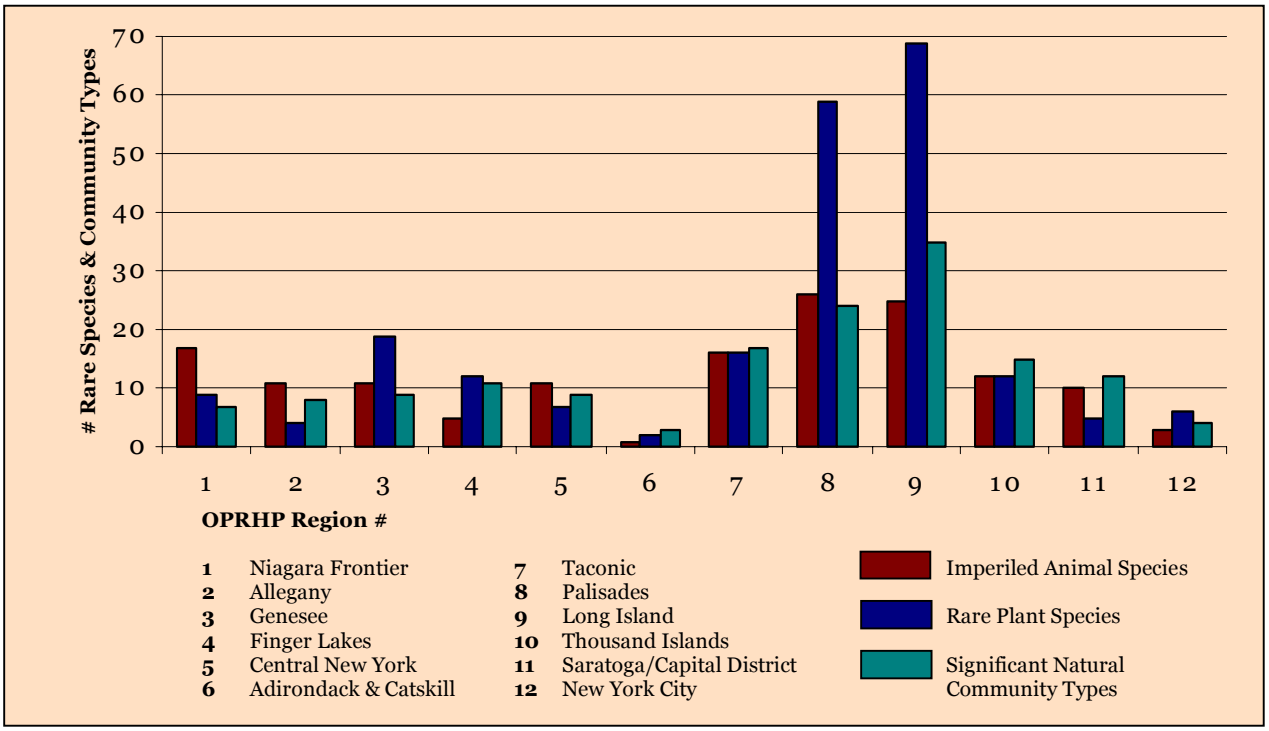
STATE PARK HIGHLIGHTS BY REGION

The 359 imperiled animal species, rare plant species, and significant natural community types known in the state park system are distributed across the state according to the availability of habitat, so boreal species, for example, are typically restricted to northerly regions while Midwestern species are mostly in western New York. Despite this patchy distribution, however, the numbers of rare species and natural community types in each region consistently range between about five and 20 (Figure 3). The Long Island and Palisades Regions, however, are dramatically more diverse.

While exploring the reasons for the variation in the Long Island and Palisades Regions was beyond the scope of this project, we surmise that several factors may be behind it. First, many of New York's rare species and unusual natural community types are maritime, and these species and communities are restricted to Long Island. Second, the Long Island and Palisades Regions may capture species and natural community types (such as tiger salamanders – *Ambystoma tigrinum*) that are reaching the northern extent of their ranges. Third, these regions include several geologically unusual areas, particularly the Long Island moraine and the Shawangunk Ridge, which create uncommon habitats. Finally, the Palisades Region includes several of the state's largest parks – Harriman, Sterling Forest®, and Minnewaska – and greater area increases the likelihood of having a rare species or significant natural community present. A final factor that may or may not hold up under analysis is that the Long Island and Palisades Regions have undergone some of the most intensive development in the state, which may have given them a disproportionate number of species that were once common but are now rare.

While the Long Island and Palisades Regions have particularly high biodiversity, every region (Figure 2) has something that makes it distinctive and important. We briefly summarize some of these notable features in the following pages.

Figure 3. Distribution of Rare Species and Significant Natural Community Types within State Park Regions. The number of rare species and significant natural community types are distributed relatively uniformly across the state parks regions with the exceptions of the Long Island and Palisades Regions. The low numbers in the Adirondack and Catskill Region are probably due to most state lands there being in the forest preserve, not state park, system.



ALLEGANY PARK REGION

Along with being the largest property managed by OPRHP, Allegany State Park is part of one of the four largest intact forested landscapes in the state and the largest forested landscape in western New York. It contains approximately 55,000 acres of significant forest natural communities, comprising hemlock-northern hardwood forest, rich mesophytic forest, maple-basswood rich mesic forest, and beech-maple mesic forest. Nearly 5,000 acres of these significant natural communities are New York's second largest old-growth hemlock-northern hardwood forest system.

These forests exist on the only area of New York that was not glaciated during the last (Wisconsinan) glacial advance. The more weathered, very productive soils and rounded hills of Allegany Park Region are a unique feature of the unglaciated landscape and the only place these features can be seen in the state.

Old Growth Forests

Some of New York's old forests have the tall, graceful, cathedral-like canopies and open understories that people usually associate with "old-growth" forests. Others are messy, the hardened survivors of hundreds of years of hurricanes, ice storms, fires, and Nor'easters. Either way, old-growth forests make a lasting impression on visitors.

