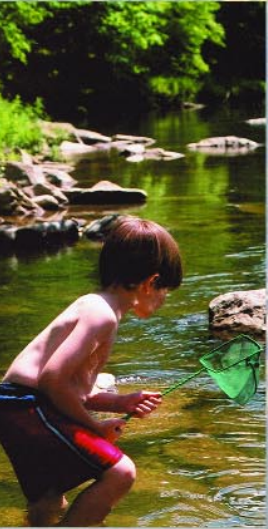




# Protecting Nature in Your Community



## ***By sustaining and restoring nature, your town can:***

- *Increase property values.*
- *Reduce expenses for flood control, water treatment, and other infrastructure maintenance.*
- *Provide open-space recreation and the chance to experience nature close to home, whether you live in a suburban, rural, or urban setting.*
- *Preserve our natural heritage. The woodlands and wetlands that excited and gave joy to your grandparents or earlier generations continue to support life and beautify your town, and enrich the lives of your children.*

**T**wenty-five percent of New Jersey's lands and waters are currently protected as parkland and open space. While this is a remarkable achievement, it still means that the majority of the state's plants, animals, and natural communities are found on private lands. Consequently, the actions of private landowners and local governments are vital to maintaining the life-sustaining environmental systems that provide water and air purification, flood control, summer heat abatement, and erosion control. Ultimately at stake is the future survival of the state's plant and animal species.

Some New Jersey municipalities have a high percentage of undeveloped natural lands, and they can work locally and regionally to protect them. Many towns have only a few farms or woodlands remaining within their boundaries. Others were "built-out" years ago, with no undeveloped land left. Yet, with thoughtful land-use planning and the adoption of more ecologically sound and sustainable practices, each municipality can conserve and restore the natural world on which our lives depend.

This primer provides an overview of New Jersey's natural world, discusses the importance of this heritage for the state's citizens, and offers suggestions on how municipal decision makers can best improve the conservation of this natural treasure.

**Center for Biodiversity and Conservation  
American Museum of Natural History**

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# Biodiversity — New Jersey's Natural World

Although it is the most densely populated state in the nation, New Jersey has a remarkably diverse natural landscape, ranging from expansive barrier beaches to pine barrens to forested hill country and river valleys. It is also home to an impressively rich diversity of life. Mammals such as black bear, bobcat, porcupine, and otter live here along with over 400 species of birds, at least 200 of which nest in the state. With 280 different types of upland and wetland habitats, New Jersey supports more than 2,000 native plant species, almost half of which are considered rare. Seals, sea turtles, sea stars, and blue crabs swim in coastal waters, and a wide array of insects, including butterflies and dragonflies, abound in the woods, fields, and wetlands. This wealth of species and habitats make up the state's biological diversity (or biodiversity, for short).

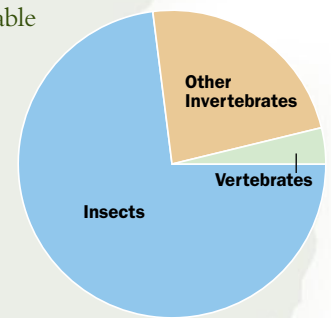
*Biodiversity* is used to describe all the components of nature that are needed to sustain life. The term refers to the complex relationships among living things, as well as the relationships between living things and their environment. It includes genetic variety, species diversity, and variability in natural communities, ecosystems, and landscapes.

Biodiversity includes not only species we consider rare, threatened, or endangered. It includes all species, even common ones like robins and chipmunks, as well as living things we know less about, such as microbes, fungi, and invertebrates. All biodiversity — local species and habitats as well as those in distant rainforests — deserves consideration because each contributes directly to healthy ecosystems.

The biodiversity of a freshwater swamp includes the fish, snails, algae, and insects living in the water; the wading birds and ducks paddling among the tussocks; the small voles searching for seeds along the water's edge; the turtles basking on the floating logs; the irises that bloom in the spring; and the father with his young daughter fishing in the stream. It encompasses the relationships among the species in this community (who eats whom, for example) and between different natural communities (between forests and fields, lowland swamps and upland woodlands).

Invertebrates (animals without backbones) — primarily insects — make up the bulk of life on Earth. Often overlooked, they perform invaluable services and play important roles in all ecosystems. Many invertebrates, for example, feed on dead plant and animal matter. By recycling nutrients and enriching the soil, these decomposers create the conditions on which all life in that ecosystem depends. Invertebrates also disperse seeds and pollinate flowering plants, and they are invaluable for agriculture.

**Diversity of Animal Life**  
(Derived from Wilson 1992)



Among New Jersey's rare species are Hammond's spring beauty (*left*) and the bog asphodel (*right*), found nowhere else on Earth.



# Why Is Biodiversity Important?

Biodiversity provides an important source of both goods and services, and also has value in its own right.

## GOODS

Thanks to biodiversity, we have such necessary goods as food, fuel, fiber, and building materials. All of our food comes from biodiversity; 20 plant species, including wheat, corn, rice, and potatoes, provide 90 percent of the world's food. We depend on wood for lumber and fuel, and we value different woods for their unique properties: white ash for baseball bats, cedar and locust for fence posts, rosewood for guitars.

Close to 25 percent of Western medicinal drugs were developed from plants. In the United States alone, 57 percent of the top 150 most-prescribed prescription drugs, with an economic value of \$80 billion, originated with discoveries made in the wild from animals, fungi, and bacteria as well as plants (Grifo et al. 1997).



