Some Persuasive Facts *for protecting biodiversity*

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West Nile Disease and Wetlands

There is a common misconception that wetland habitat protection will lead to increased numbers of mosquitoes and increased threat of contracting West Nile Disease. The principal transmitter of the West Nile Virus is the northern house mosquito (*Culex pipiens*), which breeds in the standing water that collects in rain barrels, clogged gutters, flower pots, catch basins, discarded tires, and other artificial containers. The highly organic nature of this stagnant water, along with a lack of predators, provides optimal conditions for the development of larval mosquitoes. Naturally-occurring, healthy wetlands, on the other hand, have a diversity of predators that eat mosquito larvae; some invertebrate predators include diving beetles, backswimmers, water striders, and dragonfly and damselfly larvae. Certain species of birds, fish, and amphibians also feed on larval and adult mosquitoes. In addition, water levels in healthy wetlands fluctuate regularly, which deters *Culex* mosquito breeding. Research from North Dakota found many more mosquitoes in degraded wetlands than in higher quality wetlands. (Chipps et al. 2006) In Massachusetts, when the Essex County Mosquito Control Project restored a 1,500 acre wetland, the mosquito population dropped by 90 percent. (Williams 1996) This is a good example of biodiversity providing a human-health service. Maintaining and restoring high quality wetlands may not only help control flooding, preserve water quality, and provide important habitat, it may help solve mosquito-related problems, as well.

Flood Protection

Flooding problems in Hudson Valley communities will likely grow in severity as more intense precipitation events occur due to our changing climate. Preserving natural systems, or "green infrastructure," is an important adaptation strategy for local communities, and wetlands in particular are a defense mechanism against disastrous flooding. Wetlands are often likened to giant bathtubs, due to their ability to hold large amounts of water. This water storage, combined with the slowing action of vegetated buffers, lowers flood heights and reduces erosion downstream and on adjacent lands, and helps prevent over-saturation of agricultural land. Wetlands within and downstream of urban areas are particularly valuable in this regard, counteracting the greatly increased rate and volume of surface-water runoff from pavement and buildings.

This ecosystem service is clearly demonstrated in the Charles River basin, the most densely populated river watershed in New England, which drains approximately 307 square miles in the Boston area. Severe flooding in 1955 due to Hurricane Diane caused more than $5 million in damages to the watershed. After a study to identify protections against future flooding, the U.S. Army Corps of Engineers (USACE) determined that wetland preservation would be a "prudent and least-cost solution to future flooding." The "Charles River Natural Valley Storage Project," started in 1984, identified 6,930 acres of land in 17 existing wetlands within the river basin as essential for protection. By preserving the wetlands, costly structural controls were avoided. Purchasing the land and easements cost $10 million, only 10% of the estimated $100 million cost of constructing a dam for the same purpose. The USACE also estimated that in 1987 an additional $3.2 million in damages was prevented by controlling severe spring flooding. It has been further estimated that the city of Boston has realized annual savings of $17 million in flood damage from the project. Added benefits include a 1.5 percent premium added to the property values of homes next to the wetlands. Realtors in the area noted an undeniable advantage to selling the land adjacent to the wetlands. (USEPA 2005)

Lyme Disease

In a study conducted at the Cary Institute of Ecosystem Studies in Millbrook, NY, researchers concluded that fragmentation of forests into <5 acre patches should be avoided to help reduce risk of Lyme disease. (Allan et al. 2003) The reason has to do with decreased mammalian biodiversity in smaller forested patches – fewer small mammal competitors and fewer mammalian predators to control the populations of white-footed mice, considered the principal natural reservoir for the bacterium that carries Lyme. The small forest patches were linked with higher densities of white-footed mice and higher densities of infected nymphal blacklegged ticks. Research in a highly urbanized area in Connecticut had slightly different results, but concurred that the relationship between landscape structure and disease risk could be used to inform residential planning and development. (Brownstein et al. 2005) They concluded, "Residential configurations that preserve remnant forests in such a way that reduces adjacency of households to forest fragments would also serve to reduce human exposure to infected ticks."

