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Urban Wildlife

JEFFREY P. COHN

Next time you're in New York City, go and see Pelham Bay Park. You may be surprised to learn that this city park harbors a refreshingly natural landscape in the midst of one of the most densely populated and highly developed metropolitan areas in the United States. Here in the northeastern part of the Bronx, only a few miles from the skyscrapers of Manhattan, you'll find grassy meadows, lagoons and salt marshes, nature trails that wind through woodlands with 400-year-old oak trees, and rocky beaches wedged between Long Island Sound and the Hutchinson River.

The 2700-acre Pelham Bay Park, the largest in New York City's park system, also harbors a wide variety of wildlife, including animals not normally thought of as city critters. These include flying squirrels and red-backed voles that usually dwell well beyond city and suburban boundaries, as well as a rare moth found nowhere else that lays its eggs on grass leaves. "There is nature in cities," says David Burg, president of WildMetro, a New York–based environmental group. "Cities are not necessarily a wasteland. [Pelham Bay Park shows how] some species can adapt to city living."

Wildlife is good for human health

An increasing number of university researchers, conservation groups, and other wildlife biologists have come to recognize that wild places and wildlife can be found in urban settings. For that reason, the Society for Conservation Biology devoted several sessions to the subject at its 2004 annual meeting in New York City. The talks, says Don Melnick, executive director of Columbia University's Center for Environmental Research and Conservation (CERC), focused on how the health of wildlife and the environment affects people where they live.



Like the proverbial chicken, an Eastern box turtle crosses a rural road, thereby putting itself in danger of being killed by a passing vehicle. Terrestrial turtles have not suffered as great a difference in the numbers of males and females killed crossing roads as have aquatic turtles. Photograph: Sean Giery.

"We need to study wildlife wherever it is found and to show how ecological and human systems are connected," adds Fred Koontz, assistant director of Wildlife Conservation International's Metropolitan Conservation Alliance and former head of the Wildlife Trust's New York Bioscape Initiative. The bioscape initiative combines the resources of three dozen scientists from 15 groups to study wildlife in the New York metropolitan area. "Wildlife, ecosystems, and human health are all related," Koontz adds. Wildlife biology "is not just about endangered species and land conservation."

"We are seeing a worldwide shift from rural and wild areas to urban areas that is challenging how we use natural resources," says Deborah Jensen, president of the Woodland Park Zoo in Seattle and of the Society for Conservation Biology. "The boundary between rural and urban is becoming blurred. We cannot just look at animals in pristine areas. We have to learn what our urban centers mean for wildlife."

Metropolitan areas are taking on an increasing importance in ecological health because of their growth in size and population. Some 21 million people, or about 8 percent of the entire US population, live in the New York metropolitan area, which includes areas of New Jersey, Connecticut, and southern New York State. The city itself is home to more than 8 million people. Worldwide, 2003 was the first year in which more people lived in urban areas than rural ones. By 2050, perhaps as many as three-fourths of the world's human population will live in cities and suburbs.

That there is any habitat for wildlife beyond pigeons, rats, mice, and the like in and around New York City may surprise some. But the city alone features a dozen parks of 600 acres or more. In all, New York City manages more than 28,000 acres of parks. The metropolitan area includes nearly 100,000 acres of

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Biologist Joanna Burger holds a squawking great egret. Burger and her colleagues collect feathers from great egrets and other seashore birds to test for heavy-metal contamination. Photograph courtesy of Joanna Burger.

state parks in northwestern New Jersey and southern New York. To those numbers add the 26,000-acre Gateway National Recreation Area and the 19,500-acre Fire Island National Seashore on Long Island, both run by the US National Park Service, as well as several smaller national wildlife refuges.

One way to look at the relationship between wildlife and ecological and human health is through seabirds. "These birds are at the top of the food chain," says Rebecca Harris, SEANET (Seabird Ecological Assessment Network) program coordinator for Tufts University's Center for Conservation Medicine in North Grafton, Massachusetts. "They are good indicators of pollutants. Their health serves as an advance warning for people who eat the fish and shellfish from the same waters as the birds."

The SEANET program, begun in 2002 (and in New York and New Jersey in 2004), uses volunteers to collect and photograph dead seabirds that have washed ashore. The goal is to help scientists study seabird demographics, causes and rates of mortality, and evidence of environmental contaminants from Newfoundland to New Jersey. Volunteers also send feather and liver samples to researchers to test for heavy-metal pollution and organic compounds like PCBs (polychlorinated biphenyls).

