

❖ Birding and Wildlife Watching

The Delaware River and Bay are home to populations of birds, mammals, reptiles, amphibians, fish, insects, and shellfish surviving and thriving in the functioning ecosystems of the region. The plants and animals within the River and its corridor are a major draw bringing tourists from near and far to vacation and experience the beauty of our River and its natural communities. Many Delaware River plants and animals are nationally significant for health, historical, and economic reasons. All of the species within the River deserve to be respected, protected and preserved if they are to continue to exist for future generations.

Because of the River's free flows, its captivating beauty, its vast natural resources, historical significance, high water quality, premier recreation, and natural open space, in 1978 a majority of the non-tidal Delaware River (73 miles extending from Hancock, New York to Milford, Pennsylvania and 40 miles from just south of Port Jervis, New York to the Delaware Water Gap) was Congressionally designated a National Wild and Scenic River of the United States.¹⁴⁵ In 2000, the Lower Delaware from the Water Gap to Washington Crossing, a stretch of 76 miles, was also granted Wild and Scenic designation due to its extraordinary beauty and health. The abundant wildlife and bird watching opportunities within this nationally significant corridor generate a tremendous volume of ecotourism and related business. Many of the species inhabiting the Lower and Upper Delaware are designated as threatened or endangered, demonstrating the fragility and vulnerability of the ecosystems and ecological communities dependent upon the area. **Figure 5** lists some of the diverse species found here. This table is just a sampling of the interesting and valuable species that can be found in the Delaware River Watershed. (Figure is at the end of this section)

In 2006, over 71 million Americans participated in wildlife watching including photography and observation, spending nearly \$45 billion dollars on travel, equipment, food, and lodging.¹⁴⁶ Twenty-three million of the 71 million traveled away from home (more than a mile) to engage in wildlife watching activities.¹⁴⁷ In New Jersey, it has been determined that watchable wildlife attracted 1.9 million participants in a single year.¹⁴⁸

Wildlife viewing creates nearly 500 thousand jobs nationally, and generates \$2.7 billion in federal and state taxes.¹⁴⁹ In Pennsylvania, New York and New Jersey, 31% of the population participates in some form of wildlife viewing.¹⁵⁰ These activities generated an estimated \$1 million in retail supply sales, \$623 million in trip related sales, \$217 million in federal and state taxes, and supported 35,000 jobs.¹⁵¹



KEMPTON, PA BIRD WATCHING FROM WITHIN THE HAWK MOUNTAIN SANCTURAY. BIRD WATCHING IS ONE OF THE FASTEST GROWING FORMS OF RECREATION. PHOTO CREDIT: HAWK MOUNTAIN SANCTUARY

The total economic contribution of wildlife viewing in the tri-state area exceeded \$3 million in the year 2002.¹⁵² The Outdoor Recreation Alliance estimates that New Jersey alone generated nearly \$4 billion from wildlife-related recreation in 2006, and reports that New Jersey ranks number six in the amount of economic activity created by in-state wildlife viewing activities.¹⁵³

Celebrating Birds is a Lucrative Business

Bird watching has become one of the most lucrative forms of recreation in the watershed because of the avian diversity and wealth of attractive viewing areas. Bald Eagles, Ospreys, Red-Tailed Hawks, and migrating shorebirds such as Sanderlings and the Red Knot *rufa* can all be viewed within the watershed. In addition to being among the most lucrative activities for our region, birding is also among the fastest growing. The Center for Rural Pennsylvania issued a report on nature-based tourism in 2003 which listed bird watching up 155% in Pennsylvania; a greater percentage increase than every other form of recreation measured.¹⁵⁴



ONE OF MANY RAPTORS THAT CAN BE SEEN FROM HAWK MOUNTAIN AND OTHER LOCATIONS IN THE DELAWARE VALLEY. RAPTOR POPULATION DECLINES ARE OFTEN DUE TO HABITAT FRAGMENTATION, OR BUILDING HOMES, ROADS, AND RETAIL SPACES ON FORMERLY FORESTED LAND. PHOTO CREDIT: GEORGE WILLIAMS

Hawk Mountain in Kempton, Pennsylvania is a wildlife sanctuary for raptors in the Delaware River Watershed (Lehigh River) eastern Pennsylvania. The preserve is the largest protected tract of contiguous forest in Pennsylvania with 13,000 acres of private and public lands.¹⁵⁵ Mountaintop vistas, hiking trails, and over 25,000 Hawks, Eagles, and Falcons bring visitors year round.¹⁵⁶ The Hawk Mountain sanctuary brought in over \$850,000 in 2005 from visitor fees, memberships, and retail.¹⁵⁷



