State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

MARK N. MAURIELLO
Acting Commissioner

Land Use Management
P.O. Box 402
Trenton, NJ 08625-0402
Telephone: (609) 292-2178
Fax: (609) 633-0750

August 20, 2009

Bradley M. Campbell
Suite 1100
50 West State Street
Trenton, New Jersey 08608

Re: Delsea Offshore Wind Energy (Delsea)

Dear Mr. Campbell,

As you know, on June 11, 2009 officials from the New Jersey Department of Environmental Protection (Department) met with Delsea counsel and principals to discuss the above project proposed for the Delaware Bay and contiguous wetlands in southern New Jersey. During the meeting, the Department continued to express deep concerns regarding the proposed project's impact to avian and other resources and indicated that sufficient data currently exists to determine that the project, or any large scale wind energy project, is inappropriate for that area given its strategic location on the North American flyway and importance to migratory and other bird populations.

At that time, Delsea asked whether the Department would consider how Delsea could perform iterative, low cost avian population/impact studies to determine the project's viability without significantly investing in meteorological towers or large scale radar studies. Since that meeting, the Department has considered this suggestion.

However, in considering this issue, the Department has determined that we have, over many years of study and evaluation, developed sufficient information regarding the diversity, scope, and importance of avian resources in and around the Delaware Bay. Based on these data, we conclude that, at this time, this area is not appropriate for a large-scale wind turbine project due to concerns with impacts to migratory and other bird populations. The Department has determined that the richness of current data makes it unnecessary for additional data to be collected or additional studies to be undertaken to document potential avian impacts. As such, we conclude that there would be no value added to Delsea undertaking additional studies at this time and that the Delaware Bay is not an appropriate area for development of wind energy.

We have compiled the information pertinent to this decision and are attaching same for your information. Additionally, I am attaching a copy of a letter the Department recently received from the Atlantic Flyway Council on the same topic.

In addition to the impacts to migratory birds, the review of the permit application for the test structures has raised additional concerns from programs within the Department. The State Historic Preservation Office has indicated that there is a potential for impacts to historic resources and therefore has requested both archaeological and visual impact analyses. The Department's Endangered and Non-game Species Program is concerned with impacts to endangered fish, wildlife and plant species. The Department's Bureau of Shellfisheries has recommended denial of the permit application due to impacts to oyster seed beds in Delaware Bay. Also, the State of Delaware's Department of Natural Resources & Environmental Control has submitted comments to the Department that expressed concern regarding impacts to shellfish and migratory bird populations resulting from installation of the test towers and a large scale wind farm in Delaware Bay.

The Department continues to support and encourage alternative and wind energy projects in areas where impacts to natural resources are manageable and appropriate and appreciates Delsea's interest helping us meet Governor Jon S. Corzine's ambitious alternative energy goals.

I am of course available to discuss this at your convenience.

Very Truly Yours,

Scott Brubaker

Scott Brubaker
Assistant Commissioner
Land Use Management

cc: Jeanne Herb, Director, Policy, Planning & Science
Enclosure

Migratory Bird Use of Delaware Bay with Respect to Risks of Wind Energy Development

New Jersey Department of Environmental Protection
Division of Fish and Wildlife

Fish and Wildlife

Report edited by: Dave Jenkins and Kathleen Clark
Contributors: Kathleen Clark, Christine Kisiel, Amanda Dey, Dave Golden, Ted Nichols, Paul Castelli

Abstract: The Delaware Bay and its wetlands support a diverse and abundant assemblage of migratory birds such that the region is internationally recognized for its natural resources. Delaware Bay is a major spring shorebird stopover in the Western Hemisphere, one of only four estuaries in North America where over one million shorebirds concentrate during migration. In Delaware Bay, spring migrating shorebirds spend several weeks replenishing fat reserves needed to continue migration to Arctic breeding grounds. Of particular importance are red knots, which are a candidate species for federal listing under the Endangered Species Act. Over 80% of the Atlantic Flyway population of red knots stages on Delaware Bay during spring migration. Delaware Bay also supports more than 500,000 waterfowl consisting of over 20 species, including an average of 35,000 American black ducks. During the fall and winter, southern New Jersey contains the largest concentration of black ducks on earth; approximately 35% of New Jersey's black ducks are found along Delaware Bay. In the open waters of the Bay, 200,000 to 400,000 sea ducks have been observed in winter, including the highest concentration of black scoters on the Atlantic coast. Thousands of songbirds and raptors migrating in fall become concentrated along the Delaware Bay coast in New Jersey since the open water of the Bay creates a barrier to migration. As a result, these migrating birds "stack up" along the Bayshore and subsequently move up and down the Bayshore seeking a favorable spot for crossing. The temporal and spatial use patterns of these bird groups are such that large numbers of birds reside in, and travel through, Delaware Bayshore marshes and open waters in low altitude flight. The birds of Delaware Bay include groups that are vulnerable to collision with structures like wind turbines. The mosaic of Delaware Bay waters, wetlands and forests supports the largest concentration of bald eagles in New Jersey in both breeding and wintering seasons, and represents the most vital region to the eagle's recovery in the state.

Because of the exceptional aggregations of birds found here, Delaware Bay has received international recognition by a number of organizations. It is recognized as a Western Hemisphere Shorebird Reserve Network site of international importance. It is a Wetland of International Importance under the Ramsar Convention on Wetlands of International Importance (an international treaty for the conservation and sustainable utilization of wetlands). BirdLife International and Audubon recognize Delaware Bay as an Important Bird Area of global significance. As such, New Jersey and Delaware have regional, national and international responsibilities to protect birds and their habitats in Delaware Bay. Guidance on the siting of wind turbines specifically advises avoiding areas of high concentrations of birds and bats, such as migratory staging areas. Delaware Bay exemplifies such a bird staging and migration area in which wind turbines should not be permissible.

Introduction

The Cape May peninsula and the Delaware Estuary waters and wetlands support a diverse and abundant assemblage of wildlife, and are collectively considered one of New Jersey's, and the country's, most valuable natural resources. This report summarizes the information on significant migratory bird populations of Delaware Bay, and how the patterns of habitat use by these birds suggest that wind energy development carries particularly high risks to those populations. There are four general categories of significant migratory bird populations addressed: spring migratory shorebirds, fall migratory raptors and passerines, migrating and wintering waterfowl, and resident and wintering bald eagles.