Conclusive results as to what is killing which animals are not yet available for seabirds, Harris says. So far, though, ingested plastic seems to be killing more seabirds than oil or other pollutants. Shearwaters, which feed on fish and crustaceans at the ocean's surface, are particularly prone to floating plastic. They can also become entangled in fishing gear.



Wildlife researcher Michael Gochfeld measures common tern eggs from a New Jersey seashore nesting colony of terns, gulls, and other birds. The eggs are checked for heavy metal and other contaminants. Photograph courtesy of Joanna Burger.

More is known about the exposure of common terns and herring gulls, says Joanna Burger, distinguished biology professor at Rutgers University in Piscataway, New Jersey. Burger and Michael Gochfeld of Rutgers' Environmental and Occupational Health Science Institute have been studying the eggs laid by birds that nest in colonies along New York's shores for 30 years. Their research shows that levels of heavy metals such as cadmium and lead increase, and rates of reproductive success decrease, the closer tern and gull nesting colonies are to New York City itself. They also report behavioral problems among herring gull chicks whose bodies become laden with contaminants. The young birds do not eat much, fail to recognize their parents, and wander into the territories of other herring gulls, which often attack and kill the wayward chicks.

Although Burger says lead levels have fallen in tern and gull eggs since the use of lead in gasoline was banned in the 1970s, lead is still found in all the eggs she and her colleagues have examined. Moreover, the amount of lead found in some eggs was high enough to cause behavioral problems in young birds. And while lead and cadmium levels have fallen in the last 30 years, those of mercury have remained fairly constant. "That's disturbing," she says. "We have to remain vigilant" concerning heavy metal contamination of urban habitats.

Burger cautions that contaminants represent but one threat for common terns and other colonial nesting seabirds in metropolitan areas. Others include the sheer size of the human population and the level of development in and around New York City, as well as global warming, habitat loss, and predators like foxes and raccoons. "We can control contaminants more easily," she says of her focus on their role in wildlife and ecological health. On the other hand,

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Burger points out, overall the New York metropolitan area has one of the most diverse and healthy bird populations, with increasing numbers of double-crested cormorants, egrets, and herons.

Beyond birds

Alonso Aguirre is worried about Kemp's ridley, green, loggerhead, and other large sea turtles as yet another indicator of ecological health. Aguirre, the Wildlife Trust's director of conservation medicine, works with Steven Morreale of Cornell University and Ralph D'Giovani of the Riverhead Foundation on Long Island to monitor the health of and to rehabilitate sea turtles caught in fishermen's nets. So far, the news is good. Based on preliminary data, Aguirre sees no change in a basically healthy turtle population in New York waters from the early 1990s, although testing for heavy metals is set to begin later this year.

More ominously, though, Aguirre and his colleagues have found a significant change in population dynamics among the sea turtles. One of every three turtles caught in New York waters in the early 1990s was a loggerhead. Now, however, catching a loggerhead is rare, while Kemp's ridleys account for half the sample. Aguirre speculates that loggerheads may be killed more frequently when caught in fishermen's nets, or that the local crabs on which they prefer to dine have been replaced by a less palatable exotic species from China.

Ashore, James Gibbs is concerned about an imbalance of mortality among land and freshwater turtles crossing roads in New York and New England. Confirming anecdotal reports, his literature searches and field studies have found that 60 to 70 percent of road fatalities among turtles are females. As a result, he says, sex ratios are becoming skewed. Where males once were 45 percent of turtle populations, they now represent about 60 percent.

"That cannot go on forever," says Gibbs, associate professor of conservation biology at the State University of New York in Syracuse. "Females are the core of the population. Slight increases in mortality can lead to large declines in



SEANET volunteers trek over a rock-strewn shoreline to examine birds and other wildlife killed or sickened by an oil spill that washed ashore in Buzzards Bay, near Woods Hole, Massachusetts. Rebecca Harris (not pictured) coordinates SEANET volunteers and research along the beaches of New York and New Jersey. Photograph: Andrew Cunningham, Tufts University.

populations." He cites the case of eastern box turtles, whose overall numbers have declined over the past 50 years as the population has become ever more male dominated.

Gibbs points out that female turtles, especially large snappers, make annual migrations from the lakes, ponds, and streams where they live and mate to on-land nesting sites. That journey places them in danger every time they have to cross a road to find the warm, well-aerated soils they need to incubate their eggs. The more sedentary males are less likely to wander and thus be killed on roads. Not only are turtles at risk as they cross roads, so too are drivers who swerve to avoid the reptiles, he says.