Old-growth is a condition of a forest, not a type of forest. The core concept in "old-growth" involves the dominance of long-lived species such as hemlock and sugar maple (which can live for more than 300 years), rather than short-lived species like jack pine and quaking aspen. These short-lived types give way to long-lived species unless a disturbance such as fire maintains their habitat. And yet, old-growth is more than just old trees. It is a stage in the life of certain forest types, and as such includes many other forest species and the ecological processes that support them.

Paradoxically, "healthy" old-growth forests are full of dying, dead, and fallen trees. While still standing, their hulks provide nesting cavities for birds like barred owls and for mammals like red squirrels. Once fallen, they enrich the soil as rotting trunks and branches add nutrients essential to the next generation of trees.

The fallen trees also make the floor of an old forest uneven, peppered with pits and mounds. This is because as trees fall, their roots tear holes in the earth. As the roots rot, the soil captured among them falls to the ground, creating mounds. When a tree is completely gone, all that remains is a pit and a mound. Fallen trees also create openings. New trees grow in these openings, giving old forests a wide range of tree sizes and ages. In contrast, forests that were cleared in the past typically have trees that are all about the same age, beginning at the date of the last human disturbance.

The state park systems harbors old-growth forest stands in several places across New York. Some areas are large, such as the 5,000-acre hemlock-northern hardwood forest in Allegeny State Park (shown above with NY Natural Heritage ecologist DJ Evans). Most are much smaller, such as the 168-acre stand in Palmaghatt Kill Ravine in Minnewaska State Park and the 140-acre patch in Green Lakes State Park.

CENTRAL NEW YORK PARK REGION

The American Hart's-tongue fern (*Asplenium scolopendrium* var. *americanum*) is a federally threatened plant that grows in woodlands on calcium-enriched talus slopes. In New York, it is restricted to the plunge basins of large post-glacial waterfalls. Almost all the species' total numbers live in the Clark Reservation and Chittenango Falls State Parks.

Chittenango Falls State Park is also home to the world's only population of the federally threatened Chittenango ovate amber snail (*Novisuccinea chittenangoensis*). Biologists remain unsure about why only one population of this terrestrial snail has ever been found. There have been surveys for it by biologists since the late 1800s, but the population at Chittenango Falls remains unique. As a result, it is particularly vulnerable to extinction.

In 2003, NY Natural Heritage zoologists working with DEC wildlife biologists found a juvenile Indiana bat (*Myotis sodalis*) at Clark Reservation State Park. Indiana bats are listed as both state and federally endangered, and biologists are just beginning to understand the summer movements of this species in the Northeast. Capturing a young bat indicated the presence of one of the first known maternity colonies in New York. The colony was definitely in the vicinity of, and possibly even within, the state park.

Also in 2003, NY Natural Heritage and DEC biologists found a male small-footed bat (*Myotis leibii*) at Clark Reservation State Park, which indicated the possible presence of a bachelor colony (a roost for male bats during the non-breeding summer months) somewhere in the vicinity. Biologists know even less about the summer movement of small-footed bats than of Indiana bats. This finding contributed an important piece of information to efforts to understand the numbers and distribution of this species in New York.

90% of American Hart's-tongue Ferns Grow in NYS State Parks

Perhaps no other plant is as dependent on the state park system as the federally threatened American hart's-tongue fern. Although the species has a few scattered populations between Alabama and northern Michigan, most plants are restricted to Chittenango Falls and Clark Reservation State Parks.

American hart's-tongue fern fronds typically grow to be about 9" long. In a biological twist, ferns in one of the six populations at Clark Reservation State Park grow to be much larger, some exceeding one foot in length. The reasons for this variation is a subject of debate between botanists. Some experts assert that the larger fronds are the result of better growing conditions. Others surmise that the population has hybridized with a closely related but different hart's-tongue fern relative (the European hart's-tongue fern). Only further research will answer this biological puzzle.

FINGER LAKES PARK REGION

Leedy's roseroot (*Sedum integrifolium* ssp. *leedyi*) is a federally threatened wildflower with fewer than 10 populations in just two states: New York and Minnesota. In New York, three populations have been found, all on cool moist cliffs. The population at Watkins Glen State Park consists of a single plant, but represents one of just two populations on public lands (the other is in Minnesota's Whitewater Wildlife Management Area). All other populations are found on private lands, which leaves them vulnerable to destruction despite the species' federally listed status.

Newtown Battlefield is not just an important historic site, it is also extremely important to two rare plants. New York's only known population of Porter's reedgrass (*Calamagrostis porteri* ssp. *porteri*) grows here, as does one of the state's best populations of the state-threatened nodding wild onion (*Allium cernuum* var. *cernuum*). These rare plant populations offer an excellent opportunity to highlight the importance of biodiversity and the critical role of the state park system in protecting it.

Shale Cliff & Talus Community – Life over the Edge

The shale cliff & talus community is an uncommon but not rare type in New York characterized by nearly vertical exposures of shale bedrock with small ledges and areas of steep, unstable talus. Vegetation tends to be sparse on this community type because little soil can develop on the steep and sometimes unstable slopes. One of the New York's best examples is in Taughannock Falls State Park, where the 38-acre community supports three state-threatened wildflowers: butterwort, bird's-eye primrose, and yellow mountain-saxifrage.

GENESEE PARK REGION

Letchworth State Park ranks second among all state parks for having the most rare species populations and significant natural community occurrences. It is also one of the richest places for rare plants statewide. More than 40 rare plant populations representing 18 different species have been found in the park – a number unmatched by any other state park. Of particular note are New York's only populations of giant pine drops (*Pterospora andromedea*), a state-endangered plant. Also present are some of the state's best populations of the state-threatened woodland agrimony (*Agrimonia rostellata*), Willdenow's sedge (*Carex willdenowii*), green gentian (*Frasera caroliniensis*), golden-seal (*Hydrastis canadensis*), butterwort (*Pinguicula vulgaris*), bird's-eye primrose (*Primula mistassinica*), and yellow mountain-saxifrage (*Saxifraga aizoides*).