Aggregates of more than 500,000 shorebirds use the estuary each year during spring migration (Myers et al. 1987, Clark et al. 1993). These shorebirds make daily cross-bay flights at altitudes below 150 m to exploit available foraging and roosting habitats. Each May-June, a large percentage of the Western Hemisphere's population of red knots is present along the bay, along with significant numbers of five other species. In winter, hundreds of thousands of waterfowl reside in Delaware Bay. Of particular importance is one of the largest concentrations of American black ducks on earth, for which the Delaware Bayshore marshes provide critical stopover habitat during both spring and fall migrations as well as throughout the winter. The Cape May region is home to one of the most significant raptor and songbird migrations in the world. These migrants become concentrated along the New Jersey coast of Delaware Bay and in the southern portion of Cape May peninsula. The open water of Delaware Bay creates a temporary barrier to many migrating birds, causing many to stop, rest and feed on the peninsula, and to move along the Delaware Bayshore wetlands looking for better crossing points. Delaware Bayshore marshes, fields and forests also host a growing population of bald eagles that congregate around open waters in winter, taking advantage of the convergence of migrating and wintering waterfowl and fish. The Bayshore has been the epicenter of bald eagle recovery for New Jersey, and continues to support the core of the nesting and wintering populations.

The diversity and abundance of wildlife using the Delaware Estuary has led to national and international recognition of these areas. Delaware Bay has received international recognition as a Western Hemisphere Shorebird Reserve Network site, a Wetland of International Importance under the Ramsar Convention, and an Important Bird Area of global significance. Similarly, Cape May peninsula is considered by many authorities as one of the top birding destinations in the world. As such, New Jersey and Delaware have regional and national responsibilities to protect birds and their habitats in Delaware Bay.

Stopover, defined

Cape May peninsula and Delaware Bayshore is a well-recognized, vital stopover site for migrating birds, including waterfowl, shorebirds, raptors, woodcocks and neotropical migrants (Allen and Peterson 1936, Stone 1965, Krohn et al. 1977, Wiedner and Kerlinger 1990, Wiedner et al. 1992, Herpetological Associates, Inc. 1993, McCann et al. 1993, Niles 1996, Sutton and Sutton 2006). A migratory stopover is "an area with the combination of resources (i.e., food, cover, and water) and environmental conditions (temperature, precipitation, presence and absence of predators and competitors) that promotes occupancy by individuals of a given species in migratory passage" (Morrision et al. 1992). During migration stopovers, it is essential for birds to replenish fat reserves, rest, and locate cover from predators and harsh weather conditions (Biebach et al. 1986, Barlein 1987, Greenberg 1987, Moore and Kerlinger 1987, Winker et al. 1992, Moore et al. 1993, Niles et al. 1996, Moore and Aborn 2000). The ability of migrants to fulfill these requirements affects success throughout migration and at wintering grounds, and influences productivity during the breeding season (Moore and Kerlinger 1987, Myers et al. 1987, Moore et al. 1993).

A description of the significant birds and their habitats in the Delaware Estuary

1. Migratory Shorebirds

Delaware Bay is a major migration stopover, unique because of the occurrence of the Western Hemisphere's single-largest horseshoe crab (*Limulus polyphemus*) population. Horseshoe crab spawning and shorebird migration coincides in spring (Botton et al.1994), and abundant horseshoe crab eggs attract up to one million shorebirds including 80% of the Western Hemisphere's population of red knots (*Calidris canutus rufa*) and large numbers of six other species (ruddy turnstone [*Arenaria interpres*], sanderling [*Calidris alba*], semipalmated sandpiper [*Calidris pusilla*], dunlin [*Calidris alpina*], short-billed dowitcher [*Limnodromus griseus*]) (Clark et al. 1993, Niles et al. 2008). Horseshoe crab eggs provide rapid weight gains of >80% in less than 14 days (Gillings et al. 2009). Spring migration is time-constrained, and Delaware Bay is the last critical stop for shorebirds before lifting off to frozen Arctic breeding grounds (Niles et al. 2008). Fat reserves obtained on Delaware Bay are critical for adult survival (Baker et al. 2004) and successful reproduction.

The abundance and distribution of migrant shorebirds on Delaware Bay have been documented by weekly aerial surveys during May and early June, from 1986 to 2009 (Clark et al. 1993, New Jersey Division of Fish and Wildlife [NJDFW] unpublished data). Up to 500,000 migrant shorebirds annually use beaches, sandy creek mouths and some sod banks that stretch almost continually along the Delaware Bay shore -- from Town Bank north to the Cohansey River, and from Woodland Beach south to Cape Henlopen in Delaware (Clark et al. 1993, Niles et al. 2008). NJDFW biologists have also counted shorebird using marshes and mudflats, and estimated that marshes support more than twice the number of shorebirds counted on Bayshore beaches (Burger et al. 1997).

A review of published papers, unpublished NJ Division of Fish and Wildlife reports, and data from various studies (including radio telemetry, resightings of marked individuals, aerial and ground surveys) shows that large numbers of shorebirds use Bayshore beaches as their main foraging areas (sandy beach is preferred spawning habitat for horseshoe crabs); shorebirds make multiple day and night-time flights to use these beaches and roost on a tidal schedule.

To find optimal food resources, radio-tagged red knots make frequent daytime flights among foraging beaches in both New Jersey and Delaware. Red knots make frequent nighttime flights directly from roost sites on the Atlantic coast to Bayshore foraging areas on falling tides (Sitters 2001, 2003, 2005). Day and nighttime flights from New Jersey roosts to New Jersey and

Delaware Bayshore beaches are made directly over land and Bay waters (Figure 1), and birds make frequent flights across Delaware Bay (Sitters 2005).

Spatial and Temporal Patterns of Use

Shorebird movements between foraging and roost habitats are integrally linked to tidal cycles. Birds make frequent flights between habitats to take advantage of food resources on falling tides, roost areas on rising tides, to avoid human disturbance, and to escape predators (Burger and Olla 1984, Clark et al. 1993, Meyer 1999, Niles et al. 2008).

Researchers in Delaware Bay have been banding and color-marking red knots since 1996, and have used alpha-numeric codes (readable from a distance) since 2004 (NJDFW reports at http://www.njfishandwildlife.com/ensp/shorebird_info.htm). Resightings of individually-marked red knots have been made each spring since 2004. This large data set has not been extensively analyzed to develop baywide movement patterns for red knots, ruddy turnstones and sanderlings. However, in May 2007, at least 14% of marked red knots resighted (481 of 3,429), 6% of marked ruddy turnstones (103 of 1,767), and 7% of marked sanderlings resighted (80 of 1,085) made cross-bay flights (NJDFW and DEDFW unpubl. data). An examination of a sample of seven individually-marked red knots in 2007 showed that movement distances for knots that made cross-bay flights ranged from 24 km to 138 km in an observation period of 2-10 days (Table 1).

Table 1. Movement distances of a sample of individually-marked red knots (n=7) that made cross-bay movements in May 2007. A complete analysis of all marked individuals resighted within season (2004–2009) is not yet available (A. Dey, NJDFW, unpubl. data).