Gibbs is encouraging highway planners and engineers to consider placing barriers by roadsides to keep turtles away; building tunnels underneath roads, although this is of questionable value because turtles and amphibians are reluctant to use them; or, better yet, developing artificial nest sites between lakes, ponds, and streams known to harbor turtles and the roads they would have to cross. Given North America's diverse turtle population, "we have a lot to lose here," Gibbs says.

More beneficial than beautiful

Not all animals of concern to wildlife researchers in the New York metropolitan area are as charismatic as seabirds or large turtles. As a matter of fact, some are downright small, unattractive, or disgusting. Carrion and dung beetles fit that bill. Depending on the species, these beetles eat dung, roll it into a ball and bury it, or lay their eggs in it. Some dig tunnels under dead animals to bury the carcasses and lay their eggs on them. Taken together, carrion and dung beetles "affect ecosystem services that affect how we live," says James Danoff-Burg, an associate research scientist at Columbia University's CERC.

Danoff-Burg estimates that 20,000 to 30,000 species of carrion and dung beetles live in North America, of which about 50 are found in the New York metropolitan area. In New York City, however, only about a dozen species are usually found in traps placed in city parks, and only four species are found in downtown Manhattan. Many of those, including the most abundant species, are exotic scarab beetles. Carrion and dung beetles are important because they help remove and recycle waste materials that, if left on the ground, could become sources of disease. When the beetles are not around to remove carrion and dung, flies take over. And, instead of burying or eating the material, flies fly off with some of it on their feet to be deposited on someone's table, plate, or food.

Normally, carrion and dung beetles outcompete flies for food both because they remove the food from where the latter can get it and because the flies, as Danoff-Burg says, do not fight for it. But, to do what they do, the beetles need soft, diggable soil. The hard, compacted

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New York state field technician Angel Knox holds a snapping turtle caught in a pond in Onondaga County. Sex ratios among North American freshwater turtles have become increasingly male dominated over the last century because females on their way to nesting sites are killed while trying to cross roads. Photograph: David Steen.

soils and paved streets, sidewalks, and yards of New York and its suburbs are not favorable beetle habitats. Moreover, many carrion and dung beetles prefer places covered by tree canopies and bushes that hide them from birds and other predators. Those beetles avoid open meadows, urban playgrounds, and city neighborhoods.

Sometimes, just finding carrion and dung beetles can be difficult. "You have to seek them out," says Elizabeth Nichols, a biodiversity specialist at the American Museum of Natural History in New York and Danoff-Burg's former graduate student. "You usually have to poke into dung to find them." Nichols also notes that dung beetles prefer the wetter portions of dung. "It's like gravy to them," she says. It's also where most bacteria and protozoa are found within dung. Some studies indicate that by eating dung, the beetles kill bacteria and protozoa that can cause disease in people. Whether flies transmit those bacteria and protozoa to people remains unclear. "We want to establish those linkages," Nichols states.

Another wildlife-and-health relationship can be seen in Dutchess County, 70 miles north of New York City. Here, in the forest fragments left by development and increasing suburbanization, the number of white-footed mice is growing as the number of other mammals and birds decline in these small forest patches. Richard Ostfeld, a senior scientist at the Institute of Ecosystem Studies in Millbrook, New York, has found that the more white-footed mice in a forest patch, the higher the risk that someone entering the forest will get Lyme disease.

At one time, scientists and physicians thought ticks got Lyme disease from deer. Actually, while ticks can get the pathogen from (and give it to) a variety of animals, white-footed mice represent the best reservoir for the disease. More than 90 percent of ticks that feed on the mice become infected, while at most 50 percent get the pathogen from feeding on other species. The more diverse the bird and mammal populations, Ostfeld says, the fewer ticks will be infected and the less likely humans will be to get the disease. "Diversity is good for your health," he concludes.

Protecting plant life

Other researchers in the New York metropolitan area are studying how some common and exotic plants are faring in human-altered habitats. One such place is Black Rock Forest, a 3800-acre, privately owned reserve located 50 miles north of New York City. Here, researchers are looking at changes in the composition of tree species as well as tree regeneration.