The Genesee River, Letchworth State Park's central feature, contains the largest occurrence of cobble shore documented in New York. These sparsely vegetated rock bars are found along bends and on islands in the large, meandering Genesee River and provide habitat for a very rare insect that was discovered in 2000 in and near the park: the cobblestone tiger beetle (*Cicindela marginipennis*). This species is extremely scarce across its range and typically local in distribution. Elsewhere in New York, the cobblestone tiger beetle has only been found on cobble bars in Cattaraugus Creek in the Zoar Valley and at a single site on the Delaware River.

Letchworth State Park Is a Botanical Wonderland

Letchworth State Park is one of New York's richest places for rare plants. The park's combination of dramatic cliffs, forests, and wetlands creates a bounty of habitats. Feeding these are calcium-enriched waters from limestone bedrock, an uncommon feature in New York. Letchworth is also at a floristic crossroads for eastern and western species, giving it a flavor of both.

Goldenseal (center) and butterwort (bottom) are two rare wildflowers that flourish in Letchworth State Park.

LONG ISLAND PARK REGION

The Long Island Region harbors more rare plants than any other New York State Park Region, and four state parks here (Hither Hills, Jones Beach, Napeague, and Connetquot River) rank in the top 10 for parks with the greatest numbers of rare species. Connetquot River State Park, for example, has more rare plant populations (22 populations of 19 species) than any other state park.

One of this project's more significant finds on Long Island was Roland's sea-blite (*Suaeda rolandii*). Early in the study, the world's largest population of this globally rare plant was discovered in Hither Hills State Park, and in 2003 another population was found in Napeague State Park. The discovery of this state-endangered wildflower has prompted the Brooklyn Botanic Garden to begin research into nuances of the species' habitat and into the species' origin. Botanists are debating whether the species is unique but overlooked, or a recent cross between two closely related species.

Jones Beach, Gilgo Beach, and Robert Moses State Parks protect one of the best global populations of the federally threatened and globally rare seabeach amaranth (*Amaranthus pumilus*). This species disappeared from New York in 1950, but was rediscovered in 1990 at several sites including Robert Moses State Park.

New York's best examples of several natural community types are found in Long Island state parks. Caumsett State Park harbors more than 500 acres of oak-tulip tree forest, and Orient Beach State Park has 69 acres of maritime red cedar forest. Montauk Downs State Park includes one of New York's only examples of the globally rare maritime grassland. Cold Spring Harbor and Hither Hills State Parks boast New York's only known coastal oak-laurel forests.

Seabeach Amaranth – Back from the Brink

The return of the seabeach amaranth, a federally threatened wildflower, to Long Island is a great conservation success. Seabeach amaranth is a low plant that grows on open beaches above the high tide line, especially around inlets. In 1950, the wildflower disappeared from Long Island's south shore beaches, a loss that was echoed along the eastern seaboard from Massachusetts to Virginia. This absence persisted for 40 years until, to the surprise of botanists, approximately 300 plants reappeared on four separate Long Island barrier islands.

Ten years later, nearly 200,000 plants were tallied all along Long Island's southern barrier beaches. The loss of the seabeach amaranth was the result of human and vehicle traffic and shoreline manipulation. The recovery appears to be tied to the replenishment of sand to eroded beaches, which provided excellent habitat, and to efforts to protect the nesting areas of two rare birds: federally threatened piping plovers and state-threatened least terns.

Piping plovers and least terns nest along Long Island's beaches in the same areas where seabeach amaranths once thrived. Vehicle and foot traffic along the high tide line can disturb nesting birds and result in chick mortality. To protect these vulnerable birds, OPRHP, in cooperation with DEC and the US Fish & Wildlife Service, created a model stewardship program at its Long Island parks. This program includes public education, installation of string fencing around nesting areas, and placement of exclosures to protect nests from predators. The stewardship program has contributed to the resurgence of piping plovers, least terns, and seabeach amaranth.

Temporary signs and string fencing help guide beach visitors away from areas where piping plovers and least terns are nesting.

NEW YORK CITY PARK REGION

Due to its southern-most position in the state, Clay Pit Ponds State Park Preserve has a distinctive flora. New York's only native population of the state-endangered shortleaf pine (*Pinus echinata*), a southern pine species, grows here, as does the state-endangered dwarf hawthorn (*Crataegus uniflora*), another predominately southern plant. Dwarf hawthorn was believed to be absent from New York for nearly 90 years before its rediscovery in Clay Pit Ponds State Park by a local botanist during the course of this biodiversity inventory.

Data collected by NY Natural Heritage ecologists during this project allowed us to classify a new natural community type: post oak-blackjack oak barrens. This community is known in New York only on Staten Island. This is the first recognition of this natural community type anywhere in North America, and its description is being incorporated into the International Vegetation Classification System – the federal standard for vegetation classification.

Post Oak-Blackjack Oak Barrens Thrive on Dry Sand

Just as botanists and zoologists sometimes recognize new species of plants and animals, ecologists are finding and developing a better understanding of the natural communities that make up our landscape. Post oak-blackjack oak barrens are one of the newest additions to the state classification, and are currently known in New York only from Clay Pit Ponds State Park and one other site on Staten Island. The woodland is dominated by 11 different tree species, including five oaks. Its natural history remains poorly understood. Ecologists believe it is adapted to periodic fires, which would be expected in woodlands on such dry, sandy sites, but no information has been gathered on how often these fires would naturally occur.

NIAGARA FRONTIER PARK REGION

The Niagara Gorge's unique combination of waterfall misting, wet seepage areas interspersed with dry open rock faces, and calcareous bedrock produces one of the most diverse assemblages of rare plants within New York State. The various microhabitats within the Niagara Gorge support 13 rare plant populations representing eight different species. Three of these plants are listed as state endangered and are found nowhere else in the state: sky-blue aster (*Aster oolentangiensis*), elk sedge (*Carex garberi*), and slender blazing-star (*Liatris cylindracea*). Another rare plant, Kalm's St. John's-wort (*Hypericum kalmianum*), also has its only recorded New York occurrence in Niagara Gorge, but this population is no longer present and the species is considered to be extirpated from the state.