Bird ID	Obs. Period 2007 (No. Days)	No. Obs.	No. Del. Bay Crossings	Total Distance (km) Between Obs. Locations
Fo(AES)	May 24-25 (2)	2	1	23.79
Fr(XC)	May 17-27 (11)	3	2	57.37
Fl(5N)	May 26-31 (6)	3	1	70.27
Fl(AEU)	May 17-27 (11)	4	2	70.78
Fl(7A)	May 16-21 (6)	4	2	82.52
Fl(28)	May 14-21 (8)	5	2	104.27
Fl(AJE)	May 17-26 (10)	5	4	138.57

A more detailed picture of individual red knot movements is derived from radio-telemetry studies (Meyer 1999; Sitters 2001, 2003, 2005) and direct counts of red knots during daytime aerial (Clark et al. 1993, NJDFW unpubl. data) and Stone Harbor roost counts (Sitters 2001, 2003, 2005). In each of 2001, 2003, 2004, and 2005, between 50 and 65 red knots were tagged with radio transmitters and tracked using aerial and ground tracking and stationary radio receivers (NJDFW and DEDFW unpubl. data). These data represent a minimum characterization of movements typically made by red knots on Delaware Bay, since birds are more mobile than we can detect with conventional radio telemetry.

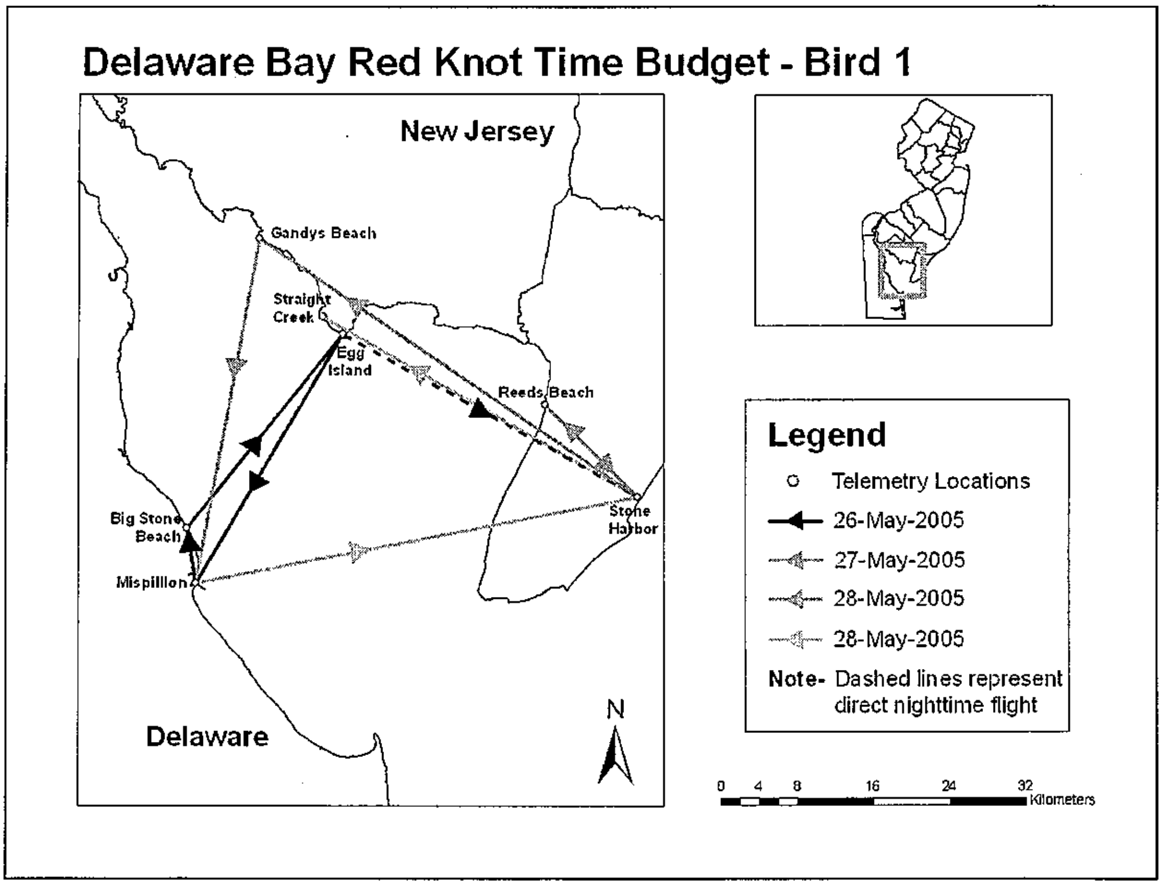
An examination of telemetry data shows the following general movement patterns of radio-tagged red knots (Sitters 2001, 2003, 2005):

- Radio-tagged red knots make frequent day- and nighttime flights between Atlantic coast roost and Bayshore foraging beaches, and among Bayshore foraging beaches.
- Red knots make direct, cross-bay flights between New Jersey and Delaware. At least 34% of radio-tagged red knots were detected making 1-7 cross-bay flights during the stopover period.
- The flight paths documented with telemetry indicate the entire red knot population, as well as other shorebird species using Delaware Bay, are in constant diurnal movement along all Bayshore beaches, directly over land and Bay waters, and over Cape May peninsula, throughout the duration of the May-June stopover period.
- Seventy to 80 percent of the red knot migrant population in Delaware Bay roost on Stone Harbor Point in Hereford Inlet, and 20%-30% roost on Egg Island (estimated from radio tracking data and direct counts; Sitters 2001, 2003, 2005). Radio-tagged red knots made direct flights from Delaware and northern Bayshore beaches of New Jersey to roosting areas at Stone Harbor Point (18-47 km away), and frequently left Stone Harbor Point on the falling tide at night to fly directly to foraging areas (18-47 km away). Elapsed time between departures and arrivals of tagged birds was sufficiently short to indicate that birds could have only made a direct flight over land and water to reach their destination.
- A number of day and nighttime flight paths were documented by radio telemetry (Sitters, 2001, 2003, 2005):
    1) Between Stone Harbor roost and northern Bayshore beaches in New Jersey
    2) Between Egg Island roost and northern Bayshore beaches in New Jersey
    3) Between Stone Harbor and Delaware beaches
    4) Between Egg Island/northern Bayshore and Delaware Beaches
    5) Between Egg Island and southern Bayshore beaches in New Jersey
    6) Between Egg Island and Stone Harbor roosts
- Observations of red knots departing from foraging areas (Reed's Beach) and arriving at the Stone Harbor roost reveal that these flights, generally made at dusk or night (~8:30 PM-9:30 PM), are low-altitude (i.e., <150 m) flights directly over Cape May peninsula (A. Dey, pers. obs., 2005-2009).

Red knots make frequent flights to seek out optimal food resources and roost sites. While many flights occur in daylight among foraging sites, red knots also actively fly and forage at night, making direct flights from roost sites to foraging areas on the falling tide (Sitters 2001, 2004, 2005). Two locations, Stone Harbor Point in Hereford Inlet and Egg Island Point, were consistently used as day and nighttime roosts by a major portion of the red knot migratory population each May (Sitters 2001, 2005). Direct flights to and from Stone Harbor Point were made during the day and at night to foraging sites that included Jenkins Sound (≤3 km west), Reed's Beach (13 km west), northern New Jersey Bayshore including Moore's Beach (23 km), Egg Island (35 km), Fortescue (45 km), Gandy's Beach (48 km), and directly across Delaware Bay to Mispillion Harbor (47 km southwest) (Sitters 2005). Direct flights to and from the Egg Island roost were made to foraging sites at Straight Creek (5 km), Fortescue (5 km), Moore's Beach (18 km), and to Stone Harbor (35 km; Sitters 2005).