HAWK MOUNTAIN SANCTUARY KEMPTON, PA NOW HAS 13,000 ACRES OF CONTIGUOUS FOREST PROTECTED FOR RAPTORS AND OTHER WILDLIFE. PHOTO CREDIT: HAWK MOUNTAIN SANCTUARY



Case Study: Nature Photographer Mike Hogan

Michael Hogan,
Professional Nature
Photographer, has
spent decades taking

pictures of the Delaware Bay and Pinelands region. His pictures help in tracking invasive species; producing photographic natural resource inventories for counties and municipalities; and using Geographic Integrated Systems (GIS) technology to document where endangered species exist such as Swamp Pink, a gorgeous flowering wetland plant that remains in only a few remote locations throughout New Jersey. Working with the South Jersey Land and Water Trust and the Rutgers Water Resources Program, and using the USDA Stream Visual Assessment Protocol, Michael has visually assessed 300 stream segments in southern New Jersey for stream health and quality.

Nature photography in the region has led Hogan to become an advocate and active environmentalist for preserving open space in New Jersey. "The habitats and ecosystems within New Jersey are keeping my career afloat. If I wasn't helping to preserve land and wildlife in New Jersey through education, book illustrations, visual stream assessments, and art, I don't know what I'd be doing right now," said Hogan.

Michael's large format, landscape photographs are in public, private, and corporate art collections. In addition, Michael has donated his work to various local nonprofit organizations including the Delaware Riverkeeper Network to help them in their fundraising. In 2005, Michael Hogan partnered with author Robert Peterson to create an illustrated book called "The Natural Wonders of Jersey Pine and Shore." "This book combines years of photographs and prose into one source so that people from all over can see what I see when I'm hiking in the Pinelands or relaxing on the Bay shore" says Hogan. The book was the last from author Robert Peterson who passed away in 2003 just after viewing the final text of the book.

When asked how important southern New Jersey is to him Michael Hogan replied "It's where I live, it's what I care about, and it's my livelihood".

There are many careers supported by the nature and wildlife of the Delaware River Valley. Michael's work can be viewed on his website www.hoganphoto.com.

The Bald Eagle, an emblem of American freedom, spirit, and pursuit of excellence, currently lives and thrives along the protected Upper Delaware River. Explicit Bald and Golden Eagle protection laws, conservation of Eagle habitat, and the banning of DDT and other poisons have been successful in protecting Upper Delaware Eagles.¹⁵⁸ In the United States, Bald Eagle populations have increased from less than 500 nesting pairs in the 1960's to more than 5,000 currently.¹⁵⁹

To celebrate the remarkable comeback of the Bald Eagle, Eagle Fest is an annual winter festival held in Narrowsburg, New York along the scenic Upper Delaware River. The festival draws between 1,500 and 2,500 people from around the region, including residents from New York, Pennsylvania and New Jersey. The local fire Department uses the festival as a successful fundraiser, selling hot dogs and hamburgers; local churches and the Chamber of Commerce help run the event and set up tables for fundraising.

For many local businesses, Eagle Fest brings tourists and visitors to the region in the middle of winter when tourism is relatively low. Festival attendees learn about Bald Eagles and their recovery while they try and catch a glimpse of one flying over the often frozen Delaware River. To broaden appeal, Eagle Fest holds multiple events including lectures, art shows, a live raptor show, Eagle educational exhibits, food, and environmental films. Conservation groups are also invited to participate and share information about their organizational mission and efforts. Ice carvers, wood carvers and other artists are able to exhibit their handy work. Local shops featuring gifts, clothing, antiques, art stores, and even furniture stores not only see greater sales during the event, but see return visitors throughout the year who first came during Eagle Fest. For many local businesses, Eagle Fest brings the best or second best sales day of the year.¹⁶⁰

In New Jersey, the Cape May Bird Observatory holds a Spring Weekend every year offering guided walks, boat rides, nature tours, book signings, movies, speakers, and birding. At the end of the three-day weekend they hold a World Series of birding to discover how many birds each person has counted over the weekend. More than 200 birds have been spotted flying throughout the nature center's premises.¹⁶¹ Bird watchers wishing to enter as a single person or team obtain sponsorships where they receive money for every bird they view and proceeds go to the conservation fund of their choice. The event raises more than \$500,000 annually to support bird conservation efforts and attracts bird enthusiasts from all over the world.¹⁶²