A clotting agent derived from horseshoe crab blood is used by pharmaceutical companies to test for the sterility of drugs, vaccines, and other medicines.

J. E. DeKay/courtesy: New York State Museum



E. Johnson

A chemical compound found in the mayapple, a woodland plant native to New Jersey, has been used to develop two drugs, etoposide and tenoposide, both of which have been important in the treatment of lung cancer and lymphoma.

## SERVICES

Equally important, but often less apparent, are the life-sustaining ecological services that biodiversity provides at no cost to us. Green plants absorb carbon dioxide (CO<sub>2</sub>), provide food, produce the oxygen in the atmosphere, and are also important for the control of erosion, drought, and floods. Bacteria and fungi cycle nutrients, reduce waste products, and create fertile soil. Intact woodlands, wetlands, and watersheds play an important role in providing clean water and in replenishing aquifers. Furthermore, natural pest control is provided by birds, mammals, amphibians, reptiles, and predatory insects.



J. Crane

### Pollination and Cranberries

For years New Jersey cranberry farmers have relied on the domesticated European honeybee for pollination. Now, managed honeybee populations are subject to mite and beetle predation and microbial disease, which could threaten cranberry harvests. Scientists are exploring options for encouraging and managing native bees, such as this bumblebee, which are not susceptible to the same problems, but these bees require natural or provided habitat for nesting.

Did you know that there are over 350 species of

*Nature gives us:*

- Clean air
- Clean water
- Nutritious food
- Better health
- Productive soil
- Beauty and inspiration

An estimated 90 percent of flowering plants depend on bees and other insects as well as birds and bats for pollination, and on small mammals, insects, and birds for seed dispersal. Pollinators are critical to the production of most major food crops around the world and in New Jersey, and they are virtually impossible to replace.

Biodiversity also provides a genetic “library” — a vast resource of genes to create more productive livestock or pest-resistant agricultural crops — in essence, providing insurance for agriculture.



M. Bisognato

Insects such as this painted skimmer dragonfly help keep pest insects in check.



M. Ehlentfeldr/USDA-ARCS

The genetic variability in New Jersey's wild populations of highbush blueberries was used by farmer Elizabeth White and USDA researcher Frederick Colville to develop the first commercial blueberry crop in 1916, at historic Whitesbog Village in the Pine Barrens.

## OTHER VALUES

Biodiversity is also valued for its own sake — for the many cultural, spiritual, and aesthetic values people place on nature and natural areas. Every New Jersey resident deserves to benefit from the protection of such places whether they live in urban, suburban, or rural areas. In densely populated New Jersey, parks are an essential component to the quality of life for residents; more than 17 million people visit these parks each year (New Jersey State Park Service 2006) for relaxation and recreation. This desire to “be in nature” translates into a multibillion-dollar tourism industry for New Jersey.

Perhaps most important, biodiversity has an intrinsic value in its own right, apart from its worth to other species or ecosystems. We have an ethical responsibility to preserve living species and have implemented important regulations to this end such as New Jersey's Endangered and Nongame Species Conservation Act, the Freshwater Wetlands Protection Act, the Pinelands Protection Act, and the Highlands Water Protection and Planning Act.



R. Kuruminski



K. Strahosch-Walz

Biodiversity has economic value for ecotourism. The New Jersey coastal tourism industry, worth over \$21 billion a year (K. Wolfe, personal communication, March 2007), is based on the beauty of the 127 miles of dunes and beaches, the health of the coastal fisheries (which depends on the water quality of the state's fresh, estuarine, and marine water systems), and the maintenance of suitable habitat for the many species that live on and migrate to the Jersey shore. Piping plover chicks (*top*); Sandy Hook, Gateway National Recreation Area (*bottom*).

bees in New Jersey?

# Threats to Biodiversity

Over the last century, humans have come to dominate the planet. Ecosystems are being rapidly altered, and the planet is undergoing a massive loss of biodiversity. While the Earth has always experienced changes and extinctions, the current changes are occurring at an unprecedented rate. Still more sobering, most threats to biodiversity are generated by human activity. The good news is that it is within our power to change our actions to help ensure the survival of species and natural systems — and ultimately, ourselves.

The main direct threats to biodiversity are:

- **Habitat loss and habitat fragmentation**
- **Invasive species**
- **Pollution**
- **Unsustainable use**
- **Global climate change**



K. Karlson

A scarlet tanager depends on large, unbroken forests to meet its needs for food, shelter, and nesting each spring.

## HABITAT LOSS AND HABITAT FRAGMENTATION

Each year, more and more of New Jersey's remaining undeveloped land and wildlife habitat is consumed by a pattern of poorly planned housing and nonresidential development that is termed "sprawl" (Johnson and Klemens 2005). While all development affects biodiversity, carefully planned, compact development minimizes the impact. Whatever the pattern, New Jersey's sprawling development is accelerating habitat loss at an alarming rate. Some habitats are destroyed outright, wetlands are altered, and forests and farmlands are cleared for construction or are simply paved over. When this happens, the plants and animals living in these habitats usually perish.

More often, wildlife habitats are fragmented — broken into smaller and smaller pieces — by the construction of roads and curbs, buildings and lawns, and mowed rights-of-way. When habitats are thus fragmented, the living conditions within them change (for example, soils dry out, different predators abound). Some species may seek out more suitable habitat, but traversing busy roads and numerous lawns in search of better conditions makes these animals vulnerable to predation and to being hit by vehicles. The plants and animals that remain behind become isolated from others of their kind, and the resulting loss of genetic diversity leaves them more susceptible to disease and disturbance. In time, populations in these areas may become extinct.