There is no reason to suspect that the movement patterns of radio-tagged red knots are not representative of the red knot population on Delaware Bay. Therefore, it is likely that thousands of birds at any given time are making both diurnal and nocturnal flights across Delaware Bayshore marshes and Delaware Bay open waters to find adequate foraging and roosting opportunities.

Figure 1. Example of radio-tagged red knot that made multiple cross-bay movements and direct, nighttime flights in May 2005. Bird 1 was detected on 9 dates over a 14-day period (May 17-May 30, 2005), it used an average of 2.27 sites per day (range 1-5 sites used in a given day), and made 8 cross-bay movements during the observation period (2 in one day from Egg Island, NJ, to Mispillion, DE, back to Egg Island then to Stone Harbor to roost for a minimum of 90 km traveled in one day).



Vulnerability

The concentration of large numbers of shorebirds, coupled with high frequency of flights (day and night) across Delaware Bay wetlands and waters, increase the risk of impact from wind turbines. This is especially the case if fog or poor weather further reduces nighttime visibility. The patterns of shorebird movement across the wetlands, mudflats, and across the peninsula and open Bay waters make it unlikely that siting turbines in any portion of Delaware Bayshore lands or waters could be done without risk of high levels of mortality.

These elements of shorebird stopover in Delaware Bay increase risk of negative impacts from wind turbine development:

- The concentration of more than one million shorebirds in Delaware Bay each spring (May–early June).
- The patterns and frequency of shorebird movement among Bayshore beaches, marshes and roost areas, as well as across Delaware Bay open waters.
- Shorebirds' behavior of flying at night, moving among roosting and foraging areas on a tidal schedule.
- Shorebirds are mobile in both fair and poor weather conditions; poor conditions may reduce visibility and thus increase the risk of accidental impacts.
- Local shorebird flights are lower altitude (<150 m) flights typical of birds searching out good foraging areas, not high altitude flights characteristic of active long-distance migration.
- Compounding the risk to shorebird populations is the fact that a major portion (~80%) of the Hemisphere's *Calidris canutus rufa* red knot population (a candidate for federal listing) and major portions of five other shorebird species are present in Delaware Bay at the same time each May. Precipitous declines in red knots, related to over harvest of horseshoe crabs, have left this small population (estimated 18,000–27,000 individuals) extremely vulnerable to endangerment, or total loss, from any catastrophic events (e.g., oil spill in Delaware Bay, red tide, or loss of essential habitat). For small populations, additive losses may reduce the effective population size below a viable level, from which red knots may not recover (Shaffer 1981, Baker et al. 2004).

2. Migratory Raptors and Songbirds

Challenges faced by migrating birds intensify when a migrant is forced to confront an ecological barrier such as an inhospitable landscape, a mountain range, or a large water body (Alerstam 1981, Kerlinger 1989, Barrow et al. 2000, Berthold et al. 2003). Those challenges of migration include weather conditions, the risk of mortality from predation and other threats, the availability of resources at stopovers and bird body condition (Alerstam 1981, Kerlinger 1989, Alerstam and Lindstrom 1990, Moore and Aborn 2000, Schaub and Jenni 2001, Berthold et al. 2003). Habitats adjacent to ecological barriers have been recognized as critical stopovers for migrants that concentrate there prior to making the energetically demanding flight (Sprunt 1975, Moore et al. 1993, Barrow et al. 2000).

Migratory raptors at the Cape May stopover are faced with the challenge of making the energetically demanding, 18-km water crossing of Delaware Bay. Some raptor species readily make water crossings, including ospreys (*Pandion haliaetus*), merlins (*Falco columbarius*), northern harriers (*Circus cyaneus*) and peregrine falcons (*Falco peregrinus*; Kerlinger et al. 1985), but must use powered flight in the absence of thermals over water. Sharp-shinned hawks (*Accipiter striatus*), Coopers hawks (*Accipiter cooperii*), American kestrels (*Falco sparvarius*), northern goshawks (*Accipiter gentilus*), vultures and many species of Buteo hawks are reluctant to negotiate water crossings in adverse weather conditions (Allen and Peterson 1936, Kerlinger 1989). Many species fly back inland to use the resources of the peninsula and the Bayshore and wait for favorable weather to cross the Bay, or they follow the Bayshore coast north in search of a narrower crossing (Allen and Peterson 1936, Kerlinger 1989, Niles et al. 1996). In a seminal study of raptor migration at Cape May, 73% of sharp-shinned hawks arriving at Cape May Point between mid-September and mid-November were observed flying north along Delaware Bayshore, while just 27% made the water crossing near Cape May; sharp-shinned and other forest hawks flew north following the forested edge, while open-habitat hawks like American kestrels flew north across marshes and creeks (Allen and Peterson 1936). Most of the raptors and songbirds migrating through Cape May in fall are juveniles making their first migration, so they are inexperienced and more likely to be affected by local habitat changes and prey availability (Kerlinger 1989). Therefore they must forage during migration, and the peninsula and Bayshore provide the resources needed for these migrating raptors and songbirds to refuel (Niles et al. 1996).

The Cape May peninsula and Bayshore offers areas of concentrated resources for southbound migrants (Wiedner and Kerlinger 1990, Wiedner et al. 1992, McCann et al. 1993, Niles et al. 1996). The region is rich in prey for raptor species, including migrating passerines for sharp-shinned hawks, Cooper's hawks, northern harriers, northern goshawks, peregrine falcons; fish for ospreys; and insects for American kestrels. Migrants also find resting and roosting sites in shrub and forest habitats on the peninsula and along the Bayshore (McCann et al. 1993). The quality and quantity of these and other habitats within the region, however, are in decline due to increases in development. Between 1984 and 2001, residential development on the lower 20km of the peninsula increased by 23%. Between 1972 and 1995, development destroyed over 40% of forest, shrub-scrub and field habitats (Niles 1996).

Surveys conducted by Niles et al. (1996) on the peninsula during fall, 1984 and 1986, demonstrated that migratory raptors were associated with habitat throughout the Cape May stopover but concentrated near the southern tip of the peninsula. Surveys of the concentration area (i.e., the lower 10 km) showed that raptors were distributed throughout the concentration area, using a variety of habitats and avoiding developed land (Niles et al. 1996). In 2002, a follow-up study found a reduced concentration of raptors and an even distribution throughout the northern portions of the peninsula (Frank 2007). The loss of habitat in the lower peninsula has caused raptors to fly and forage (i.e., stop over) in a larger area of the peninsula than previously found (Frank 2007). These findings, and the continued habitat loss in the lower peninsula, have led to the recommendation that land-use protections in place for the lower 10 km be extended to the entire peninsula, and the lower 20 km at a minimum (Frank 2007). The changes observed in the peninsula emphasize the importance of maintaining good conditions in the stopover region: continued loss and degradation of habitat will ultimately reduce the carrying capacity of the stopover. Lower carrying capacity of the Cape May stopover (the peninsula and the Bayshore), will translate to reduced raptor and passerine populations that can survive migration (Myers et al. 1987, Moore 2000).

