



The Temperate Times

Newsletter of the Northeast Temperate Network

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Putting the “Rock” in Rockefeller

Over the past few centuries, the land that surrounds and comprises Marsh-Billings-Rockefeller National Historical Park has experienced degradation and deforestation, followed by reforestation and recovery. The park commemorates four individuals and their families, who served as occupants, conservators, and stewards of the rolling hills of eastern Vermont for nearly two centuries. George Perkins Marsh, Frederick Billings, and Laurance and Mary Rockefeller played important roles in the history of American conservation, all leading by example. The park interprets how these people strove to preserve and manage a sustainable environment for future generations.

The Geologic Resources Inventory (GRI) for the park, completed in the fall of 2011, looks at a history many

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Saugus’s Resources get a Check-in

The Natural Resource Condition Assessment (NRCA) for Saugus Iron Works National Historic Site is now available for download. The report highlights the natural resources of the park’s riverine-wetland environment that includes fish communities, aquatic benthic macroinvertebrates (big water bugs bereft of backbones that live on the bottom of a water body), water quality, riverbed and wetland sediments, river hydrology, wetland and aquatic vegetation, and amphibian and reptile communities.

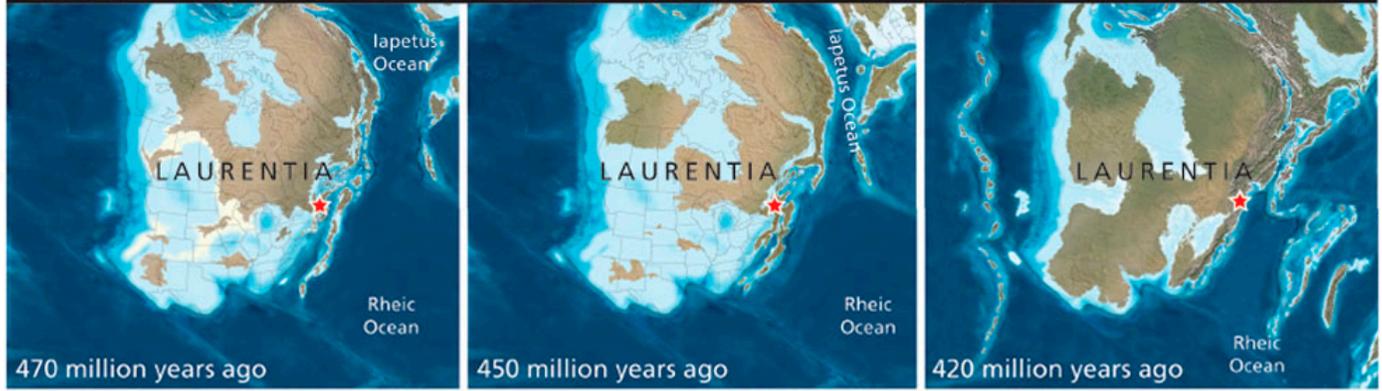
The Iron Works is a small, urban park located just north of Boston, and preserves the site of America’s first sustained, integrated, and successful iron works that started operation in the mid 1600’s. The natural resources of the park are primarily associated with

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Winter scene on Acadia’s Eagle Lake. Justin Russell photo.

During the Paleozoic Era, the Appalachian Mountains formed as the supercontinent Pangaea was assembled through the collision and accretion of island arcs, continental fragments, and the continent Gondwana.



During the Mesozoic Era, Pangaea splits apart, forming the Atlantic Ocean.



During the Cenozoic Era, the Atlantic Ocean continues to widen and the Appalachian Mountains erode.