THE AMERICAN EAGLE THE UNITED STATES EMBLEM WAS NEARLY EXTINCT AFTER THE DECADES OF HEAVY PESTICIDE USE AND DECREASING WATER QUALITY IN WATERWAYS LIKE THE DELAWARE RIVER. ITS REMARKABLE RECOVERY IS AN IMPORTANT SUCCESS; ONE THAT SHOULD BE REPLICATED FOR THE MANY OTHER BIRD SPECIES CURRENTLY IN PERIL THROUGHOUT THE US. PHOTO CREDIT: DOUGLAS NORTON 2007



BOWERS BEACH, DE DELAWARE BAY IS HOME TO THE WORLDS LARGEST SPAWNING POPULATION OF HORSESHOE CRABS IN THE WORLD. THE HORSESHOE CRAB IS AN ANCIENT SPECIES DATING BACK OVER 350 MILLION YEARS.



RED KNOT PHOTO TAKEN DURING THE 2008 RED KNOT MIGRATION. RED KNOTS WERE BEING BANDED SO THAT SCIENTISTS COULD TRACK THEIR QUALITY OF HEALTH AND WEIGHT TO BETTER UNDERSTAND THEIR SURVIVAL.

Protecting Birds, Food and Habitats

Delaware Bay is home to the largest spawning population of Horseshoe Crabs in the world. The Horseshoe Crab is an ancient species, dating back over 350 million years. Delaware Bay is also critical habitat to more than 400 species of birds and migrating shore birds.¹⁶³ Each spring, at least 11 species of birds stop over on the Delaware Bay shore to feed on the eggs of the Horseshoe Crab and thereby fuel their annual spring migration, including the Sanderling, Sandpiper, Red Knot, and Ruddy Turnstone.¹⁶⁴

It is estimated that between 425,000 and 1,000,000 birds stop in the Delaware Bay as part of their 3,000 to 4,000 mile migratory journey from their wintering grounds in

South America to their breeding grounds in the Arctic.¹⁶⁵ The bird stop over is ecologically timed to coincide with the spawning of the Horseshoe Crabs, their eggs being a critical food source.¹⁶⁶ The eggs of the Horseshoe Crab are so critical that recent declines in their abundance threaten the survival of the Red Knot (*Calidris canutus*).

In 1982, 95,530 Red Knot were counted on the shores of the Delaware Bay. In 2006 only 13,445 were observed during the same time period¹⁶⁷ and more recent study continues to show declines and low weight gain for the birds that do arrive to feed on Horseshoe Crab eggs. The Red Knot is now predicted to go extinct because declines in the Horseshoe Crab and their eggs.¹⁶⁸



MOORE'S BEACH NJ INTERESTED VOLUNTEERS AND AREA VISITORS WATCH THE ARRIVAL OF THE BIRDS WITH BINOCULARS.

Other shorebirds that rely on Horseshoe Crab eggs, such as Ruddy Turnstone (*Arenaria interpres*), Semipalmated Sandpiper (*Calidris pusilla*), Sanderling (*Calidris alba*), Dunlin (*Calidris alpina*) and Short-Billed Dowitcher (*Limnodromus griseus*), have also declined in numbers on the Delaware Bay migratory stop over. These species and Red Knot make up 99 percent of the shorebird concentration in the Delaware Bay and all are primarily dependent upon Horseshoe Crab eggs for their diet.¹⁶⁹

The arrival, feasting and migration of the shorebirds supports a multi-million dollar ecotourism industry. Birding and outdoor enthusiasts from all over the world flock to the Delaware Bay shore to watch the spectacular

feeding frenzy. During their visit they buy recreational-related goods and services, stay in the region's hotels, and visit parks and patronize restaurants and local shops.¹⁷⁰ According to one report, Horseshoe Crab dependent ecotourism generates between approximately \$7 million and \$10 million of spending in Cape May, New Jersey alone, and creates 120 to 180 related jobs providing an additional \$3 million to \$4 million in social welfare value.¹⁷¹ According to a New Jersey Department of Fish and Wildlife report, the economic value of the Horseshoe Crab and migratory bird phenomenon seasonally for the Delaware Bay shore area is over \$11.8 million with over \$15 million of economic value generated if other beneficiaries beyond New Jersey are included. Annually, it provides \$25 million in benefits to the Delaware Bay shore region and \$34 million regionally.¹⁷² Because most of these expenditures occur in the "off-season", it is particularly valuable to local economies.