Migrating songbirds also funnel into Cape May peninsula, even though their migration strategy differs somewhat from raptors. Songbirds migrate at night using both the night sky and terrestrial landmarks (Able 2001). Many birds, especially inexperienced juvenile birds, get carried by northwest winds to the coastal barrier islands and beyond, and must make their way back to land in early morning hours (Wiedner et al. 1992). In a study of migrating songbirds in the mid-Atlantic region (New Jersey, Delaware, Maryland, Virginia), biologists documented the distribution of Neotropical migrant songbirds in coastal and interior areas on the Cape May and Delmarva peninsulas (McCann et al. 1993). Four distribution patterns emerged:

1) Migrant abundance and species richness were significantly greater near the coast (0–1.5 km) than in areas farther away from the coast (1.5–3 km).
2) Bay coastal zones (in New Jersey, 0-3 km from the Delaware Bayshore) have higher abundances of migrants than seaside coastal zones or peninsula interiors (10–23 km from the mean high tide line).
3) Migratory songbirds are more abundant on barrier islands than the coastal mainland.
4) Migrants are associated with particular habitats on a species-specific basis; i.e., migration stopover and breeding habitat affinities were similar for individual species.

This study (McCann et al. 1993) and others (cited below) made these conclusions about habitat for migrating birds:

1) Geographic factors override habitat factors; therefore, all native habitats in coastal areas are important (McCann et al. 1993).
2) Migrant songbirds will use all available habitat patches regardless of size, particularly where habitat is limited (Biebach 1995, Skagen et al. 1998). Isolated patches or "oases" serve both as critical stopover sites and migratory "stepping stones" (Skagen et al. 1998).
3) Large forest and scrub-shrub patches support greater numbers and diversity of migrant birds and also provide breeding habitat (McCann et al. 1993).
4) Migrant songbirds fall out along coastal areas and will remain there to rest, forage and shelter from predators until fat reserves and hydration are restored. This is particularly true for fat-depleted birds which stay for longer periods than fatter birds (Moore and Kerlinger, 1987), and inexperienced first-year birds where the benefits of rejecting even marginal habitat is outweighed by the energetic cost of finding more suitable sites (Moore et al. 1990, Kuenzi et al. 1991).
5) Migration is physically stressful, and migrant songbirds are highly vulnerable to predators, starvation, and adverse weather during migration (all cited authors).

Spatial and temporal patterns of use

Most raptors are actively hunting and migrating during daylight hours. Altitudes for foraging and local habitat use are below 100 m (Holthuijzen et al. 1985), while migrating flight is 100 m and above (Holthuijzen et al. 1985, Smith 1985, Kerlinger 1989). However, raptors within the Cape May stopover – on the peninsula and along the Bayshore – may be in various stages of migratory movement and stopping-over at any time from August to November. Their behaviors and habitat use range from migratory flight (generally >300 m) as they arrive, to low flight (generally <100 m) as they descend in altitude approaching Delaware Bay open water then move about the region actively searching for food and cover (*cf* Harmata et al. 2000, Mabee and Cooper 2004). Altitude of flight in the Cape May stopover is related to habitat type, wind speed and wind direction, and ranged from 43 m (buteos in forested habitat) to 153 m (buteos in field habitat) (Niles et al. 1996). The most numerous species, sharp-shinned hawk, was observed at mean altitudes of 52 m (field habitat) to 86 m (marsh habitat). Raptors that pause in the Cape May region before continuing migration may do so for days or weeks, and spend their days moving among and between habitats for hunting and resting (Niles 1996). As individual raptors gain weight and prepare to continue their migration, they may make repeat flights south along the peninsula, or (in adverse wind conditions) move north and west along the upland edge of Delaware Bayshore to a point that offers a shorter water crossing (Allen and Peterson 1936, Niles 1996, Sutton and Sutton 2007).

Vulnerability

The concentration of raptors that occurs in the Cape May stopover, along with the various patterns of flight (foraging and low level flight) as they funnel into and mill around the region, makes them vulnerable to collision with turbines placed within the same airspace (<100 m); two raptors (osprey and peregrine falcon) have been killed by an array of five turbines located in wetlands near Atlantic City after one year of monitoring (Mizrahi et al. 2008). The density of land birds (raptors and songbirds) concentrating in the region, and the fact that the majority are inexperienced, juvenile birds, increases the likelihood of collisions as birds make their way into and out of this migration stopover. Perhaps of equal importance is the likelihood of turbines causing migrating birds to avoid habitat, and therefore be subject to habitat loss that is additive to that occurring at a high rate on Cape May peninsula. The loss of habitat to development has already had a negative impact on migrating raptor habitat use on the peninsula, causing birds to move farther to find adequate foraging and roosting areas (Frank 2007).

Post-construction carcass surveys have shown that passerines are among the most likely avian groups to be impacted by collisions with wind turbines (Howe et al. 2002, Johnson et al. 2002, Schmidt et al. 2002, Kerns and Kerlinger 2004, Mizrahi et al. 2009). Although migrating songbirds often fly at higher altitudes than current turbine rotor blades can reach, they fly lower when crossing over bodies of water and this makes them more likely to be flying in the rotor swept area (Huppop et al. 2006). They also fly at lower altitudes when the conditions for migrating are poor (e.g., fog, low cloud ceiling, headwinds), and in areas where stopover habitat exists as they descend and ascend to take advantage of resting and foraging areas (Langston and Pullen 2003). Radar data of bird migration from the Cape May area recorded the presence of thousands of low-flying migrants (<100 m in altitude), confirming that migrants fly at lower altitudes in the Cape May stopover than might be expected during migration (Mizrahi et al. 2009)

3. Waterfowl

Delaware Bay is a significant region for wintering waterfowl, whose numbers exceed 500,000. It is also an important stopover for fall and spring migrants as well as a breeding ground for a significant portion of the New Jersey black duck population.

Wintering waterfowl have been documented by the Midwinter Waterfowl Survey (MWS), a standardized aerial survey conducted annually since the 1970's. The MWS covers the tidal marshes and waters within 3 km of the marsh. Biologists have documented over 150,000 ducks, geese and swans wintering along Delaware Bay each January (NJDEP DFW unpubl. data). That includes 35,000 black ducks (*Anus rubripes*), more than 6,000 mallards (*Anus platyrhychos*), and 20,000 Canada geese (*Brant canadensis*), all of which are species of regional priority under the New Jersey State Wildlife Action Plan (NJDEP 2008). During the fall and winter, southern New Jersey contains the largest concentration of black ducks on earth. Approximately 35% of New Jersey's black ducks are found along Delaware Bay (Nichols, unpubl. data; Castelli, pers. comm. 7/28/09). Significant numbers of greater snow geese (*Chen caerulescens*), green-winged teal (*Anus crecca*), and northern pintails (*Anus acuta*) are also counted along Delaware Bay.