By fragmenting habitat, sprawl also disrupts the natural processes that create and maintain our landscapes. Some of these processes include fire, coastal dune movements, decomposition and nutrient cycling, and natural flooding, which deposits nutrients in floodplains and recharges the aquifers that supply drinking water.

M. Valent



This New Jersey male bobcat has a home range of 48 square miles, but may travel well outside of its home range to find a mate. Each animal exists as a part of the population with which it interacts, and it needs sufficient habitat to provide for food, water, shelter, and social interactions with others of its species.

(Right) Sprawling development fragments habitat.

NJ Endangered and Nongame Species Program



New Jersey is projected to be the first state to reach “build-out,” where all available and yet-to-be preserved open space has been developed.

New Jersey Future 2005

S. Young/NY Natural Heritage Program



Fire creates sandy openings required by plants like bearberry (above). A prescribed ecological burn is conducted by the N.J. Forest Fire Service in the pine plains (right).



A. Windisch

## Fire and the Pine Barrens

The New Jersey Pine Barrens includes pitch pine-scrub oak forests, sandy soil, abundant freshwater streams, and lowlands underlain by the largest aquifer in the state. This unique diversity of habitats supports a rich array of plants and animals including the rare curly grass fern and Pine Barrens treefrog. A key natural process that sustains this diversity is fire. Many of the plant and animal species that live in the Pine Barrens have developed special adaptations that allow them to survive or even regenerate after a fire. Despite the fact that nearly half of the 1.4-million-acre Pine Barrens is protected, the fire suppression policies needed to protect homes that have been built within and near the Pine Barrens are altering the natural fire regime. This can have serious consequences both for the people who build there and for the ecosystem. Managing development to maintain important ecosystem processes such as fire and to protect water quality is key to Pine Barrens conservation.

B. Zanic



## Agriculture and Sprawl

Poorly planned growth consumes prime farmland. Although overall biodiversity declines when native habitat is converted to farms, traditional small-scale

farms provide habitat for a great variety of wildlife. Field edges support native bees and other pollinators, while catbirds and cottontail rabbits seek cover in hedgerows, and great horned owls nest in woodlots. Preservation of farmlands, especially when those farms apply management practices that reduce pesticide use and minimize soil erosion, also helps replenish groundwater and reduces runoff and stream pollution. This is especially true if an impervious cover limitation is included in the farmland preservation easement. Some easements successfully used in New Jersey limit impervious cover to 2% of the preserved land, protecting 98% of the land for infiltration. Another species that benefits from farmland is the bog turtle (above), listed as threatened by the federal government and endangered in New Jersey. Bog turtles prefer open marshy meadows, but with the loss of its preferred wetland habitats statewide, lightly grazed farmlands have become increasingly important to the global conservation of this species.

## URBAN AND SUBURBAN SPRAWL

Poorly planned or random development of housing, roadways, businesses, and industry:

- Pollutes air and water
- Decreases farmland
- Degrades healthy ecosystems
- Reduces quality of life
- Increases cost of living
- Contributes to climate change



E. Johnson

Japanese barberry is abundant in deciduous forests throughout New Jersey, where it can form impenetrable thickets that affect the diversity of native plants and wildlife. Researchers at Rutgers University have shown that this invasive shrub actually changes the chemistry of the forest soil and prevents native plants from growing. In addition, deer avoid browsing on barberry because of its thorns and the distasteful chemicals in the leaves, further encouraging its spread. In places such as Morristown National Historic Park and Allamuchy State Park (Kourtev et al. 1998), the diversity of plant species has severely declined as Japanese barberry has covered the ground.

One-half of the plants considered to be most invasive in North America were introduced intentionally for horticultural use.

Marinelli 1996

## INVASIVE SPECIES

Fragmented landscapes facilitate the spread of invasive species (those species whose populations have expanded so dramatically that they cause harm to native species and ecosystems). They can be *native* (species that occur naturally in an area) or *non-native* (species that were brought here or spread here from somewhere else). Invasive species can be predators, disease carriers, or competitors for resources, and they sometimes even alter the ecosystem processes that sustain native plants and animals.

Businesses and individual homeowners inadvertently establish new sources of non-native invasive plants when they plant purple loosestrife, shrub honeysuckles, or Japanese barberry, for example, on their property. Birds further disperse the seeds of these non-native invasive plants into the region, causing trouble for the other plants and animals that live in more natural habitats. Extensive road networks required by dispersed development also serve as conduits for the spread of invasive plants and animals.

In addition, other practices of home and business owners can alter environmental conditions adjacent to their properties, leading to an increase in invasive species. For example, runoff from yards containing lawn fertilizers changes the chemistry of nearby wetlands, providing the right conditions for the spread of common reed (*Phragmites*), and other invasive plants — usually to the detriment of native wetland plants and animals. Grass clippings, yard waste, and even discarded houseplants, such as bamboo, dumped in adjacent woodlands spread chemicals, weed seeds, and the plants themselves into the surrounding forests. Land clearing and other disturbances create the sunny openings that invasive plants, such as multiflora rose, need to thrive, allowing them to take over as the dominant ground cover.