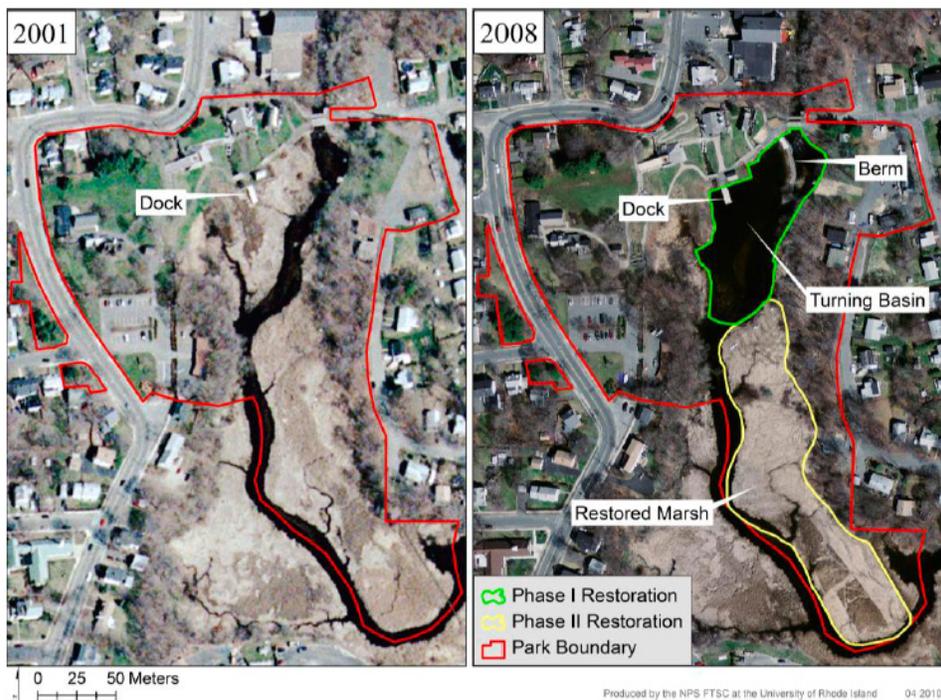
Sample graphic from geologic report on M-B-R NHP showing the paleogeography of North America. The bedrock geologic units of the park are tied to the intense deformation and intrusion of molten material during the formation of the Appalachian Mountains that lead to the assembly of Pangaea. Pangaea began to split apart during the Mesozoic and the Appalachian Mountains began to erode. Red stars indicate approximate location of the park. The full report is chock full of many detailed and beautifully rendered graphics such as this.

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the Saugus River and its adjacent wetlands and the riparian forest that borders the eastern edge of the river, including the tidally influenced turning basin. In 2007, the park initiated a restoration of the turning basin and southern wetlands along the river. One of the first tidal freshwater wetland restoration projects in New England, the project excavated sediment and returned the basin to open water and mudflat, removed invasive vegetation, began the restoration of the freshwater wetland and mudflat adjacent to the Saugus River, and made the river a more suitable nursery for aquatic and terrestrial organisms.

The NRCA was organized by ecosystem resource, then grouped by the riverine-wetland environment and the terrestrial environment. Within each grouping, the natural resources were described, the

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Dramatic before and after photos of the restored turing basin at the Iron Works.

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orders of magnitude longer than the relative blink-of-an-eye that people have been influencing the landscape. The report is a companion document to the previously released digital geologic map and adds to its usefulness for resource management.

Just as it does throughout North America and around the world, geology and geologic processes form the foundation, or "bedrock" if you will, for the ecosystem at Marsh-Billings-Rockefeller and continue to influence the evolution of the landscape. Geologically speaking, the park is located within the Connecticut Valley-Gaspé Province, which is east of the Green Mountains in east-central Vermont. This province contains rocks that were originally deposited in an ancient ocean basin that are many hundreds-of-millions of years old; rocks that have been cooked, metamorphosed, and folded into the landforms park visitors recognize today. The natural processes of weathering and erosion that act on the bedrock and other geologic structures continue to shape the park's landscape. During the past 2 million years, glaciers scoured the mountains of Vermont, including the Taconic and Green mountains, and deposited thick mantles of sediment in some spots throughout the area.

Geologic issues such as changes in stream channel shape, sediment load, wetland preservation, disturbed lands, mass wasting (gravitational down-slope movement of loose rock and soil), erosion, and seismicity may be significant to the park's resource managers, as identified during a scoping meeting in 2007. Geologic knowledge contributes to understanding landscape evolution and human impacts, such as the location of future facilities.

It is important for resource managers to understand how water moves across, through, and under the park. Erosion can impact and distort the cultural/natural landscape and natural systems in the park, increase sediment loads and meandering in local waterways, and lead to the damaging of aquatic and riparian environments. In the past, the severe erosion that followed deforestation transported away many tons of soil and carved steep valleys on several slopes in the park.