The MWS, with its focus on tidal marshes and nearshore open waters, does not account well for open water species known as sea ducks (Nichols 1995). This group includes 15 species, among them black scoter (*Melanitta nigra*), surf scoter (*Melanitta perspicillata*), white-winged scoter (*Melanitta fusca*), greater scaup (*Aythya maila*), lesser scaup (*Aythya affinis*), canvasback (*Aythya valisineria*), buffleheads (*Bucephala albeola*), ruddy duck (*Oxyura jamaicensis*), and hooded merganser (*Lophodytes cucullatus*). Large numbers of these migratory waterfowl winter in Delaware Bay, and others pass through on the way to wintering areas further south or to spring breeding grounds in the north (Nichols 1995). The U.S. Fish and Wildlife Service conducted a targeted aerial survey of wintering waterfowl in 1999 in waters more than 3 km offshore, where biologists found an estimated 200,000-250,000 black and surf scoters in the mid-depth (5-8 meters) areas of lower Delaware Bay. During the winter of 2001-02, an aerial survey of offshore waters out to 20 km found that waterfowl (primarily scoters) were more prevalent on open waters of Delaware Bay than on shoals of the Atlantic Ocean in New Jersey (Forsell and Koneff 2002). More recently, Silverman et al. (2008) estimated over 400,000 sea ducks, primarily scoters, in Delaware Bay waters in February 2008. The number of black scoters in Delaware Bay was by far the highest of any survey region along the Atlantic Flyway (Silverman et al. 2008).

Numbers of Eastern Population (EP) tundra swans (*Cygnus columbianus*) have doubled since the 1960's (Serie et al. 2002). Satellite tracking data has shown that EP tundra swans make brief stopovers in Delaware Bay and Chesapeake Bay during migration (Petrie and Wilcox 2003). Swans are large-bodied birds that have a more difficult time making fast maneuvers to avoid structures than other birds do. Research has shown that they have a high "hit-wire index" (Rose and Baillie 1989) and are susceptible to collisions with other tall structures like power lines (Butler 1999). Swans, as well as other large species like wading birds, decrease and increase altitudes at a gradual rate when approaching or departing from areas like stopover habitat that is found in the Delaware Bay region.

Nearly 2.2 million waterfowl winter south of New Jersey (U.S. Fish and Wildlife Service's Migratory Bird Data Center 2009). Delaware Bay is an important migration stopover for these birds. Malecki et al. (2006) found Delaware Bay to be one of two key spring migration stopovers for Atlantic Flyway northern pintails. Nutrient reserves obtained during the winter and spring migration stopovers are critical to reproductive success. In addition, while most wintering black ducks migrate north to nest, Delaware Bay is a breeding ground for a significant portion of the resident New Jersey black duck population.

Spatial and temporal patterns of use

Biologists conducting the MWS have found that dabbling ducks (particularly black ducks) respond to hunting pressure by moving 2-5 km offshore into Delaware Bay waters to avoid hunting pressure on a daily basis (T. Nichols pers. comm. 7/24/09). They return to feed and roost in tidal marshes in the evenings after hunting has ceased. Altitude of these daily flights is less than 100 m, consistent with localized movements of ducks (van der Winden et al. 1999, Dirksen et al. 2000).

Winter use of salt marsh habitat by black ducks is strongly related to open vs. closed hunting seasons and the presence or absence of ice. Conroy et al. (1987) found that during the open hunting season, nocturnal use of salt marsh habitat was higher as birds flew to salt marshes from open-water areas of refuge on a daily basis, presumably to forage. Such localized flights at (or after) dusk are estimated to occur below 100 m in altitude (van der Winden et al. 1999, Dirksen et al. 2000). Extensive ice cover led to a local dispersal of black ducks throughout the salt marshes along the Atlantic and Delaware Bay, as well as some dispersal to more southerly locations throughout the flyway.

Cross-bay movements have been documented in greater snow geese using radio telemetry (Hill and Frederick 1997). The average daily movement distance for marked snow geese ranged 4–23 km between roosting sites and feeding sites, with the longer flights involving geese crossing Delaware Bay to feed in southern New Jersey Delaware Bay tidal marshes (Hill and Frederick 1997). With an average of nearly 100,000 snow geese on New Jersey Bayshore (NJDFW Mid-Winter Waterfowl Survey), and approximately the same number on the Delaware Bayshore (DEDFW Mid-Winter Waterfowl Survey at http://www.fw.delaware.gov/Hunting/Documents/Wfowl%20survey%20January%202009.pdf), there is the potential for many thousands of snow geese to make cross-bay flights daily in the winter concentration period.

Movements of sea ducks with respect to offshore wind farms in Denmark were studied by van der Winden et al. (2000). Foraging flights of sea ducks occurred most often at night. Movements were significantly different on moonless nights compared to moonlit nights. Sea ducks avoided flying through wind farm areas on moonless nights, thereby increasing flight distance and duration to reach feeding areas. Presumably, these increases lead to an increase in the demand for individual energy.

Vulnerability

One of the greatest potential impacts of wind turbines to waterfowl and seabirds in the Delaware Bay region is avoidance of habitat containing turbines and the "barrier effect" that would occur to these species during migration. Waterfowl and seabirds tend to avoid habitat containing turbines in their daily movements (e.g., in wintering and stopover areas), and tend to move away from turbines (as "barriers") during active migration (Goodale and Divoll 2009). While avoidance reduces their likelihood of collision, it also increases the energy expenditure for flight by forcing birds to fly farther to avoid turbines. Flight is the most energetically costly activity for birds. Increases in flight cause increases in daily energetic requirements, thereby reducing the overall carrying capacity of the habitat at the population level. At the individual level, birds must spent additional time foraging to accrue the energy lost by the increase in flight. Birds unable to accumulate adequate energy are more susceptible to predation as vigilance is sacrificed for increased foraging. This may lead to decreased survival and lower productivity as a result of being energetically stressed.

Avoidance of suitable habitat during the wintering period results in an overall decrease in the amount of habitat available for survival in the difficult winter conditions. Reduced habitat for waterfowl species like the American black duck, which winter in large numbers in Delaware Bay, reduces the carrying capacity of Delaware Bay for waterfowl, leading to lower populations of those species (Goodale and Divoll, 2009, P. Castelli, pers. comm. 7/28/09). Various studies have shown that seabirds will travel distances of 100-3,000 m to avoid flying near turbines (Winkelman 1992, Christensen et al. 2004, Kahlert et al. 2004a). Other research has shown that scoters, an important winter inhabitant of Delaware Bay, avoid wind farms and the surrounding area (Langston and Pullen 2003, Christensen 2004, Kahlert et al. 2004b, Petersen et al. 2004). Furthermore, it appears that as more time passes, the abundance of these species decreases in the vicinity of wind farms. Although it was once speculated that habituation would occur over time, surveys have not borne this out (Stewart et al. 2007).