William Schuster is particularly worried about the chestnut, red, and white oaks that once dominated the forested highlands surrounding New York City. At one time those trees made up more than half of the Black Rock Forest's subcanopy species. Now they constitute less than 10 percent. Plenty of large oaks remain, but there are few small or even medium-sized ones despite plenty of seedlings that sprout nearly every spring, says Schuster, executive director of the Black Rock Forest Consortium, a 17-member group of universities and

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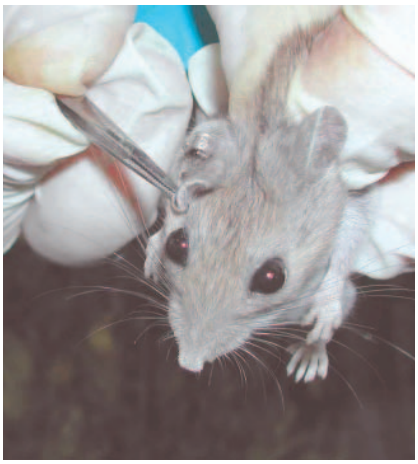
research institutions that manages the reserve.

As a result, few young oaks are replacing older trees that succumb to disease, parasites, storms, or simply old age. Schuster blames the forest's large deer herd for most of the lack of oak regeneration. The deer, which now total 250 to 300, or about 40 per square mile, have few predators to keep their numbers low. They prefer to eat oak seedlings, thus skewing the age demographics of oak trees. Black birches and red maples, which once numbered less than 10 percent of the subcanopy trees at Black Rock Forest, now represent more than 50 percent.

Scientists at Black Rock Forest have been fencing off experimental sites since the mid-1960s to test the effect of deer foraging on oak and other plant regeneration. Such exclusion sites and similar ones on neighboring West Point lands are now chock-full of oak and other seedlings, Schuster says. As the slow-growing oaks mature, he expects them to replace the faster-growing black birches and red maples that still dominate most experimental sites.

Yet other studies of plants in the New York metropolitan area have yielded some surprising results. Erik Kiviat, science director of Hudsonia Limited, a nonprofit research institute, and professor of environmental studies at Bard College in Annandale, New York, studies exotic marsh plants in the New Jersey meadowlands west of New York City and in Jamaica Bay on the south side of Long Island. He is particularly interested in purple loosestrife and *Phragmites,* both much-despised invasive species. Purple loosestrife is a shrublike herb that can reach 10 feet, while *Phragmites* is a grass growing to 15 feet. They prefer water-covered ground but grow in disturbed soils as well.

Kiviat's studies show that purple loosestrife and *Phragmites* harbor a diverse range of wildlife, especially birds. "People too often assume that exotic [plant] species have no value for wildlife," he says. "Extensive stands of *Phragmites* offer a refuge from predators and from people. They benefit some birds that would be harmed if the plants were removed. Any plant community can be good for some animals and not for others."



Contrary to popular conception, white-footed mice represent the largest reservoir for Lyme disease in wooded areas of upstate New York and elsewhere in the New York City metropolitan area. The tick that spreads the disease can be seen behind the right ear of this juvenile white-footed mouse, just below the numbered tag used to identify the animal in mark–release–recapture studies. Photograph: R. Ostfeld laboratory.



Dung beetles (pictured) and carrion beetles feed their larvae and help protect human health by burying bacteria-laden wastes that might otherwise be spread to people by houseflies. Photograph: Edward L. Manigault, Clemson University.

As proof, Kiviat points to the herons, ibises, least bitterns, marsh wrens, and ruddy and gadwall ducks, among other birds, that breed in *Phragmites* stands. He also notes that not all purple loosestrife or *Phragmites* stands in New York area marshes are alike. In summer, grasshoppers dine on *Phragmites* leaves in parts of the New Jersey meadowlands where the stands are thick and few other plants grow. In other places in those same marshes, *Phragmites* is interspersed with other plants. There, no grasshoppers are found. Instead, the caterpillar of Henry's marsh moth eats *Phragmites* leaves.

"You have to ask what impact invasive plants have on other plants and animals," Kiviat adds, warning against widespread efforts to eliminate purple loosestrife and *Phragmites*. "Getting rid of them may have considerable consequences, like freeing toxic substances from the soils." Purple loosestrife forms extensive roots that hold soils in which a diverse array of mosses and other plants grow, while *Phragmites* absorbs nutrients that would otherwise feed algal growth in marshes. Kiviat recommends managing these exotic species to keep them limited in number but widespread enough to benefit wildlife.

In the end, natural areas in the New York metropolitan area provide important ecological services, says Columbia University's Don Melnick. "There is a direct connection between the health of the environment and the health of people," he adds. "Natural areas are critical for people living in urban areas. They provide habitats for wildlife, recreation opportunities for people, and clean drinking water for millions. We need to galvanize scientific attention on the need to preserve ecosystems in and around cities like New York."

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