Some species benefit from sprawl, often to the detriment of other species and to the health of natural ecosystems. The habitat we have created — scattered homes and businesses interspersed with lawns and gardens — is widely used by deer, geese, and adaptable predators such as opossums and raccoons. Couple this with the increased presence of free-ranging household pets in the landscape, and it becomes difficult for many of our native birds and small mammals to survive and reproduce.

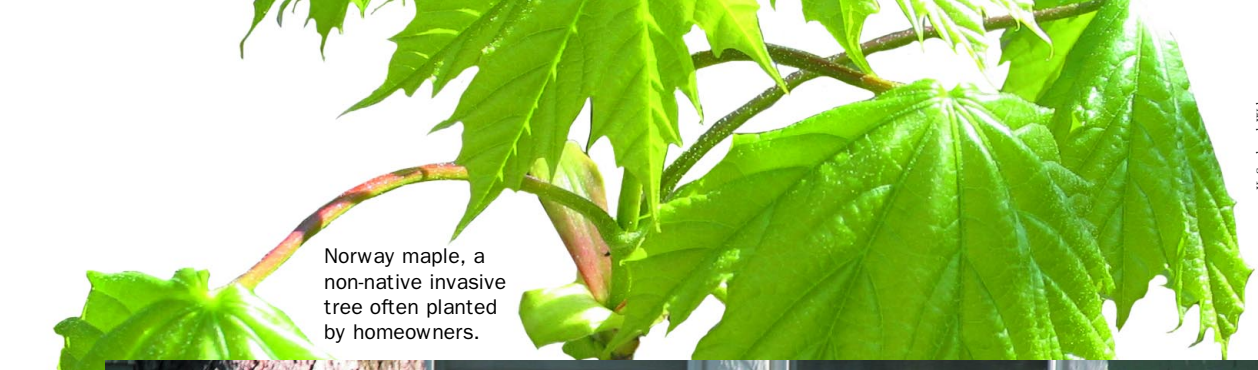


L. Cohen

House cat with blackpoll warbler.



Norway maple, a non-native invasive tree often planted by homeowners.



White-tailed deer numbers in New Jersey have been increasing steadily over the past several decades, in part due to the absence of natural predators, such as wolves and cougars, but due primarily to increased sprawling development. White-tailed deer prefer edge habitat, which increases with greater fragmentation of the landscape by sprawl. The increase of deer populations has significant economic costs, such as increased traffic accidents and costs to farmers, nursery growers, and homeowners. There are also significant ecological costs because deer are heavy browsers and they have taken a toll on native forest understory plants. Conservation of biodiversity in New Jersey requires innovative efforts to control deer populations.



P. Curtis/Cornell University

House cats kill more than a billion birds, small mammals, amphibians, and reptiles in the U.S. each year.

### Sprawl Negatively Affects Human Health

Poor land-use planning affects human health in a number of ways. For example, development that results in reduced options for walking and biking has been linked to higher rates of obesity (Harder 2007). The increased driving necessitated by sprawling development increases air pollution, which affects respiratory health (Benfield et al. 1999, Jackson and Kochtitzky 2002).

Additionally, researchers have shown that the incidence of Lyme disease is increasing, especially where dispersed housing or other development has fragmented larger forests into smaller patches of less than 5 acres in size. White-footed mice are the main carriers of the Lyme disease bacterium, which is transmitted from the mice to other animals, including humans, by the black-legged tick (above). These mice thrive in smaller forest fragments, perhaps because there are fewer competitors for food or other resources (Allan et al. 2003).



S. Bauer/USDA



Long-tailed salamander

In aquatic systems, amphibians and invertebrates are particularly susceptible to pollution because of their permeable skin, which allows toxins to pass through quickly. In addition, toxins move up the food chain, from sediments to insect to frog or fish to osprey or eagle, for example.

## POLLUTION

While substantial improvements in air and water quality have been made since the passage of the Clean Air Act in 1972 and other environmental laws, pollution in New Jersey — particularly air pollution — is again on the rise due to sprawling development. This is partly because more than 73 percent of employed New Jersey residents now drive to work in cars rather than take mass transit (U.S. Census 2000) and because our vehicles are less fuel-efficient.

Sprawling development reduces the quality and quantity of New Jersey's supplies of both groundwater and surface water across a wider landscape. Within each watershed, the amount of impervious surface — where rainwater runs off instead of percolating back into the soil to replenish the groundwater — is increasing. Impervious surfaces typically include pavement and building roofs. But even unpaved surfaces, such as soils compacted by construction vehicles or heavy pedestrian use, or dense turf grass used in lawns, can be impervious to rainwater infiltration and can cause substantial stormwater runoff. Runoff from lawns, roads, agricultural fields, golf courses, and the like carries with it pollutants such as heavy metals, road salt, oil, dust, pet waste, pesticides, and even household pharmaceuticals and personal care products. Ingredients such as the triclosan in antibacterial soaps and other such products have been shown to cause reproductive and development problems in amphibians and other wildlife (Pelley 2007). All of these pollutants are carried by stormwater pipes directly into the nearby bodies of water we use for swimming, fishing, and drinking water. In addition, most of these pollutants cannot be treated effectively by present-day sewer and septic systems.



S. Stanne/NYS Department of Environmental Conservation

**Light pollution.** Life on Earth has evolved over the millennia in response to predictable day-night cycles. Artificial night lighting interferes with these adaptations and can affect animal navigation, reproduction, and courtship, as well as plant germination and flowering.