4. Bald Eagles

The bald eagle (*Haliaeetus leucocephalus*) population in New Jersey had declined to a single nest in Cumberland County by 1970, due to the severe and pervasive effects of DDT in their food chain (Smith and Clark 2008). Biologists in the NJDEP Division of Fish and Wildlife worked since 1980 to restore the population. Prior to the population crash as well as in recovery, the bald eagle population has been centered on the tidal rivers, marshes and forests of the Delaware Bay area. Records from 1970-1980 indicate eagles wintered in the Bayshore region even before the nesting population recovery began (NJDEP Biotics database). As eagles began to repopulate the state, nests became established in the Bayshore region: East Creek, Maurice River, Stow Creek, Cohansey River, Nantuxent Creek and Mannington Meadows, all by 1995. In 2009, with the statewide population at 82 pairs, the highest density of eagle nests continues to be found in the Bayshore region in Cumberland and Salem counties. Several nests have been established less than 2 km apart, which is an indication of the exceptional resources that exist in this region for bald eagles.

In addition to resident, nesting bald eagles, the region supports an annual concentration of eagles in winter, wherein eagles forage and roost. Concentration areas for foraging and roosting are recognized by the U.S. Fish and Wildlife Service (even after removal of the bald eagle from the federal Endangered Species List) because of the importance of these areas to the survival of large numbers of eagles, particularly sub-adult birds (Buehler 2000, USFWS 2007). Essential elements for eagles are reliable locations of open water and prey, with nearby forested areas that provide shelter from wind and weather for night roosting. These elements are found all along the Delaware Bayshore. Human activities near or within communal roost sites may prevent eagles from feeding or taking shelter, especially if there are not other undisturbed and productive feeding and roosting sites available (USFWS 2007). Activities that permanently alter communal roost sites and important foraging areas can altogether eliminate the elements that are essential for feeding and sheltering eagles (USFWS 2007). Thus, development that destroys habitat and interrupts the landscape, such as residential housing, roads and structures, poses the risk of eliminating bald eagle habitat that is essential to the survival of resident and wintering bald eagle populations.

Nesting bald eagles are year-round residents of their nest territories (NJDEP-DFW Bald Eagle Project reports at http://www.njfishandwildlife.com/ensp/raptor_info.htm#eagle), and therefore can be found in the Bayshore region in all seasons. The nesting season begins in December when eagles begin courtship activities and build or rebuild nests. The nesting season proceeds through incubation and hatching, and young eagles begin learning to fly in late June and throughout July. Young eagles remain in their nest areas for approximately two months after fledging as they learn to fly and hunt with their parents, frequenting ponds, creeks, rivers and marshes from Pond Creek (near Cape May) along the Bayshore and beyond the Cohansey River. Resightings of some eagles banded in New Jersey indicate many young eagles move south to Chesapeake Bay for the winter (B. Watts, College of William and Mary, Center for Conservation Biology, pers. comm.). However, there is also an influx of bald eagles in the Bayshore for the winter months. The Midwinter Eagle Survey has consistently recorded more wintering eagles in the Bayshore region than anywhere else in the state: 94 bald eagles were counted in the 2008 midwinter survey between Reed's Beach and the Cohansey River, with most of those observed in the Maurice River-Turkey Point area (Smith and Clark 2008). Wintering eagles move daily between foraging areas around open waters of the marshes, rivers and the Bay, to forested tracts with large trees that offer shelter from weather. Although eagles are capable of extensive soaring, gliding and flapping flight, they tend to use soaring and gliding for food searching and migration (Buehler 2000). In many cases hunting is done from a sedentary perch near water, particularly during winter when eagles need to conserve their energy (Buehler 2000). Bald eagles can be found perched and in low flight (<100 m) on Bayshore marshes in all daylight hours (Clark, pers. obs.) as they hunt fish, waterfowl, muskrat and other aquatic prey (Buehler 2000).

Vulnerability

Fifty-four golden eagles (*Aquila chrysaetos*) were killed by turbines in the Altamont Pass in California, 1998-2003, accounting for 10% of all raptors killed (Smallwood and Thelander 2008). While bald eagles differ somewhat in their flying and hunting behaviors, they are like golden eagles in overall size and dimensions. Eagles are large birds with relatively high wing loading (the ratio of body weight to wing area – how much "load" each unit area of wing must carry; Able 2001). They are less able to maneuver around obstructions compared to smaller, more agile birds. One of the leading causes of bald eagle mortality is impact injuries: of 1,428 bald eagles necropsied by the USGS National Wildlife Health Center, 1963-1984, 23% died from trauma, primarily impacts with wires and vehicles (as cited in Buehler 2000). Similarly, 24% of bald eagles in Maryland, 1988-2004, died of collision-type trauma, for those with a known cause of death (Driscoll et al. 2004). Bald eagles are also susceptible to collision with powerlines, causing injury and death due to impact or from electrocution (Buehler 2000, Driscoll et al. 2004).

Bald eagles use the open waters of Delaware Bay, creeks and rivers for foraging, and the Bayshore forests and woodlands for roosting (Paturzo and Clark 2003, NJ DEP Biotics database, July 2009). The U.S. Fish and Wildlife Service (USFWS 2007), in its Bald Eagle Management Guidelines, makes this specific recommendation: "Minimize potentially disruptive activities and development in the eagles' direct flight path between their nest and roost sites and important foraging areas."

Conclusions

Many guidance documents and literature reviews highlight the importance of careful consideration of potential locations for wind turbines, noting that appropriate siting of turbines is one of best ways to avoid unacceptable levels of impact to wildlife resources (Bright et al. 2008, Drewitt and Langston 2006, Everaert and Steinen 2006, Fox et al. 2006, Goodale and Divoll 2009, Huppop et al. 2006, Langston and Pullen 2003, U.S. Fish and Wildlife Service 2003). Appropriate siting includes avoiding areas where there are high concentrations of birds and bats, such as migratory stopover locations, as is the case in Delaware Bay (U.S. Fish and Wildlife Service 2003). The turbines at Altamont Pass in California and Navarra and Tarif in Spain stand as examples of the consequences of poorly sited wind farms (Langston and Pullan 2003). If consideration had been given to bird use at each site prior to their turbine construction, the high mortality of birds could have been reduced (through better design) or avoided (by not permitting turbines in these locations). The Delaware Bay region is known and internationally recognized for its importance to migratory and wintering birds. Placing turbines in this area would be a critical mistake, given what is known about bird use at this site and what can happen when turbines are placed in unsuitable locations.

