turn west along the Delaware Bayshore in an attempt to find a shorter and safer crossing site — in effect flying around Delaware Bay.

Fall raptor migration counts have been conducted by CU at East Point, NJ, since 1987 (primarily and in-depth from 1989 to 1991) to monitor the hawk migration moving west around Delaware Bay. All-time peak one-day hawk counts

As an adjunct to core winter studies, hawk migration has been monitored along the lower Maurice River since 1987, with targeted fall raptor counts carried out from 1989-1991. Here a Cooper's Hawk migrates overhead near East Point.



achieved through these adjunct efforts are shown in **Table 3**. The results of the East Point Hawkwatch effort have been reported elsewhere, and will not be reiterated here in depth. In 1990, the primary count season, a full time hawkwatch was conducted; a total of 308.5 hours of observation (all by Sutton and Dowdell) occurred on 60 days spanning from 9 September to 7 December. In summary, 9,042 raptors of 17 species were recorded as migrants at East Point in 1990. This was an average of 150.7 hawks per day or 29.3 hawks per hour, compared to the Cape May Point hawkwatch's 36.9 hawks per hour. The East Point total was 34.6% of the total hawks counted at Cape May during the same 60 day period. Except for Osprey, Merlin, and Peregrine Falcon — species known not to be averse

TABLE 3
Autumn Hawk Migration:
Peak One-Day Counts of Fall Raptors
on the Maurice River in Twenty-five Years
of Study: 1987-2012

	FALL
Species	Peak One-Day Count
Black Vulture	47
Turkey Vulture	176
Osprey	73
Bald Eagle	36
Northern Harrier	51
Sharp-shinned Hawk	671
Cooper's Hawk	90
Northern Goshawk	4
Red-shouldered Hawk	13
Broad-winged Hawk	2,000
Swainson's Hawk	1
Red-tailed Hawk	195
Rough-legged Hawk	5
Golden Eagle	3
American Kestrel	495
Merlin	76
Peregrine Falcon	13

to water — virtually all birds were moving west around Delaware Bay. Prior to the 1990 full-season study, almost all knowledge of the return flight up and around the Bayshore was speculative and anecdotal, but from that pivotal count and subsequent corroborating efforts, we now have a far clearer picture of the dynamics of coastal plain raptor migration through New Jersey and the Mid-Atlantic. It is important to note the crucial role that the high-quality stopover habitat provided by the Maurice River and Delaware Bayshore plays in this annual pageant.

Maurice River Shorebirds

The Delaware Bay is well known as a migratory shorebird staging area of international significance, as shorebirds gather in spring to feed on the eggs of Horseshoe Crabs. The Maurice River area has also long been known to host significant numbers of these visitors. Both anecdotal data from birders and NJ DFW ENSP aerial surveys have shown high counts of shorebirds in spring on the Delaware Bay beaches of the lower Maurice River near East Point. What was less-known and understood is the extent of shorebird use of other tidal portions of the Maurice River Basin — those areas away from the immediate Delaware Bay beaches. Also, little was known about southbound (fall) shorebird use of the river environs. Beginning in 2000, CU Maurice River began to focus on migratory shorebird use of the Maurice River, and in the fall of 2003 and spring of 2004, systematic counts were initiated. Shorebird counts were conducted at three primary locations on the lower Maurice River: East Point, Heislerville WMA, and Bivalve.



Short-billed Dowitcher group at Bivalve, Site 9

Focused spring and fall shorebird counts have documented large numbers of these birds using Maurice River mudflats and impoundments. In the twelve years of focused study, 34 species of shorebirds have been recorded on the Maurice River, some in small numbers and some in very high numbers. All-time peak one-day spring shorebird counts are shown in **Table 4**. Numerous Black-bellied Plover, Semipalmated Plover, Greater Yellowlegs, Lesser Yellowlegs, Semipalmated Sandpiper, Dunlin, and Short-billed Dowitcher are found each spring on the Maurice River, traveling between Heislerville WMA and Bivalve depending on the tide stage and resultant water levels. CU Maurice River's ten years of shorebird counts have augmented DFW ENSP aerial censuses of the Delaware Bayshore and further

substantiate the need to protect the resources of the lower Maurice River. The presence of such high numbers of migratory shorebirds on the river's mudflats and tidal impoundments should call for management of resources and habitats that will promote the long-term protection and conservation of these long-distance migrants. Migratory shorebirds are one more among many documented and proven ornithological highlights of the Maurice River, and brightly colored, restless, feeding shorebirds by the thousands are yet one more reason that the Maurice River is a very special place indeed.