Sierra Club/NY/NASA

**Noise pollution.** Most animals rely on hearing to communicate, avoid predators, and find food. For these reasons, the noise from recreational vehicles, increased traffic, and the two-



NJ Endangered and Nongame Species Program

cycle engines used in lawn equipment can affect their long-term survival.



Lilacs, apples, and grapes are blooming an average of 4-8 days earlier than in 1960, due to warming temperatures in the Northeast (Clean Air — Cool Planet, 2005).

C. Gracie

## UNSUSTAINABLE USE

Compared to compact development, large lots containing “big-box” stores or single-family homes scattered over a landscape require more resource use and infrastructure support, with more miles of pavement and sewer, water, and telephone lines. This affects not only the immediate environment but also distant ecosystems where much of the construction material, such as harvested lumber, originates. Additionally, these larger suburban properties consume almost 16 times more water than homes on smaller lots in urban settings (Otto et al. 2002). Sprawling suburban development also leads to increased energy use, due mostly to increased need for vehicle use. This move away from compact cities and villages to single-family homes on large lots serviced by cars and strip malls — coupled with increasing population growth and resource demand — is not sustainable.



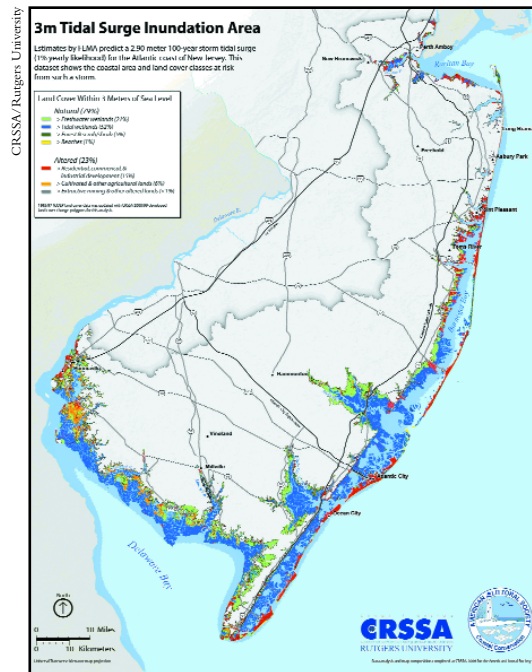
M. Klemens

Single-family homes on large lots scattered across the landscape consume significant amounts of natural resources.

## GLOBAL CLIMATE CHANGE

One of the most serious threats facing biodiversity today is global climate change, which poses risks to human health and to terrestrial and aquatic ecosystems. Warmer temperatures, more severe droughts and floods, and sea-level rise will have a wide range of ecological and economic impacts. Scientists predict an increase in global average temperatures of between 2.5 and 10.4°F over the coming century. What may seem an insignificant change is, in fact, projected to lead to a sea-level rise of between 4 and 35 inches over the next 100 years (New Jersey Department of Environmental Protection 2006). In New Jersey, this would cause the shoreline to shift inland as much as 480 feet and would contaminate drinking water supplies (Cooper et al. 2005). Additionally, warmer temperatures may increase ground level air pollution and aid the northward spread of disease-carrying insects (Environmental Protection Agency 1997).

Poorly planned development contributes to climate change due primarily to the need for increased car use, which releases even more greenhouse gases (CO<sub>2</sub>, methane, and nitrous oxide) into the atmosphere. Additionally, sprawling development patterns that fragment the landscape may impede the movement of species and hinder ecosystem adaptations in response to climate change.



Colored portions of the map indicate the coastal area of New Jersey at risk for 100-year storm tidal surge inundation, predicted to become more frequent with rising sea level.

In one study, a single-family house in an otherwise intact natural ecosystem had a zone of negative influence — such as changed behavior, increased predation, altered soil and water conditions, trampling — on nearby wildlife and plants as far as 650 feet into the surrounding forest.

# Steps to Conserving Nature in Your Community

Municipal decision makers must make tough decisions every day about the well-being of their community, balancing fiscal realities with many competing interests. Although the environment is often seen as just one more special interest, *the quality of our local and regional environment is what sustains the quality of our lives*. Here are some suggestions for ensuring the ecological health of your community. Even implementing just a few of these measures can go a long way toward conserving the natural world on which we depend.



J. Burke

## A. SIX MAIN STEPS

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- 1. Conduct a natural-resource inventory of habitats and species, as well as underlying geology, soils, and sources of freshwater.** Map all natural lands and their connections to open space in surrounding towns and the region in relation to developed areas.
- 2. Develop a municipal master plan that addresses nature at all levels: habitat protection, development and zoning, redevelopment, and environmental practices.** This plan should take a long-term view (20 to 50 years), should err on the side of caution when making recommendations that could have lasting environmental effects (the precautionary principle), and should allow for regular updates and/or actual modification to zoning or other ordinances. Adaptability in the plan is vital. Nature changes, technology changes, and our knowledge changes as well, especially as the cumulative impacts of past land-use decisions become apparent. In order to develop a shared vision for the municipality, local citizens, as well as experts, should be included during the planning stage.
- 3. Tap into other resources as necessary.** Establish an environmental commission and build conservation partnerships with a variety of local community groups and individuals, such as garden clubs, watershed organizations, and school boards. Select and work with professionals such as planners, attorneys, and biologists who understand your municipality's vision and are willing to work with you to achieve strengthened biodiversity conservation.
- 4. Identify other threats to your town's biodiversity,** such as light pollution or the presence of non-native plants or other invasive species, and make plans to address them.
- 5. Establish a fund for the preservation of open space in your municipality.**
- 6. Educate yourselves and your citizens about the importance of local biodiversity and its conservation.** Foster studies about the plants and animals in your area — including insects and other invertebrates — and what they need to live. *Ecological literacy leads to more informed decision-making, ensuring that development and preservation are implemented effectively and in an ecologically sensitive manner.*