In addition to the rare plants within the Niagara Gorge, the calcareous cliff community and the calcareous talus slope woodland that bisect Niagara Reservation, Whirlpool, and Devil's Hole State Parks are of statewide significance. The plants and animals that live in these habitats are typically restricted to them. These species tend to have small populations which depend on specific characteristics of the rock substrate for survival (Larson *et al*. 2000). Protecting the calcareous cliff faces and talus slopes at the north end of Goat Island and throughout the gorge therefore will not only protect several rare species, but also a suite of uncommon species that make the Niagara Gorge so biologically diverse.

Niagara Gorge – Whirlpools & Blazing-Stars

Niagara Gorge supports 14 populations of nine different rare plant species. One population of the state-endangered lesser fringed gentian clings to a cliff face while Niagara Falls literally shoots over the edge just feet above them. Other rare wildflowers, such as the state-endangered sky-blue aster thrive in the dry woods on the gorge's rim.

New York's only known population of the slender blazing-star grows in Whirlpool State Park.

PALISADES PARK REGION

The Palisades State Park Region is unusually rich in rare plant populations and significant natural community occurrences. This richness is due in part to four large state parks – Bear Mountain, Harriman, Minnewaska, and Sterling Forest® – which total nearly 81,000 acres and support a variety of habitats and conditions. Natural community highlights include the globally rare dwarf pine ridges found within Minnewaska State Park and neighboring Sam's Point Preserve, the only example of this community type in the state, and the largest tract of chestnut oak forest documented within New York. This nearly 50,000-acre natural community spans Sterling Forest®, Harriman, and Bear Mountain State Parks.

The Palmaghatt Kill ravine in Minnewaska State Park contains 200 acres of old-growth forest. The Palmaghatt Kill hemlock-northern hardwood forest has a wide range of tree ages and is characterized by a variety of microhabitats typical of the very few old-growth areas that remain within the northeastern hardwood forest system. Tree core data from this forest put the oldest overstory trees at 300-500 years old.

During this study, the globally rare, state-endangered basil mountain-mint (*Pycnanthemum clinopodioides*) was rediscovered in New York. This plant was last observed in the state nearly 100 years ago and was thought to be extirpated. It was rediscovered at Hook Mountain State Park during field surveys in 2000, then a second population was found at High Tor State Park. Further survey work at High Tor also led to the discovery of Torrey's mountain mint (*Pycnanthemum torrei*), another globally rare, state-endangered wildflower.

NY Natural Heritage zoologists collaborating with local experts found a population of the Allegheny woodrat (*Neotoma magister*) in the New York portion of Palisades State Park, a notable find because this elusive animal had last been seen in New York in 1987. These woodrats represent the northern extent of a population that is centered in New Jersey.

Timber Rattlesnakes – Peaceful & Misunderstood

Stretching three to five feet long, rattlesnakes strike fear into the hearts of many. Yet this fear is based largely on the myth that rattlesnakes are aggressive and actively try to hurt people. Fortunately, this couldn't be further from the truth – rattlesnakes just want to be left alone, and fear us more than we fear them.

Timber rattlesnakes are members of the pit viper family, and like their relatives have temperature-sensitive pits on either side of their faces between their eyes and nostrils. These pits are sensory organs that help rattlesnakes detect potential prey, usually small mammals such as white-footed mice. Rattlesnakes use their venom to immobilize their prey, which they then swallow whole.

One important aspect of protecting rattlesnakes is the conservation of the dens in which they spend the winter. These dens are typically located on steep, unforested, south-facing slopes with talus or rock crevices. Timber rattlesnakes overwinter on these slopes in deep cracks and fissures below the frost line, sometimes with many other snakes (such as copperheads) and skinks.

Timber rattlesnakes are listed as threatened in New York.

SARATOGA/CAPITAL DISTRICT PARK REGION

The biodiversity inventory conducted at John Boyd Thacher State Park allowed Heritage biologists to document in detail the biological characteristics of the Helderberg Escarpment, one of the most prominent landscape features in Albany County. Stretching nearly seven miles and averaging about 100 feet in height, the calcareous cliff community on the Helderberg Escarpment is the second largest of 21 calcareous cliff communities documented in New York. More than two miles of the escarpment are within John Boyd Thacher State Park.

Plant diversity within Thacher State Park is outstanding due to the assortment of habitat types and local climatic conditions found in rocky forest and woodland communities, cliff edge environments, and sinkhole and cave features. There are rare animals too. The state park's cave habitat is utilized by at least two rare animal species, small-footed bat (*Myotis leibii*) and the federally endangered Indiana bat (*Myotis sodalis*) for overwintering.

The Hudson River, another very prominent feature of the Saratoga/Capital District Park Region, is important to the global protection of several rare species, including two plants: the estuary beggar tick (*Bidens bidentoides*) and the state-threatened heartleaf plantain (*Plantago cordata*). The vast majority of the world's populations of these two plants grow within the tidal portions of the Hudson River. New populations of both species were discovered at Schodack Island State Park along with the world's northern-most population of the state-threatened golden club (*Orontium aquaticum*).

Haile's Cave Hosts Thousands of Bats

Behind Thacher State Park's 100' high escarpment and below its rolling forests, Haile's Cave knifes thousands of feet into the soft limestone bedrock. Carved by an underwater stream that still runs through it, the cave is a wintering site – or hibernaculum – for six of New York's bat species: big brown, little brown, eastern small-footed (which is state special concern), eastern pipistrelle, northern long-ear, and Indiana (which is federally threatened).

The renowned bat biologist Donald Griffin first recognized Haile's Cave as a major hibernaculum in 1937. In 1996, more than 27,000 bats were estimated to spend the winter there. Then a major winter thaw occurred which flooded the cave and killed thousands of bats. Only about 7,000 bats were counted the following winter, but biologists from the NYS Department of Environmental Conservation are seeing an encouraging, gradual increase in numbers each year.