TABLE 4
Peak One-Day Counts of Spring Shorebirds
on the Maurice River 2000-2012

	SPRING
Species	Peak One-Day Count
Black-bellied Plover	860
American Golden Plover	1
Semipalmated Plover	5,075
Piping Plover	1
Killdeer	20
American Oystercatcher	4
Black-necked Stilt	4
American Avocet	1
Greater Yellowlegs	815
Lesser Yellowlegs	575
Solitary Sandpiper	3
Willet	100
"Western" Willet	1
Spotted Sandpiper	7
Whimbrel	1
Marbled Godwit	5
Ruddy Turnstone	192
Red Knot	625
Sanderling	450
Semipalmated Sandpiper	28,050
Western Sandpiper	1
Least Sandpiper	932
White-rumped Sandpiper	26
Pectoral Sandpiper	6
Dunlin	14,000
Curlew Sandpiper	3
Stilt Sandpiper	5
Ruff	1
Short-billed Dowitcher	12,334
Long-billed Dowitcher	1
Wilson's Snipe	107
American Woodcock	2
Wilson's Phalarope	1
Red-necked Phalarope	1
Peak single day total shorebirds	45,487

Summary and Conclusions

For the Maurice River, twenty-five years of intensive study has now taken our perceptions of status and trends from “suspected” to the realm of documented and proven. An amazing 234 individual winter surveys (and 241 additional expanded season surveys) have given us a database of unprecedented and significant proportion, and an exceptional perspective from which to draw our conclusions on the health of the Maurice River system and the species dependent upon it. And, importantly, we have a baseline from which we can compare the effects and impacts of future changes on the river, be they man-made or natural.

Against a backdrop of recent, frequent and severe storms, as well as widespread and frequent drought, it is studies such as these on the Maurice River that may provide small but important pieces of the entire puzzle of climate change and sea-level rise. Sea level rise on the Atlantic Coast has been proven as accelerating and among the most severe that has been documented. As this report is written, 2012 is expected to be the hottest on record ever in the Northeast. Droughts continue throughout much of the nation, impacting waterfowl productivity and raptor nesting and survival in a myriad of ways such as low rodent/prey availability (which is suspected in the low 2011-2012 winter raptor numbers on the Maurice). In short, climate change and sea level rise are presenting a matrix of possible scenarios and interactions of various factors. The availability of these long-term avian use studies on the Maurice River may play a role in understanding possible climatological causes and effects. Recent weather events only underscore the importance of maintaining such studies over time.

As the goals of this long-term project state, the key objective of the survey efforts was to discover and

provide cornerstone avian resource data to be used in guiding river management, protection, and appreciation. With the publication of this twenty-five year summary report, this goal has been substantially met. Of note:

- Core studies have yielded significant insight on the status and trends of wintering raptors and waterfowl species.
- Supplemental studies have proven substantial use of the Maurice River by autumn raptors, spring and fall shorebirds and waterbirds at all seasons.
- Findings have been used in CU Maurice River advocacy efforts, including National Park Service Wild and Scenic River designation, recommendations in the Rare and Threatened Species listing process, oil spill protection, prioritization of conservation purchases, wildlife management decisions, and making testimony in land-use proceedings.
- Studies have been a cornerstone of CU Maurice River’s extensive awareness and environmental education efforts on many levels and over time.

Very few areas on the Delaware Bayshore or elsewhere in New Jersey can today offer such solid proof of their environmental quality as can the Maurice River. In fact, thousands of acres have been protected in and adjacent to the study area using the survey’s findings as evidence of the importance of these habitats for avian use. CU Maurice River, through foresight and commitment to sound and long-term environmental studies, provides a foundation and underlying strength to its exemplary protection and advocacy efforts. Such strong baselines and up-to-date knowledge yield high confidence that perceived environmental trends are either positive or negative, and that actions can and will be based on strong data and irrefutable evidence.



About the researchers and authors of these studies

CLAY SUTTON is a life-long resident of Cape May County, where he has worked as an environmental planner, environmental program administrator, vice-president of an environmental consulting firm specializing in threatened and endangered species, and for the past fifteen years as a self-employed environmental consultant, naturalist, and field biologist. Clay was the senior author of *The Scientific Characterization of the Delaware Estuary for the Delaware Estuary Program*, USEPA (1996, 228 pages). Clay is a co-author, with Pete Dunne and David Sibley, of the classic, and newly updated *Hawks in Flight* (Houghton Mifflin, 1988; Second Edition, 2012), and Clay and his wife Pat co-authored the acclaimed *Birds and Birding at Cape May* (Stackpole Books, 2006, 568 pages), among many other titles. Clay previously authored *Birding Cumberland: A Complete Guide to Birds and Birding in Cumberland County*, which was co-sponsored by CU Maurice River and Cumberland County.



Clay Sutton

James Dowdell

JAMES DOWDELL lives in Cape May County, where he has worked as a naturalist, field biologist, and with wildlife consulting firms for over thirty years. For many years he was part of the DFGW team that conducted Delaware Bay aerial shorebird censuses in spring. He is one of New Jersey's most highly respected birders and natural history authorities. His interests extend well beyond birding, into herpetology, lepidoptery and botany. He has both worked and birded in most of the fifty states, bringing deep perspective and skill to the Maurice River studies. Jim and his wife Deb formerly owned the popular store "For the Birds" in Cape May.

Shorebirds at Heislerville WMA in spring





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CU Maurice River

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The Lower Maurice River and the Causeway Bridge, Survey Sites 4 and 5