## B. GUIDELINES FOR HABITAT PRESERVATION, RESTORATION, AND MANAGEMENT

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1. In addition to preserving farmlands, protect natural upland and wetland habitats, such as woodlands, fields, swamps, and vernal ponds, in order to protect *all* biological resources and ecosystem functions, not just endangered and threatened species. When possible, use buffers to minimize human disturbance to preserved areas. Consider the use of Environmental Infrastructure Trust (EIT) funding because the deed restrictions are better designed to protect water resources. Although important, remember that open-space preservation is not just about creating recreational bike paths and ball fields.
2. Maintain natural flow in all water courses and wetlands. Incorporate a wetlands protection goal into your municipality's master plan.
3. While “bigger is better” in terms of providing habitat and buffers for wide-ranging species and maintaining landscape-scale ecological processes, even small patches of habitat are important to conserve. They provide food and cover for a variety of resident and migratory species and can act as a native-plant seed source for nearby natural areas. These small pockets may even divert browsing deer away from neighborhood gardens, and serve as a first line of defense for flood protection and runoff filtration. Natural habitats in neighborhoods also connect nearby residents to the natural world, offering them respite from their busy lives.
4. Protect and/or create functional wildlife connections between nature preserves or other natural areas.
5. Preserve working lands. Work with local farmers and forest owners to implement best-management practices for conservation by using, for example, Integrated Pest Management instead of relying solely on pesticides, or by modifying mowing practices to protect nesting grasslands birds.
6. Think regionally, across municipal and state boundaries. Most of the planet's life-sustaining systems, such as watersheds and the hydrologic cycle, extend far beyond individual town boundaries. For example, the quality and quantity of your drinking water may depend on the actions of other municipalities and whether or not they develop too close to surface water supplies or on your town's well-water recharge area. It is essential to work with adjacent municipalities, the county, and/or regional planning commissions to implement regional conservation activities.
7. Work with regional and governmental agencies such as the Natural Resources Conservation Service and the New Jersey Division of Fish and Wildlife, which fund property owners' efforts to restore habitats and protect stream corridors.
8. Explore options for creating new green space through brown-field restoration within your town boundaries. The New Jersey Department of Community Affairs, the New Jersey Department of Environmental Protection Office of Brownfield Reuse, or the New Jersey Redevelopment Authority can provide guidance and examples of how this has been done in other communities.
9. Reduce erosion and protect water quality by upgrading existing stream stabilization and re-vegetation projects and implementing new conservation programs within your municipality.
10. Strengthen current parameters for rebuilding in floodplains and coastal areas. This is particularly relevant given climate-change predictions concerning sea-level rise and flooding.

## C. GUIDELINES FOR BIODIVERSITY-COMPATIBLE ZONING, REGULATION, AND DESIGN STANDARDS

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1. Implement programs for concentrating density in a growth area of town, while land in conservation areas of town remains preserved as open space. Emphasize traditional neighborhood design to encourage mixed-use development, where residential, retail, schools, and businesses are all within walking distance. Ideally, these are located near train stations and other transit centers (transit-oriented development).
2. Promote cluster development. Within conventional subdivisions, encourage clustering to preserve open space over and above existing steep slopes and unbuildable lots. Preferably, at least 50 percent (or more) of the land should remain open, and these undeveloped lands should be connected to, or adjacent to, other preserved lands. Up-zoning (allowing denser development) with mandatory clustering will still limit the number of new homes built in a municipality, but it will also protect natural resources. Without clustering, homes will sprawl across the landscape, fragmenting habitat.
3. Strengthen and enforce existing environmental ordinances and implement new ones where necessary, such as steep-slope protection, shade-tree conservation, prohibitions on feeding wildlife, a “cats indoors” campaign, wetlands protection, and erosion and sediment control. In many cases, municipalities have the authority to adopt strong protective ordinances, even stronger than state regulations. In addition, review all ordinance procedures and practices, including granting of variances, to determine where they may conflict with or impede attainment of the conservation goals of the master plan.
4. Consider the environment during all phases of the development application process. Work with your environmental commission or shade-tree commission, soliciting their input on all development applications. Require environmental resource inventories and environmental impact statements for applications for larger developments such as subdivisions, implement best management/development practices for individual construction projects, and work with developers from the beginning to negotiate habitat preservation. If your town does not have an environmental commission, create one and seek its input on the environmental aspects of municipal planning and management.
5. Incorporate biodiversity-friendly infrastructure design into site design standards, as appropriate, by using fewer and narrower roadways, wildlife-compatible curbing, and/or low-impact methods of stormwater treatment, such as swales, infiltration, and rain gardens.
6. Seek Plan Endorsement from the Department of Community Affairs Office of Smart Growth.