Eastern small-footed bats are known to hibernate in only 32 caves and mines in New York.

TACONIC PARK REGION

There are only five existing populations of fence lizard (*Sceloporus undulatus*) in New York, making this the rarest of New York's three lizard species. All of these populations are within state parks and three are in Hudson Highlands State Park. Fence lizards are at the northern extent of their range in New York and are listed as state threatened.

Taconic State Park is among the top five state parks in New York for diversity of significant natural community occurrences, and is in the top 15 state parks for total number of rare species. As part of a much larger public land natural area that extends into Massachusetts and Connecticut, the contiguous forests of Taconic State Park provide a critical link between the Hudson Highlands and the large forest tracts in northern New England.

Most of the state parks within the Taconic region contain at least one rare species population. From state-threatened Blanding's turtles (*Emydoidea blandingii*) to the state-threatened clustered sedge (*Carex cumulata*), this region's parks are important reservoirs for the Hudson Valley's biodiversity.

Hudson Highlands and Clarence Fahnestock State Parks together comprise more than 21,000 acres of open space within an hours drive of New York City, and contain numerous significant natural communities, imperiled animals, and rare plants. Constitution Marsh in Hudson Highlands State Park, for example, supports five rare plant populations and is a breeding site for the least bittern (*Ixobrychus exilis*).

Taconic State Park – Local Significance in a Landscape Context

Taconic State Park is a conservation anchor in the Berkshire-Taconic landscape, one of the largest and healthiest forest blocks in southern New England and eastern New York. The forest system is so large that it supports wide-ranging wildlife, such as black bears and bobcats, in addition to vibrant populations of birds that only nest in interior forests.

The park is located on the western slopes of the Taconic Mountains, a 12-mile long by 4-mile wide plateau covered with high-quality forests and wetlands, cut by deep ravines and clean streams, and peppered with rare species and significant natural communities. Taconic State Park alone boasts seven significant natural community occurrences and seven rare plant and animal populations.

Violet wood-sorrel (*Oxalis violacea*) is a state-threatened wildflower whose 13 New York populations are restricted almost entirely to the Hudson Valley.

THOUSAND ISLANDS PARK REGION

The state's only population of green spleenwort (*Asplenium trichomanes-ramosum*) is located at Whetstone Gulf State Park. This delicate rock fern spans the globe at northern latitudes but is nonetheless rare in the United States and Canada (USDA Forest Service 2002, Evans 1997). In North America, its typical distribution ranges from the upper Great Lakes region to the southern tip of Greenland. Populations outside of this range are considered to be disjunct, such as the one at Whetstone Gulf which grows on the steep limestone shale cliffs that line the gorge.

The globally rare Champlain beachgrass (*Ammophila champlainensis*) is located at Southwick Beach State Park. Some botanists assert that this grass is endemic to the region, for populations are currently known only along the shoreline of eastern Lake Ontario and the shores of Lake Champlain. Other botanists, however, believe the species grows elsewhere around the Great Lakes.

Located on an island in the St. Lawrence River, Robert Moses State Park holds some of the state's best populations of water plantain (*Alisma gramineum*), lesser fringed gentian (*Gentianopsis procera*), and white camas (*Zigadenus elegans* ssp. *glaucus*). Populations of all three species are close to the river, especially on the ice scoured terraces near the island's shoreline.

Several populations of the state-threatened Blanding's turtle (*Emydoidea blandingii*) are known in state parks within the Thousand Islands Park Region, and a new population was documented in Wellesley Island State Park in 2001. Prior to this project, NY Natural Heritage had only historical records of Blanding's turtles on the island. At Coles Creek State Park, a SUNY Potsdam biologist is using radio telemetry to gain insights into the movement patterns of this highly mobile turtle.

Short-eared Owls Hunt by Day

We all know that owls only hunt at night, right? Wrong. The state-endangered short-eared owl hunts during the day, usually in the evening. Short-eared owls are a bit smaller than a crow and are usually seen perched on a grass tussock or fence post, or floating across a grassland while hunting. They primarily hunt meadow voles and mice in large, open grasslands and marshes, which is also where they nest. Short-eared owls are rare in the Northeast because New York and New England do not provide a lot of the open, prairie-like habitat that they prefer. During this project, short-eared owls were observed nesting in Gilgo State Park (in an extensive salt marsh) and in St. Lawrence County's Robert Moses State Park (in an area with large, fallow fields).

MULTI-REGIONAL HIGHLIGHTS

Great Lakes dune systems occur at only nine places along the shores of Lake Ontario, Lake Erie, and Lake Champlain in New York, and all are on public lands. The state park system has three of these dune systems in Woodlawn Beach, Southwick Beach and Hamlin Beach State Parks. The dune system at Hamlin Beach State Park is the fourth largest in the state and is one of only three examples that contain areas of mature forest or wooded dunes. Because of their proximity to popular recreation areas, Great Lakes dune systems face intense pressure from human activities.

Two new natural community types were classified through this project: Great Lakes shoreline bluff and maritime bluff. These distinctive community types had previously been lumped into a general "eroding cliff" designation. Our work in the state park system allowed us to gather enough data to quantify the differences between the two types and create new descriptions. Great Lakes shoreline bluffs were documented at Lakeside Beach, Hamlin Beach, Chimney Bluffs, Fair Haven Beach, and Lake Erie State Parks (Figure 4). Maritime bluffs were recorded at Shadmoor and Montauk Point State Parks.

Figure 4. Chimney Bluffs State Park has New York's best example of a Great Lakes shoreline bluff.

CREATING A BLUEPRINT FOR RESOURCE USE & PROTECTION

The findings from this project are in one sense a snapshot of the existing conditions of biodiversity. They tell us about the state park system's diversity of resources, rare and imperiled species, and significant natural communities. They also provide the framework for understanding the state of biodiversity in the state park system and the direction for expanding upon that understanding. As such, they are a road map to education, research, protection, and compatible recreational uses.