The fishery use of Horseshoe Crabs as bait for whelk, eel and conch, is highly controversial. Decades of overharvesting and abuse have resulted in a decline in the Horseshoe Crab population to such a level that the Red Knot is predicted to go extinct because of a lack of Horseshoe Crab eggs needed to fuel their annual migration.¹⁷³ Since 1989 Horseshoe Crabs in the Delaware Bay have shown a steady decline with the lowest counts taking place in most recent years.¹⁷⁴ To combat this ecological crisis, many are calling for a moratorium on the bait harvest of Horseshoe Crabs in order to allow the Crabs, the eggs and the birds to replenish and restore so that all dependent industries can be supported in the future. New

Jersey issued regulations that established a moratorium for 2006 and 2007; and in 2008 passed legislation to keep the moratorium in place until the Red Knot population is restored and stable.

INDICATOR SPECIES

Protecting bird species throughout the basin is important for several reasons. Not only is bird watching one of the most popular and lucrative forms of recreation, bringing in tourists from all over the world, but birds are an *indicator species*. Indicator species represent the overall health status of an area through their population numbers and habitats. Healthy rivers are habitat for healthy bird populations. If bird populations begin declining, it can mean that the over all quality of life for an area may be declining as well. Abundance in bird species is a good sign that land condition and air quality are high enough to support ample birds and bird watchers alike.

The continuing existence of the Horseshoe Crab and migrating shorebird phenomenon are vital for the related ecotourism industry. Of those surveyed, only 6.6% said that the Horseshoe Crab and shorebird phenomenon was unimportant to their visitor satisfaction. On average those surveyed said they would be willing to pay as much as \$212.45 (in decreased annual household income) annually for a program to protect these resources; and that they would "be willing to tolerate no more than 50.7% decline in Horseshoe Crabs and migrant shorebirds before they would cease visiting the Delaware Bay shore area."¹⁷⁵

Wildlife for Health Protection

Protecting healthy wildlife and aquatic life populations that live in the River provides critical health protections to humans, protections that have economic and social value. A good example is the Horseshoe Crab. The Horseshoe Crabs in Delaware Bay are irreplaceably important to the biomedical industry. In the late 1960's, researchers at Johns Hopkins University demonstrated that special blood properties from Horseshoe Crabs could be used to detect endotoxins.¹⁷⁶ As a result, the U.S. Food and Drug Administration now requires that many intravenous drugs and medical implants be tested for endotoxins using Limulus Amebocyte Lysate (LAL), found exclusively in the blood of Horseshoe Crabs.¹⁷⁷ In addition, LAL is used for detecting diseases including spinal meningitis.¹⁷⁸ No artificial alternatives to the LAL test currently exist.¹⁷⁹ To obtain the blood the Horseshoe Crabs are bled non-lethally,¹⁸⁰ although it has been estimated that between 10 and 15% may die once the Crabs have been returned to their natural environment.¹⁸¹

The U.S. Fish and Wildlife Service valued annual revenues associated with the LAL industry at \$60 million with the social welfare value at \$150 million. One pint of Horseshoe Crab blood is worth \$15,000 to the bio-medical industry,¹⁸² and the industry creates between 145 and 195 jobs in each of the regions it operates (Falmouth, Massachusetts, Walkersville, Maryland and Charleston, South Carolina), contributing \$73 million to \$96 million total to these local economies.¹⁸³ Furthermore, the industry is expected to grow between 8-10% annually.¹⁸⁴ The ecotourism and biomedical benefits of Horseshoe Crabs dwarfs their value as bait in the fishing industry in dollars and number of jobs.



BOWERS BEACH, DE FEMALE HORSESHOE CRAB MAKING ITS WAY BACK TO THE SHORE FROM THE OCEAN. FEMALE HORSESHOE CRABS ARE LARGER THAN MALES BECAUSE THEIR BODIES HAVE GROWN OVER TIME ALLOWING THEM TO CAPTURE MORE SPERM DURING MATING SEASON. HORSESHOE CRAB EGGS ARE THE PRIMARY FOOD SOURCE FOR MANY MIGRATING SHOREBIRDS IN THE DELAWARE BAY.

SPECIAL SPECIES HIGHLIGHT

American Eel meets the Elliptio companata mussel

The American eel deserves recognition for the journey it makes and the impact it has on the Upper Delaware River. Born in the Sargasso Sea (northern Caribbean-Bermuda region), the American eel travels across the Atlantic Ocean, into the Delaware Bay, and up the undammed Delaware River, which retains one of the largest eel populations in the nation.