We're likely to learn more as research continues, but current thinking suggests that land-use planning that concentrates residential growth and avoids fragmentation of forests into small patches will help reduce the risk of Lyme, in addition to the other known benefits of such "smart growth."

Earthworms and Forest Ecology

When discussing the importance of biodiversity with non-believers, we're often asked if it will really make a difference if we lose a particular species. Not enough is known to answer that question, but many feel it's important to err on the side of safety. The famous Aldo Leopold quote sums it up quite well: "To save every cog and wheel is the first step to intelligent tinkering." When a particular 'cog' or 'wheel' in our natural systems is removed, we can't predict how well those systems will function. Recent studies, however, have illustrated what can happen when we *add* a new cog or wheel to the system.

This situation involves the effects of non-native earthworms in forest habitats. The native earthworm populations of the Northeast were wiped out in the last glaciation; earthworms present today were first introduced by European settlers, and since then via unused fishing bait, compost, and other avenues of soil transport. Gardeners know that earthworms are extremely effective at breaking down organic matter in soils, but recent research has documented dramatic changes in native hardwood forest ecosystems when exotic earthworms invade. The problem stems from the worms' rapid decomposition of leaf litter, a process that typically is accomplished at a much slower rate by fungi and and bacteria. While this speedy breakdown is desirable in the brief growing season of the backyard garden, the resulting impacts to slower-growing forests have included changes in soil structure, declines in nutrient availability, and loss of native understory plant species. Without the typically thick, moist layers of leaves on the forest floor, spring ephemeral wildflowers and tree seedlings have difficulty germinating and are unprotected from herbivores. Effects appear to be significant for other components of biodiversity, as well, including small mammal, bird and amphibian populations, and may include invasions of other exotic species such as common buckthorn and garlic mustard. More research is needed to fully understand the magnitude of the problem on our native hardwood forest habitats, and the cascading ecological and economic impacts.

Economics of Wildlife-Related Recreation

In its national survey, the U.S. Fish and Wildlife Service (USFWS) reported that over 87 million Americans 16 years old and older (38% of the U.S. population), enjoyed some recreational activity relating to fish and wildlife in 2006. Expenditures by this group pursuant to wildlife-related recreation were $120.1 billion. This spending equates to about 1% of gross domestic product; i.e., one out of every one hundred dollars of all goods and services produced in the U.S. is associated with wildlife recreation. This spending contributed to local economies throughout the country, by improving employment, raising economic output, and generating tax revenue.

While hunters and anglers are large contributors to these activities, there is a significant economic benefit from non-consumptive wildlife recreation. More than 71 million people 16 years old and older (31% of all Americans) fed, photographed, and observed wildlife in 2006 and spent nearly $45 billion on their activities. This represents a 13% increase in overall wildlife watching since the 1996 USFWS survey, and an increase of 19% in overall expenditures. These expenditures on wildlife watching are equivalent to the amount of revenue from all spectator sports (football, baseball, and other sports), all amusement parks and arcades, casinos (except casino hotels), bowling centers, and skiing facilities. The more than one million jobs supported by wildlife watchers are almost three times the number of people who work for United Parcel Service in the U.S.

Much of this nature-based tourism involves birdwatching. Habitat conservation for birds can bring the benefits of attracting large throngs of birdwatchers who pump large amounts of money into local and state economies. The effect of dollars spent by ecotourists in and around bird watching sites is “multiplied” as tourist dollars generate local wages and consumer income, and so on. A 2001 USFWS bulletin cited regional examples of birding’s economic clout, including Cape May, where 100,000 annual birders provide cumulative impact of nearly $10 million each year, and Hawk Mountain Sanctuary in Pennsylvania, where 50,000 visitors annually contribute over $4 million to the local economy.

Of New York residents, there were an estimated 3.5 million wildlife watchers ages 16 and older in 2006, which resulted in over $1.4 billion in retail sales (estimated total multiplier effect = $2.7 billion); 25,500 jobs; and over $250 million in state and local tax revenues. Of these wildlife watchers, 2.5 million people were birdwatchers; 80% (2.0 million) observed wild birds around the home while 49% (1.2 million) took trips away from home to watch birds.

For more information on the Hudson River Estuary Biodiversity Program and its partners:

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Science for Conservation
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Resources

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