One of the major challenges for OPRHP land managers is balancing the demands of many different needs and interests on each property. The information generated by this report, and the new data that will be developed in the future, are intended to inform – not dictate – their decision-making processes. In this section, we briefly highlight several instances where the results of this project have already been used to further conservation, discuss several areas of particular conservation need, and explain access to NY Natural Heritage data.

OPRHP staff are not alone in their efforts to protect rare species and significant natural communities on their lands. Staff in other state agencies – including the NY Natural Heritage Program – are available to answer questions and provide recommendations. Brief descriptions of these agencies and contact information are provided in Appendix 1. This appendix also describes a variety of statewide and regional biodiversity conservation efforts that complement OPRHP's work.

PROJECT FINDINGS IN ACTION

OPRHP is actively integrating the information generated through this project into their land-use planning and land-management decision-making processes. Several examples follow:

- **Expanding state park boundaries**
  OPRHP worked with a neighboring property owner to add six acres to Clay Pit Ponds State Park (on Staten Island) in part because the tract was dominated by the globally rare post oak-blackjack oak barrens natural community. New York's only occurrence of this community is within Clay Pit Ponds State Park.
- **Long term natural community maintenance**
  NY Natural Heritage ecologists helped managers at the Crown Point State Historic Site in Essex County find alternative management schemes that would sustain a rare calcareous pavement community while maintaining the site's historic character.

Biodiversity Highlight

Giant Pinedrops Can Grow as Tall as the Average 7-Year Old Child

The botanical abundance of Letchworth State Park includes New York's only known population of the state-endangered giant pinedrop. This plant has no chlorophyll, so it doesn't need sunlight to grow. Instead, its roots are sheathed by a fungus that draws nutrients from the soil; the pinedrop, in turn, appears to pull nutrients from the fungus.

The more widespread Indian pipe also lacks chlorophyll, but each stalk only has a single flower. It is also much smaller, typically growing 4-10" tall. Giant pinedrops can grow to heights of four feet.

Giant pinedrops in New York are known only from Letchworth State Park.

Figure 5. NY Natural Heritage biologists, such as zoologist Jesse Jaycox, are already working with state park managers to resolve potential conflicts between hikers and rattlesnakes, including this 42" yellow-phase specimen in the Hudson Valley. Timber rattlesnakes live in forests and rocky ridges along the southern and eastern edges of New York, with more than 200 dens known in the state. The species, however, has declined dramatically over the years and is listed as state threatened. Despite their ornery reputation, rattlesnakes are actually very calm and avoid confrontation unless persistently provoked.

- **Native species consultation**
  NY Natural Heritage botanists assisted state parks with a re-vegetation plan at Niagara Reservation State Park following bridge maintenance and lead clean-up. We identified native plant species that were appropriate to the site and available from a regional native plant nursery in Pennsylvania.
- **Re-routing hiking trails**
  NY Natural Heritage zoologists conducted follow-up field surveys with state parks staff to help them design alternative trail routes that would reduce potential interactions between hikers and timber rattlesnakes and minimize unintentional trampling of rare plant populations in Hudson Highlands, Sterling Forest®, and Minnewaska State Parks (Figure 5).

AREAS OF HIGH CONSERVATION NEED

At least one rare species population or significant natural community occurrence has been documented at nearly 75% of the state parks surveyed under this project, and all of these places have value for the protection of biodiversity on a statewide or regional level. A number of areas, however, stand out because they are particularly critical to the protection of the overall biodiversity in the state and require special attention. These sites are considered to be Areas of High Conservation Need and are the focus of this section.

Some natural communities and their associated rare species are vulnerable to recreational pressures and therefore need special conservation action. Trampling is a primary concern in both maritime and Great Lakes dunes and beaches. Maritime dunes and beaches harbor a variety of rare species, most notably the federally threatened seabeach amaranth (*Amaranthus pumilus*) and federally threatened piping plover (*Charadrius melodus*). New York's few Great Lakes dunes all harbor Champlain beach grass (*Ammophila champlainensis* – a species that is endemic to the Great Lakes and Lake Champlain) and other rare dune species. Beach and dune systems are particularly susceptible to impacts by visitors during the summer months. This is the same time that plants are productive and most vulnerable to disturbance by people. Thus, there is a need for continued vigilance of potential impacts by visitors on rare species and dune systems and to maintain and adjust, where necessary, management programs to protect these critical resources.

The state park system also contains several high-quality examples of rock outcrop communities that are extremely susceptible to trampling and subsequent erosion, including cliff-edge limestone woodlands, cliff faces, and rocky mountain summits. Cliff edges and mountain summits are highly sought after by hikers for their spectacular views, and extensive trail systems provide access to these views throughout the state park system. Cliffs and steep rock outcrops are also becoming increasingly popular with rock climbers as participation in the sport gains enthusiasts across the country. Findings from this study on rock outcrop communities should be incorporated into recreation use and resource protection plans for these areas.

Most parks in the Palisades and Taconic Regions have trail systems on most, if not all, mountain summits. The high number of rare species and high-quality natural communities found in these areas speak to the need for added protection and thoughtful management of summit communities. Examples include the exceedingly rare dwarf pine barrens at Minnewaska State Park, the large rocky summit grassland on Brace Mountain in Taconic State Park, and numerous examples of high-quality pitch pine-oak-heath rocky summits in Taconic, Hudson Highlands, Harriman, Bear Mountain, Sterling Forest®, and Minnewaska State Parks.

Cliff communities in John Boyd Thacher, Letchworth, Clark Reservation, Chittenango Falls, Minnewaska, and Palisades State Parks, and the parks that line the Niagara Gorge, all have rare species associated with them. The federally endangered Indiana bat hibernaculum at Thacher State Park is located in a well known cave just below the cliff edge and the only known population in the world of the federally threatened Chittenango ovate amber snail

Biodiversity Highlight

Tiger Salamanders Spend Most of Their Lives Underground

Tiger salamanders spend most of their lives feeding on insects they find beneath the leaf litter or in tunnels underground in sandy pine barren areas. The species typically emerges only in the early spring – February or March on Long Island – on rainy nights to migrate to breeding ponds. After a few days, however, they're back underground until the next year.