There is precedent for prohibiting turbine development in an environmentally sensitive area with known high bird use. The wetlands of the Wadden Sea contain the largest stretch of unbroken mudflats in the world and are renowned for their high concentrations of birds. Like Delaware Bay, it is recognized as a Wetland of International Importance under the Ramsar Convention, and also recognized under the Bonn Convention on Migratory Species and the EC (European Commission) Bird and Habitat Directives. The Trilateral Wadden Sea Plan, completed in 1997, is an international agreement between the Netherlands, Germany and Denmark (who all share its shoreline) and it explicitly prohibits wind turbines in the Wadden Sea Conservation Area, which covers the vast majority of the Wadden Sea area (Merkel et al. 1997).

The shoreline, wetlands, upland edge and open waters of Delaware Bay, as well as the lower Cape May peninsula, comprise an internationally recognized, highly significant migratory bird stopover in spring, fall and winter. The region's habitats provide essential food and shelter resources that are unmatched in the state or the Atlantic Flyway. The Delaware Bay habitats are critical to the welfare of several hemispheric populations – a resource shared with Canada and South America. The States of New Jersey and Delaware have a high hemispheric responsibility in the Western Atlantic Flyway for populations of red knots and other bird species that use the Bay. The importance of the Bay to migratory birds is recognized nationally and internationally. Delaware Bay has recognition by the Ramsar Convention on Wetlands of International Importance, an international treaty for the conservation and sustainable utilization of wetlands. The Bay is recognized by BirdLife International and Audubon as an Important Bird Area of

Global Significance, and has the highest level of significance in the Western Hemisphere Shorebird Reserve Network. Most recently, Delaware Bay conservation was specifically supported by the Atlantic Flyway Council, comprised of U.S. east coast states and Canadian provinces responsible for management and conservation of migratory waterbirds and land birds. Wind turbine development in this region would cause disruption to the migratory and wintering patterns of hundreds of thousands of shorebirds, raptors, songbirds and waterfowl, and would likely cause permanent harm to bird populations in New Jersey, Atlantic Flyway and Western Hemisphere.

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ATLANTIC FLYWAY COUNCIL

Ontario	Québéc	Nanavut	New Brunswick	Newfoundland	Nova Scotia	Prince Edward Island
Maine	New Hampshire	Vermont	Massachusetts	Rhode Island	Connecticut	New York
Pennsylvania	New Jersey	Delaware	Maryland	Virginia	West Virginia	North Carolina
South Carolina	Georgia	Florida	Puerto Rico	Virgin Islands		

July 28, 2009

Mr. Marvin Moriarty
Regional Director, Region 5
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035

Dear Mr. Moriarty:

The Atlantic Flyway Council (Council) is an organization composed of members of state and provincial wildlife agencies in the 23 Atlantic Flyway states and Canadian provinces. The Council serves in an advisory capacity to state, provincial and federal wildlife agencies. The Council's primary responsibility is the sound stewardship of our shared migratory bird resources and their habitats.

The Council recognizes the valuable contribution that offshore wind energy development can have in meeting human energy demands and reducing greenhouse gas emissions. The Council endorses the careful siting of wind energy development where impacts to migratory birds are carefully considered in the planning process. In fact, the Council applauds the leadership roles that New Jersey and Delaware have taken in natural resource assessment regarding offshore wind energy development. The Council believes that New Jersey's Ocean/Wind Power Ecological Baseline Studies approach to offshore wind energy development, where resources are assessed to develop maps showing where the risks to natural resources posed by wind energy development are minimal, could serve as a national model.

The Council understands that a proposal by Delsea Energy plans to erect 106, 3.6 MW wind turbines that would be built in the New Jersey waters of Delaware Bay with an additional 16 wind turbines erected in adjacent wetlands in Cumberland County. The Delaware Bay and its wetlands support a diverse and abundant assemblage of migratory birds. Because of the exceptional aggregations of birds found here, Delaware Bay has received international recognition as a Western Hemisphere Shorebird Reserve Network site, a Ramsar Site per the Convention on Wetlands of International Importance especially as Waterfowl Habitat, and an Audubon Important Bird Area of global significance. As such, New Jersey and Delaware have regional responsibilities to protect birds and their habitats in Delaware Bay.

The Council is greatly concerned about the potential negative impacts to avian resources by the proposed Delsea Energy project in Delaware Bay, including collisions with wind turbines, direct habitat loss, and displacement and disturbance during construction and future maintenance activities.

Delaware Bay is a major spring shorebird stopover in the Western Hemisphere. It is one of only four estuaries in North America where over one million shorebirds concentrate during migration. In Delaware Bay, spring staging shorebirds spend several weeks replenishing fat reserves needed to continue migration to arctic breeding grounds. Of particular importance are red knots, which are a candidate species for federal listing under the Endangered Species Act. Over 80% of the Atlantic Flyway population of red knots stage at Delaware Bay during spring migration. Delaware Bay also supports about 350,000 wintering waterfowl of over 20 species including 30,000 American black ducks. Other than the southern New Jersey Atlantic Coast, this is the largest concentration of wintering black ducks in the Atlantic Flyway.

Both waterfowl and migrating shorebirds have been shown to be sensitive to disturbance caused by human activities, including avoidance of areas where large nearshore wind turbine arrays are located (per European studies). Placement, operation, and maintenance activities associated with wind turbines in Delaware Bay are likely to disrupt feeding and roosting waterfowl and staging shorebirds directly or by displacing them from areas where critical resources are located. This disruption could be particularly devastating to staging shorebirds that must increase fat reserves in a limited time to successfully continue their migration. Placement of turbines and associated project infrastructure such as power collection lines in marsh habitat areas will also directly reduce habitat available for waterfowl, shorebirds, and other migratory birds.

Songbirds, raptors, and upland game birds migrating in fall become concentrated along the Delaware Bay coast in New Jersey since the open water of the bay creates a barrier to migration. As a result, these migrating birds "stack up" along the bay shore and subsequently move up and down the bay shore seeking a favorable spot for crossing. Data from surveys and studies of shorebird movements in Delaware Bay indicate that thousands of birds fly at altitudes coincident with turbine blade operation in the proposed project area, placing them within the zone of highest risk for collision.

In closing, the Atlantic Flyway Council recommends that the appropriate authorities consider these potential significant impacts to migratory birds and their habitats, and work with their state and federal wildlife agencies when considering the Delsea Energy proposal and future wind energy proposals in Delaware Bay. The Council also urges that wind energy development be pursued at sites where negative impacts to our migratory bird resource are minimal.

Sincerely,

Calvin W. DuBrock, Chairman
Atlantic Flyway Council

cc: Dr. Herbert Raffaele, U.S. Fish and Wildlife Service, Chief, Division of International Conservation
Dr. Robert Blohm, U.S. Fish and Wildlife Service, Chief, Division of Migratory Bird Management
Matt Hogan, Executive Director, Association of Fish and Wildlife Agencies