Bedrock units within the park include the garnet-bearing metamorphic rocks (schists) of the Waits River and Gile Mountain Formations. These units were deformed by faults, folds, and shear zones developed over hundreds-of-millions of years of Appalachian mountain building and rifting events. On the surface of the park, glacial units such as till, ground moraine, outwash, and kames (an irregularly shaped hill or mound composed of sand, gravel and till that accumulates in a depression on a retreating glacier, and is then deposited on the land surface with further melting of the glacier) record when these icy behemoths covered the landscape in thousands of feet of ice. Modern sediments of peat and muck, alluvium, and terrace gravels contain evidence of the impact of human activities throughout past centuries.

The report provides a handy glossary that explains many of the geologic terms listed above, and also features lots of exceptionally well-rendered graphics and figures. A geologic timescale shows the chronologic arrangement of major geologic events. The report and digital map can be downloaded from links on NETN's Baseline Inventory webpage. TT

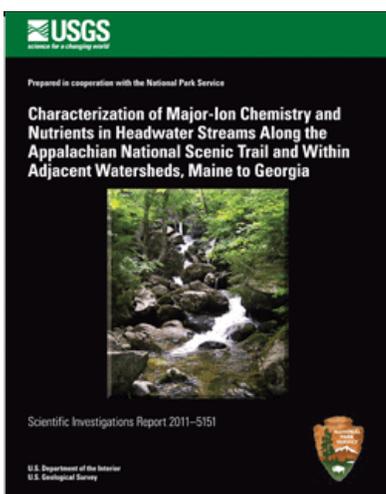
A.T. Water Report Now Available

A new report that was a collaborative effort between the NPS and the USGS is now available for downloading on the USGS website. An inventory of selected water-quality data, the report provides a summary of water quality of headwater streams within watersheds along the Appalachian National Scenic Trail. Data from over 1,800 sampling sites in about 830 catchments (areas where water is collected) were used for the water-quality summary.

Criteria used to evaluate sampling sites for inclusion were based on selected physical attributes of the catchments adjacent to the Appalachian Trail, including stream elevation, percentage of developed land cover, and percentage of agricultural land cover.

Differences in water-quality constituent levels along the Appalachian Trail may be related to elevation, atmospheric deposition, geology, and land cover. Spatial variations were summarized by ecological sections (ecosections) developed by the U.S. Forest Service.

A particular area the report focuses on that may be of interest to other parks in the Northeast is acid deposition of sulfates and nitrates. Both are important influences on the acid-base chemistry of the surface waters of the Appalachian Trail and the Northeast. Atmospheric deposition estimates are consistently high (more than 18 kilograms per hectare (kg/ha) for sulfate, and more than 16 kg/ha for nitrate) at both the highest and lowest elevations. However, the lowest elevation (Green-Taconic-Berkshire Mountains, Lower New England, Hudson Valley, Northern Glaciated Allegheny Plateau, and Northern Ridge and Valley) ecosections included the largest spatial area of sustained high estimates of atmospheric deposition. For full details on this and other data, download the report at: <http://pubs.usgs.gov/sir/2011/5151/>. TT



The Red-backs Are Coming! The Red-backs Are Coming! Minute Man has its amphibians and reptiles surveyed.



Eastern red-backed salamanders are one of the more abundant species found in Minute Man NHP. Jason Weckstein photo.

Although it could never support as many species as the tropics, the Northeast U.S. nonetheless is home to a surprising variety and abundance of amphibians and reptiles (herpetofauna). In addition

to contributing to the region's native wildlife diversity, many amphibian and reptile species play important roles in ecological processes such as food chains, energy flow, and moderating pest populations. Most national parks in the Northeast were established primarily because of their historic significance but, by virtue of their size, many of them are also important for helping to preserve local populations of native plants and animals. Recognizing this, the Park Service manages all its sites, even mostly historic ones, mindful of their natural values.

Minute Man National Historical Park is just 15 miles northwest of Boston and, at 971 acres, is one of the largest tracts of relatively undeveloped land within a very suburban landscape. As one might expect, the park contains extensive lawns and historic battlefields, but it is actually deciduous forests that make up the predominant habitat.

An important first step in protecting a park's natural resources is to first take inventory of them. Minute Man's herpetofauna was moderately well known from surveys conducted for the NPS in 1992 and data collected by the Massachusetts Herp Atlas running from 1992 through 1998 that found a total of 23 species (four species of salamander, eight frogs and toads, five turtles, and six snakes).