## D. LIVING WITH NATURE IN YOUR COMMUNITY

- 1. Practice water conservation.** Loss of groundwater recharge affects species and ecosystems, as well as our drinking water supply. Upgrade sewer or septic systems in order to protect the quality of water supplies and keep them in good working order. Reduce impervious pavement, use porous pavement where possible, and promote the use of rain gardens to improve groundwater recharge.
- 2. Reduce use of road salt, pesticides, herbicides, fertilizers, and other chemicals.** Use Integrated Pest Management in schools and on playing fields. Minimize the use of hazardous materials.
- 3. Use wildlife-compatible land management and landscaping practices on municipal lands and encourage citizens to do the same.** Reduce roadside mowing to allow local plants to grow and flower, thus providing food and shelter for native pollinators such as bees, and set mower blades at higher levels to avoid killing turtles and other small animals (higher settings also keep blades sharp for a longer time). Landscape with native plants, which require minimal maintenance and enhance wildlife habitat. Ensure that weed ordinances, if any, allow for the establishment of backyard wildlife habitat.
- 4. Choose energy efficiency.** Conduct a baseline energy audit of municipal buildings and operations. Explore options for carbon sequestering (removing and storing excess CO<sub>2</sub> from the atmosphere) by planting trees, conserving local woodlands, and avoiding lot clearing, for example. Purchase energy-efficient municipal vehicles and keep existing vehicles in good working order.
- 5. Reduce unnecessary night lighting.** Conserve energy and protect plants and animals from the disorienting (and often harmful) effects of light pollution.
- 6. Adopt green building practices for municipal projects and recommend the same for other development.** Follow the LEED (Leadership in Energy and Environmental Design) green building standards for new construction and renovation, including the use of sustainably harvested lumber, certified by the Forestry Stewardship Council, or the purchase of reclaimed wood. Provide incentives for developers to build “greener” (in compliance with New Jersey’s Residential Site Improvement Standards) by, for example, installing passive solar systems or systems to reuse gray water. Amend building codes to allow for innovative, more energy-efficient construction.
- 7. Reduce, reuse, recycle.** All the products we buy are produced using natural resources, and they usually end up in burgeoning landfills that often displace natural areas. Prevent the generation of waste in the first place by purchasing durable, long-lasting goods and by reusing or passing them on to others. Implement strong community-wide recycling programs. Support markets for recycled products, even if they cost more, by buying paper and other goods with recycled content, and then recycling all that cannot be reused.
- 8. Support local agriculture.** This will help conserve farmland, bolster New Jersey’s economy, provide fresh produce to its citizens, and reduce pollution and energy use related to transporting foods over great distances. Implement a community-wide composting program to reduce waste disposal costs and improve local soil quality. Promote organic farming, which reduces the amount of agricultural chemicals entering our waterways. Encourage development of community-supported agriculture (CSA).
- 9. Support vendors who practice sustainable production methods.** Check the Green Guide, Co-op America’s Green Pages, or similar listings for potential suppliers.
- 10. Encourage citizens to do their part to conserve biodiversity through their everyday choices.** In order to provide recommendations for homeowners and businesses, and to highlight private efforts, use municipal newsletters, press releases, and special programs to inform residents about municipal sustainability programs and actions. Most important, encourage the public to think innovatively and proactively about what they can do in their own community and how they can incorporate their ideas into municipal programs. Work with your schools, Boy and Girl Scout troops, 4-H groups, and others.

## Resources and References

Awareness of current biodiversity issues is critical if we are to see positive conservation outcomes. Learn about the biodiversity that lives in your neighborhood, stay informed about conservation issues, and share this information with others.

### For more information about biodiversity in general:

Alonso, A., F. Dallmeier, E. Granek, and P. Raven. 2001. *Biodiversity: Connecting with the Tapestry of Life*. Smithsonian Institution/Monitoring and Assessment of Biodiversity Program and President's Committee of Advisors on Science and Technology, Washington, D.C. Available from: [nationalzoo.si.edu/ConservationAndScience/MAB/publications/biotapestry.pdf](http://nationalzoo.si.edu/ConservationAndScience/MAB/publications/biotapestry.pdf)

Center for Biodiversity and Conservation, American Museum of Natural History: 212-769-5742 or [cbc.amnh.org](http://cbc.amnh.org)

Millennium Ecosystem Assessment:  
[www.maweb.org/en/Synthesis.aspx](http://www.maweb.org/en/Synthesis.aspx)

The Biodiversity Project: 608-250-9876 or  
[www.biodiversityproject.org](http://www.biodiversityproject.org)

### For more information about New Jersey's biodiversity:

New Jersey Division of Fish and Wildlife: 609-292-9400 or [www.njfishandwildlife.com](http://www.njfishandwildlife.com)

New Jersey Natural Heritage Program: 609-984-1339 or [www.state.nj.us/dep/parksandforests/natural/heritage](http://www.state.nj.us/dep/parksandforests/natural/heritage)

Northeast Climate Impacts Assessment:  
[www.northeastclimateimpacts.org](http://www.northeastclimateimpacts.org)

U.S. Fish and Wildlife Service New Jersey Field Office:  
609-646-9310 or [www.fws.gov/northeast/njfieldoffice](http://www.fws.gov/northeast/njfieldoffice)

U.S. Department of Agriculture Natural Resources Conservation Service, New Jersey: 732-537-6040 or [www.nj.nrcs.usda.gov](http://www.nj.nrcs.usda.gov)

Also contact local nature centers, environmental education organizations, and state and regional conservation organizations, such as New Jersey Audubon, The Nature Conservancy, and the New Jersey Conservation Foundation, for more specific information about species, habitats, or threats to biodiversity.