Not only does the eel perform this epic journey, but it also supports one of the largest mussel populations in the Upper Delaware, the *Elliptio companata*, mussel which relies on the eel for particular components of reproduction. The *Elliptio* can be found in the millions in the Upper Delaware because of the presence of the American eel.

These mussels have an enormous filtration capacity and are able to filter six times the Delaware's average daily summer flow. With almost 2 million mussels per mile, the clean water benefits we receive from this species interaction are invaluable.



SWAMP PINK IS AN ENDANGERED AND SIGNIFICANT SPECIES IN THE DELAWARE VALLEY. IT CAN BE FOUND IN THE SWAMPS AND MARSHES OF THE PINELANDS REGION OF NEW JERSEY. PHOTO CREDIT: MIKE HOGAN WWW.HOGANPHOTO.COM



JUVENILE AMERICAN EEL MAKE THE JOURNEY TO THE UPPER DELAWARE RIVER FROM THE SARGASSO SEA AND BECOME THE HOST SPECIES ENABLING THE *ELLIPTIO* MUSSEL TO SURVIVE. MUSSELS IN THE UPPER DELAWARE FILTER 6 TIMES THE AVERAGE FLOW PER DAY. PHOTO CREDIT: DOUG AND TIM WATTS WWW.GLOOSKAPANDBTHEFROG.COM

Amphibians and Reptiles	<p>Bog turtle (E) Coastal plain leopard frog (E) Eastern mud turtles Loggerhead sea turtle (E) Long-tailed salamander (T) Map turtle Marbled salamander New Jersey chorus frogs (E) Northern diamondback terrapin Red-bellied turtle (T) Timber rattlesnake (E) Wood turtle</p>	Invertebrates and Insects	<p>American Oyster Blue Crab Brook Floater (E) Dwarf Wedgemussel (E) Eastern Pearlshell Eastern Pondmussel (E) Horseshoe Crab Mottled Duskywing Northeastern beach tiger beetle (T) Regal fritillary Tawny crescent</p>
Birds	<p>American Bittern (T) Bald Eagle Barred Owl (T) Bobolink (T) Cerulean warbler Cliff Swallow (T) Common Snipe (T) Common nighthawk Coopers Hawk (E) Grasshopper Sparrow (T) Great Blue Heron (T) Least Bittern (T) Louisiana Waterthrush Northern Harrier (T) Northern Goshawk (E) Osprey (E) Peregrine Falcon (E) Red Headed Woodpecker (T) Red Shouldered Hawk (T) Savannah Sparrow (T) Short Eared Owls Upland Sandpiper (T) Yellow-bellied Flycatcher (T) Prairie Warbler Ruffed Grouse Marsh Wren</p>	Plants	<p>American Purple Vetch Atlantic Sedge (T) Basil Bee-Balm Basil Mountain Mint Bog bluegrass (T) Bush's sedge Eared false-foxglove (E) Grass of parnassus Great St. John's-wart Hemlock Lobelia Lowland brittle fern Missouri goosefoot Nebraska sedge Northern pondweed (E) Pale Indian plantain Prickly pear cactus Rhododendron Serpentine aster (T) Shadblow serviceberry Spreading globeflower (E) Skunk currant (E) Spring coral root Swamp pink (E) Variable sedge (E) Wood aster</p>
Fish	<p>American Shad (T) Alewife American Eel Atlantic Sturgeon (T) Banded Sunfish (E) Bridle Shiner (E) Hickory Shad (E) Ironcolor Shiner (E) Largemouth Bass Muskellunge River Herring Slimy Sculpin Sheild darter Shortnose Sturgeon (E) Smallmouth Bass Striped Bass Tadpole Madtom (E) Threespine Stickleback (E) Trout Walleye Pike White Perch</p>	Mammals	<p>Beaver Blackbear Blue whale Bobcat Canada lynx (E) Delmarva fox squirrel (E) Eastern red bat Eastern woodrat (E) Fin whale Harbor porpoise Hoary bat Humpback whale Indiana bat (E) Keen's bat (E) Least shrew (E) Marsh rat Northern long-eared bat (E) Northern right whale River otter Small-footed bat (E) Sperm whale</p>

(T) Federal or State (PA, DE, NJ, NY) Threatened Species (E) Federal or State Endangered Species

Figure 5: Delaware River Significant Species List¹⁸⁶