To better determine which species were still calling the park home, an inventory of amphibians and reptiles was conducted from March through September 2001. Some of the goals of the inventory were: to assist the park in determining the presence, abundance, and status of amphibians and reptiles in the park, including state and federal Threatened, Endangered, and Special Concern species; to identify critical habitats for those species; to compare current species status to historic records to determine long term trends; and to evaluate the state and significance of the park's herpetofauna on a site and regional scale.

A total of 17 species (12 amphibians and five reptiles) were recorded during the survey. Amphibians dominated the community, accounting for over 98% of the 4,629 individuals recorded. Frogs and toads made up the bulk of these (94.5% of all individuals recorded), and salamanders, turtles, and snakes accounted for the remaining 5.5% of species. The most frequently recorded species in each group order, based on total numbers of adults recorded, were northern spring peeper, eastern red-backed salamander, common snapping turtle, and common garter snake. In the 2001 survey, the numbers of adults recorded by habitat was substantially greater in wetlands, followed by uplands and streams. The stream-field combination is an important habitat throughout the park, and streams are also important

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condition and trend were evaluated based on selected criteria, and data gaps and threats were highlighted. Each natural resource section concludes with a table that summarizes the data and benchmarks used to assess conditions and provides estimates of condition and trend for the resource.

Prior to the restoration, the silted turning basin and wetlands along the Saugus River were practically overrun with invasive vegetation. The restoration removed contaminated sediments and returned open water to the turning basin, creating habitat for aquatic vegetation, foraging waterbirds, and fish, as well as providing the historical setting essential to the interpretation of the Iron Works. Native freshwater wetland plants were beginning to colonize the newly created wetlands, but some invasive vegetation (wetland and aquatic plants) were still present in the natural wetlands and were also found in the newly restored wetlands and turning basin. These can threaten the establishment of native vegetation in the restoration area.

The terrestrial natural resources of the park consist of terrestrial upland vegetation, mammal and avian communities, and air quality. The upland natural vegetation is limited to the narrow riparian woodlands along the eastern shore of the Saugus River. This mixed successional forest was co-dominated by invasive plants, most notably in the understory; however, the park has made substantial progress in reducing invasive vegetation. There was limited information about the mammal community in the park, though several



Sampling vegetation in the newly restored wetland in 2009. MJ James- Pirri photo.

common species are often seen within its confines. Not unexpectedly, the forest breeding bird community at this urban park has consistently been rated as “Significant Concern” by the NETN rating system, which is geared towards indicating whether or not intact interior forest habitat exists in a given park.

The number of waterbirds using the wetlands and tidal flats has increased since the restoration. Air quality of the park reflected the larger regional air quality of New England with total nitrogen wet deposition, total sulfur wet deposition, ozone, and visibility all exceeding what are considered to be acceptable values for air quality.

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Northern water snakes can be found both on land and in the water. One of them was detected in Minute Man after 2001 survey was completed. Norm Walsh photo.

travel corridors, especially for crossing under roads. The majority of species found in the park require both aquatic

and terrestrial habitats in close proximity, preferably unobstructed by barriers such as development and high traffic roads.

Of the 44 species of native, non-marine amphibians and reptiles that occur in Massachusetts, the numbers of species are fairly evenly divided among the four orders present: 10 salamander, 10 anuran (frogs & toads), 10 turtle, and 14 snake. This relatively even community composition also existed among the 32 species that occurred historically (early 20th century) in the vicinity of the park (Concord area), with seven salamander, nine anuran, seven turtle, and nine snake species recorded. Of these 32 species, 17 were recorded in the park during the surveys in 2001, and two additional species (northern water snake and Blanding’s turtle) have been recorded since.

Thus the 19 species of amphibians and reptiles currently known to occur in the park represent 59% of the 32 species historically present locally, and 83% of the 23 species documented at or near the park in the mid-1990’s.