Tiger salamanders in New York occur only on Long Island, and there only in eastern Nassau County and Suffolk County. Although nearly 100 breeding ponds are known, the species' is imperiled and listed as state endangered because their breeding ponds are easily degraded by surrounding development and pollutants. Brookhaven State Park supports the only breeding ponds known in the state park system.

At 7-8" long, tiger salamanders are New York's largest salamanders.

(*Novisuccinea chittenangoensis*) is located near the falls below the cliff at Chittenango Falls State Park. The Niagara Gorge, home to possibly one of the most recognizable natural features in the United States – Niagara Falls – also provides critical habitat to three state-endangered plants that are found nowhere else in New York: sky-blue aster (*Aster oolentangiensis*), elk sedge (*Carex garberi*), and slender blazing-star (*Liatris cylindracea*). The gorge at Letchworth State Park includes a shale cliff and talus community and harbors more than 40 rare plant populations, many of which inhabit the cliff face and seepage areas just below the cliff edge. Minnewaska's cliff community and associated community types, which are accessible along trails on the cliff edge and at the cliff base, are part of the conglomerate rocks of the Shawangunk Ridge. This ridge harbors the state's only known populations of mountain spleenwort (*Asplenium montanum*). Similarly, New York's only population of Allegheny woodrat (*Neotoma magister*) lives in the talus slopes below the cliff community at Palisades State Park, and the state's only known population of green spleenwort (*Asplenium trichomanes-ramosum*) occupies the shale cliff and talus slope within Whetstone Gulf at Whetstone Gulf State Park.

Because of their spectacular views, cliffs and gorges are often attractions for large numbers of visitors who hike along the cliff edges and trails that descend the cliffs. Cliff edges, talus slopes, and cliff faces typically have very thin soils and plants are easily trampled or inadvertently uprooted by passing hikers or climbers. The distinctive flora of cliff ecosystems add significantly to the biodiversity of the state and therefore deserve special protection and diligent monitoring by park managers.

Rocky summits, cliff edges, and open talus slopes also provide critical habitat for timber rattlesnakes (*Crotalus horridus*), which have become imperiled due to collection, habitat loss, and indiscriminate killing on both public and private land. While New York still contains more than 200 existing and historical den sites, many of these sites are concentrated in the Hudson Highlands where residential development has exploded in recent years. As the rattlesnake populations at many of these areas have been extirpated or are no longer considered viable, the dens on public lands, such as within the state park system, provide needed areas of refuge for this extremely vulnerable, often misunderstood reptile. Interpretive materials aimed at educating park users as well as educational materials for adjacent private landowners are important strategies towards protecting timber rattlesnakes across New York State.

Similar to the rattlesnake, population numbers and viability of the Blanding's turtle (*Emydoidea blandingii*) have been significantly impacted by habitat loss and collection. The capture and trading of species like the Blanding's turtle increase the need for monitoring population numbers and for policing the areas likely to harbor these rare and vulnerable animals.

Searches at several historical bog turtle sites during this inventory did not lead to finds of the bog turtle (*Clemmys muhlenbergii*). These turtles, however, are notoriously difficult to find because they are small, well camouflaged, and spend most of their time under sedge tussocks. As such, state park managers overseeing these historical sites should still remain alert to their presence and to potential illegal collection activities.

Finally, management of invasive species and detrimental pests is vitally important to the long term maintenance of all high-quality natural communities and rare species populations. Invasions by non-native species can seriously degrade the quality of state park natural areas.

Among the high-quality community occurrences in the state park system are some of the best examples old growth forests outside of the Adirondacks, such as the nearly 5,000 acres documented at Allegany State Park and roughly 200 acres in Minnewaska State Park. Garlic mustard (*Alliaria petiolata*) and multiflora rose (*Rosa multiflora*) have both found their way (via the hiking trail) into the forests of Big Basin at Allegany State Park and will very likely invade the large old growth forest tract that surrounds the trail corridor. The old growth at Minnewaska State Park is close to losing its towering overstory of 300-500 year old hemlocks due to an infestation of hemlock woolly adelgid (*Adelges tsugae*).

Many of the high-quality community examples in the state harbor rare species that are also susceptible to the threat of invasive species. For example, swallow-wort (*Cynanchum* spp.) has gained a foothold in several parks in the Syracuse area including Clark Reservation and Chittenango Falls, and threatens the long-term viability of the federally threatened American Hart's-tongue fern (*Asplenium scolopendrium* var. *americanum*).

Common reed (*Phragmites australis*), an invasive plant. was frequently observed to be a threat to rare species and significant natural communities throughout the state park system, including Jones Beach State Park. Common reed grows in dense colonies that crowd out native plants.

The presence and spread of invasive species, pests, and pathogens and the profound impact they can have on ecosystems and rare species are important issues in natural area management across all public lands in the state, including the state park system. OPRHP's participation in the development of statewide, multi-agency management strategies for combating the spread of invasive plants and animals is critical to the protection of biodiversity on state park properties.

Biodiversity Highlight

1-Inch Long Northern Cricket Frogs Can Jump More Than 5 Feet

At scale, an average man jumping as far as a Northern cricket frog would easily go the full length of a football field in a single bound. Northern cricket frogs are tiny, only an inch long, but it's their call rather than their size that resembles a cricket. From June to July (which is late for most frog species), male Northern cricket frogs trill "gick, gick, gick" 20 or more times, slowly at first, then faster and faster.