### For more information about land-use planning and biodiversity:

Environmental Protection Agency (EPA). 1997. *Community-Based Environmental Protection: A Resource Book for Protecting Ecosystems and Communities*. EPA 230-B-96-003. Washington, D.C. [www.epa.gov/care/library/howto.pdf](http://www.epa.gov/care/library/howto.pdf)

Honachefsky, W. 2000. *Ecologically Based Municipal Land Use Planning*. Lewis Publishers, Boca Raton, FL.

Johnson, E. A., and M. W. Klemens. 2005. *Nature in Fragments: The Legacy of Sprawl*. Columbia University Press, New York.

Klemens, M. W., M. F. Shansky, and H. J. Gruner. 2006. *From Planning to Action: Biodiversity Conservation in Connecticut Towns*. MCA technical paper series: No. 10, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, NY. Available from: [www.wcs.org/international/northamerica/mca/overview/publications](http://www.wcs.org/international/northamerica/mca/overview/publications)

Kennedy, C., J. Wilkinson, and J. Balch. 2003. *Conservation Thresholds for Land Use Planners*. Environmental Law Institute, Washington, D.C. [www.elistore.org](http://www.elistore.org) (available at no charge as PDF)

McElfish, J. M. 2004. *Nature Friendly Ordinances*. Environmental Law Institute, Washington, D.C.

Nature Friendly Communities:  
[www.naturefriendlytools.org/about/index.html](http://www.naturefriendlytools.org/about/index.html)

Peck, S. 1998. *Planning for Biodiversity*. Island Press, Washington, D.C.

Perlman, D. L., and J. C. Midler. 2005. *Practical Ecology for Planners, Developers, and Citizens*. Island Press, Washington, D.C.

Williams, K. S. 2003. *Growing with Green Infrastructure*. Heritage Conservancy. Available from: [www.heritageconservancy.org/news/publications/](http://www.heritageconservancy.org/news/publications/)

### Selected New Jersey organizations and agencies with planning information and examples:

Association of New Jersey Environmental Commissions (ANJEC): 973-539-7547 or [www.anjec.org](http://www.anjec.org)

Garden State Greenways:  
[www.gardenstategreenways.org](http://www.gardenstategreenways.org)

New Jersey Department of Environmental Protection:  
[www.state.nj.us/dep](http://www.state.nj.us/dep) (See Green Acres Program, Office of Brownfields Reuse)

New Jersey Future: 609-393-0008 or [www.njfuture.org](http://www.njfuture.org)

New Jersey Office of Smart Growth: 609-292-6420 or [www.state.nj.us/dca/osg](http://www.state.nj.us/dca/osg) (See New Jersey State Development and Redevelopment Plan)

Additionally, consult with local, regional, and state land trusts; regional entities such as the New Jersey Pinelands Commission, New Jersey Meadowlands Commission, New Jersey Highlands Council, Delaware Valley Regional Planning Commission; and other conservation organizations. Directory available from ANJEC.

*more on the following page*

## Resources and References

### For more information about sustainability in general:

Center for a New American Dream: [www.newdream.org](http://www.newdream.org)  
Climate Choices: [www.climatechoices.org/ne/index.html](http://www.climatechoices.org/ne/index.html)  
Ecological Footprint: [www.footprintnetwork.org](http://www.footprintnetwork.org)  
(Calculate Your Own Footprint: [ecofoot.org](http://ecofoot.org))  
Integrated Pest Management  
[www.epa.gov/pesticides/factsheets/ipm.htm](http://www.epa.gov/pesticides/factsheets/ipm.htm)  
[www.pestmanagement.rutgers.edu/IPM/inacx.html](http://www.pestmanagement.rutgers.edu/IPM/inacx.html)  
New Jersey Environmentally Sustainable Communities:  
[www.state.nj.us/dep/dsr/bscit/SustCommunities.htm](http://www.state.nj.us/dep/dsr/bscit/SustCommunities.htm)  
U.S. Environmental Protection Agency Sustainability Programs: [www.epa.gov/sustainability](http://www.epa.gov/sustainability)  
U.S. Green Building Council: [www.usgbc.org](http://www.usgbc.org)

### For more information about green purchasing:

Co-op America National Green Pages:  
[www.coopamerica.org/pubs/greenpages](http://www.coopamerica.org/pubs/greenpages)  
The Green Guide: [www.thegreenguide.com](http://www.thegreenguide.com)

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- Benfield, F. K., M. D. Raimi, and D. D. T. Chen. 1999. *Once There Were Green Fields (How Urban Sprawl Is Undermining American's Environment, Economy, and Social Fabric)*. Natural Resources Defense Council, Washington, D.C.
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- Kourtev, P. S., J. G. Ehrenfeld, and W. Z. Huang. 1998. Effects of exotic plant species on soil properties in hardwood forests of New Jersey. *Water, Air and Soil Pollution* 105: 493-501.
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- New Jersey Future. 2005. *Four Ways to Genuine Prosperity*. New Jersey Future, Trenton, NJ. Available from: <http://www.njfuture.org/Media/Docs/4%20ways%2011.28.05.pdf>
- New Jersey State Park Service. 2006. *Attendance Report: Fiscal Year 2006*. New Jersey Department of Environmental Protection, Division of Parks and Forestry, Trenton, NJ.
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