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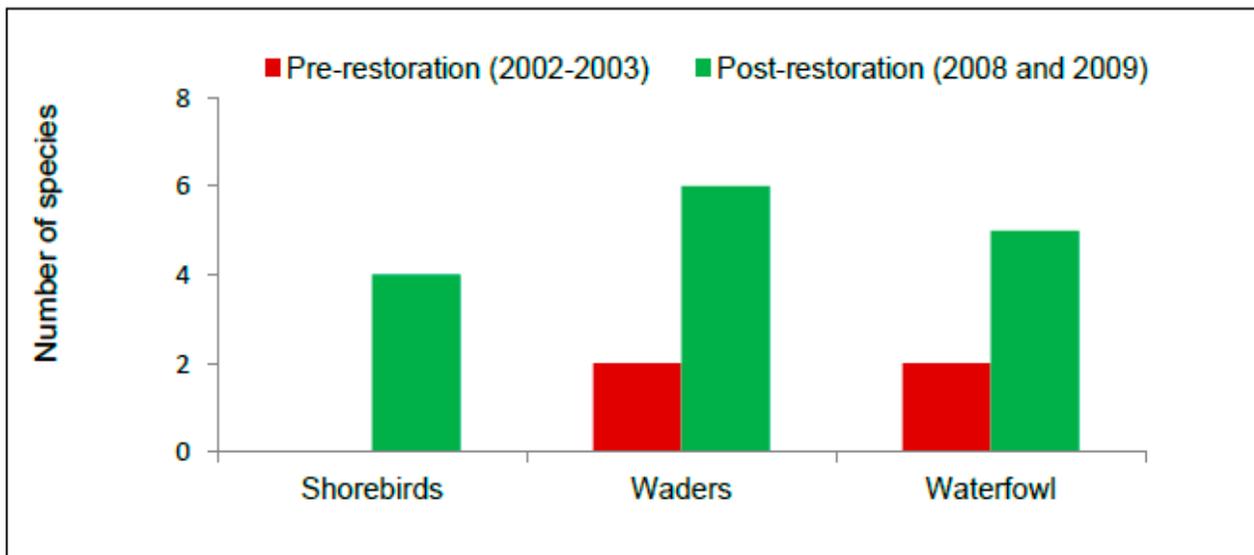
Of the 23 species that have been recorded in or around Minute Man, two of four salamander, four of eight anuran, two of five turtle, and all six snake species appear to have declined during the 20th century. These declines may be in the form of local extinction, or species that have become so rare that they are very hard to find. Both Minute Man's herpetofauna and natural resources in general have been severely impacted by numerous agricultural and urban-related stressors. These include habitat loss, alteration and fragmentation, road kill, water pollution, pesticide use, and invasive species. Many of these are hard to reverse (human population density and general urbanization) and the potential to mitigate them is limited. As a result, the herpetofaunal community of the park is dominated by urban-tolerant species, which tend to be small, sedentary, and/or have simple habitat needs. Despite these stressors, Minute Man is still important for providing habitat for species currently experiencing local

and regional decline, such as Blanding's turtle, spotted turtle, eastern milk snake, northern leopard frog, grey treefrog, wood frog, and spotted salamander. Moreover, there are many ways in which the NPS (staff of Minute Man, the Northeast Region, and NETN) can work to bring about changes to improve the condition of natural resources in general and herpetofauna in particular.

The study's authors suggest that frog-toad calling surveys, stream salamander surveys, and vernal pond egg mass surveys for spotted salamander and wood frogs would be the most useful methods for monitoring the park's amphibians, and that long term monitoring of reptiles should be held off until additional snake and aquatic turtle surveys can be conducted. For the full report and its associated Resource Brief, visit NETN's Inventories/Herpetofauna (report) and Education and Outreach (Resource Brief) webpages. *TT*

Saugus Iron Works is located in a highly urbanized watershed and the surrounding landscape and the Saugus River exert great influence on the condition of the natural resources in the park. Stressors and threats associated with human land use and population that influence water quality at the park include surface water runoff contaminated with road salt, non-point source pollution, sewage overflow and infiltration into groundwater, and alteration in river discharge flow rates. All of these human

influences threaten the park's riverine and wetland resources. Urbanization and habitat fragmentation in the larger watershed are threats to the terrestrial resources and may limit the type, diversity, and density of fauna present in the park. Climate change and accelerated sea-level rise are also threats to the park's flora and fauna as well as its riverine resources. To read about all the NRCA's findings and recommendations, download the full report from NETN's Inventories/Other Inventories webpage. *TT*



Number of waterbird species observed in wetland areas before and after the restoration of the turning basin waterfront and wetland.



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