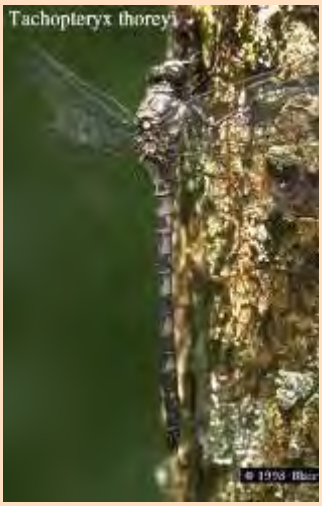
Northern cricket frogs in New York persist at only a few places in the lower Hudson Valley, including an excellent population in Sterling Forest® State Park.

Northern cricket frogs come in many colors and patterns, usually mixtures of black, yellow, orange, or red on a base of brown or green.

Biodiversity Highlight

Gray Petaltails Flew with Dinosaurs

The gray petaltail dragonfly is one of the state's tamest species, often landing on biologists' arms or visitors' caps. NY Natural Heritage zoologists working in central and western New York discovered new populations of this special-concern species in Letchworth, Buttermilk Falls, and Stony Brook State Parks.



In New York, gray petaltail dragonflies frequent sunny openings in woods and seepages in ravines.

ACCESS TO NY NATURAL HERITAGE DATA AND RECOMMENDATIONS

OPRHP and NY Natural Heritage have entered into an agreement regarding the distribution of reports and data provided to OPRHP through this project. This agreement identifies the criteria for release of information and calls for consultation between OPRHP and NY Natural Heritage on releases by either party. Hard copies of all reports by the NY Natural Heritage have been provided to each OPRHP regional director as well as each facility manager. The reports are designed for use by State Park staff. However, release of the reports and/or electronic data to others for valid reasons can be considered. Reports containing information on the location of rare species or communities contain a confidentiality statement. Information in a report on the location of rare species is for OPRHP use only. Any part of a report, or any documents or maps that are prepared using the data in a report, and that will be available to the public, cannot identify the precise locations of rare species. NY Natural Heritage and NYS DEC staff have developed a list of plants and animals that are most sensitive, meaning most vulnerable to collection or disturbance. Of the 1,250 plant and animal species tracked by NY Natural Heritage, roughly 5% have been designated as most sensitive. In addition, some occurrences of natural communities that contain old growth forest have been designated as most sensitive. Particular attention is paid to the consequences of further publicizing the presence and locations of these species and communities. The Endangered Species Unit of the Bureau of Wildlife, NYS DEC, is consulted before any information about the animals designated as most sensitive, including their locations, is released. NY Natural Heritage is consulted before any information about the plants and communities designated as most sensitive, including their locations, is released.

OPRHP is pursuing improvements to the distribution of NY Natural Heritage data to its regional technical staff. These improvements require assessment of upgraded hardware and software. Once upgraded, the information will be more readily available to regional and park staff for such uses as resource protection plans, environmental education, and project design.

REFERENCES & CITATIONS

Andrle, R.F. and J.R. Carroll. 1988. Atlas of Breeding Birds in New York State. Cornell University Press, Ithaca, NY.

Bailey, R.G. 1995. Descriptions of the Ecoregions of the United States, 2nd Edition. Miscellaneous Publication No. 1391, U.S. Department of Agriculture, Forest Service. Washington D.C.

Ecological Society of America, The Nature Conservancy, U.S. Geological Survey, and U.S. Federal Geographic Data Committee. 1999. Memorandum of understanding forming a partnership to further develop and implement the National Vegetation Classification Standards. http://esa.org/vegweb/MOU.htm.

McNab, W.H. 1993. EcoMap: National Hierarchical Framework of Ecological Units. USDA Forest Service, Washington, D.C.

Edinger, G.J., D.J. Evans, A. Finton, D. Hunt, L. Lyons-Swift, and A. Olivero. 2000. Community Field Form Instructions. May 2000. New York Natural Heritage Program, New York State Department of Environmental Conservation. Latham, NY.

Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero. 2002. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's *Ecological Communities of New York State*. (Draft for review). New York Natural Heritage Program, New York Department of Environmental Conservation. Albany, NY.

Evans, D.J. 1997. Habitat Characteristics and Distribution Patterns of Three Rare *Aspleniums* in Northern Mackinac County, Michigan. Masters Thesis, Michigan Technological University. Houghton, MI.

Federal Geographic Data Committee. 1997. Proposed revisions to the national standards for the physiognomic levels of vegetation classification in the United States. FGDC-STD-005.

Grossman, D.H., D. Faber-Langendoen, A.S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landall, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States. Volume 1. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy. Arlington, VA.

Groves, C.R. 2003. Drafting a Conservation Blueprint: A Practitioner's Guide to Planning for Biodiversity. Island Press, Washington.

Larson, D.W., U. Matthes and P.E. Kelly. 2000. Cliff Ecology: Pattern and Process in Cliff Ecosystems. Cambridge University Press, New York, NY.

NatureServe. 2003. NatureServe Explorer: An Online Encyclopedia of Life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer.

Nelson A. Rockefeller Institute of Government. 1993. Preserve and Protect. State University of New York. Albany, NY.

New York State Office of Parks, Recreation, & Historic Preservation. 1993. Fostering Environmental Stewardship. Albany, NY.

Reschke, C. 1990. Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Latham, NY.

Sneddon, L. 1994. Field form instructions for the descriptions of sites and terrestrial, palustrine, and vegetated estuarine communities. Spring 1994. Unpublished report. The Nature Conservancy, Boston, MA.

Sneddon, L., M. Anderson, and J. Lundgren. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the Northeastern United States. July 1998 Working Draft. Unpublished Report. The Nature Conservancy's Eastern Conservation Science Office and Natural Heritage Programs of the Northeastern United States, Boston, MA.

Stein, B.A., L.S. Kutner, and J.S. Adams. 2000. Precious Heritage: The Status of Biodiversity in the United States. Oxford University Press, New York, NY.
USDA Forest Service. 2002. Draft Conservation Assessment for Green Spleenwort (*Asplenium trichomanes-ramosum* L.). USDA Forest Service, Eastern Region, Hiawatha National Forest, Michigan.
Wilson, E.O. 1988. Biodiversity. National Academy Press, Washington, DC.