CHAPTER II: PRESENT RESOURCE STATUS

A. Introduction to the Present Status of Resources on the Appalachian National Scenic Trail

This chapter describes available information about the current condition of natural and cultural resources along the Appalachian Trail.

Available natural resource baseline information for the Appalachian National Scenic Trail is extremely variable. A wealth of data exists for air, biological, and geologic resources. [see the Natural Resource Bibliography for the Appalachian Trail] However, most of these inventories, environmental analyses, management plans, and other documents have been compiled at a local or regional level, and more often than not, for a land base other than the Appalachian Trail (*e.g.*, for the George Washington National Forest, or for the state of Connecticut).

The Appalachian Trail Park Office (APPA), the Appalachian Trail Conservancy (ATC), and the NPS Inventory and Monitoring Network (I&M) have accumulated a significant amount of natural resource inventory and monitoring data. The most complete inventory is the inventory of rare, threatened, and endangered species and exemplary natural communities, which is the result of an intensive 12-year effort by APPA and ATC that was completed in 2001. This information is fairly consistent for rare plants and exemplary natural communities, but inventories for rare animal species are incomplete. Information for other biological resources (*e.g.* all vascular species inventories) also is incomplete.

The Appalachian Trail passes through three NPS regions, as well as five NPS Natural Resource Inventory and Monitoring (I&M) Networks. These networks were created in 2001 to assist the NPS in developing baseline data and implementing long-term ecological monitoring of natural resources in 270 national park units. The NPS I&M Northeast Temperate Network, based in Woodstock, Vermont, has assumed the lead responsibility for coordinating inventory and monitoring programs for the Appalachian Trail. In 2007, the NPS I&M Northeast Temperate Network hired an Appalachian Trail Network Coordinator to assume responsibility for coordinating the collection and analysis of park-defined resource monitoring indicators.

Table II.A.1, Natural Resources Inventory - 12 Data Sets outlines the status of Baseline Natural Resource Information using the format provided in Appendix A of *NPS-75*, the National Park Service's *Inventory and Monitoring Guideline*.

Table II.A.1, Status of Natural Resources Inventories for the Appalachian Trail (the 12 Data Sets)

Data Set	Responsibility for compilation	Status
Natural Resource Bibliography	NPS I&M Networks	on going
Base Cartographic Data	NPS APPA	on-going
Geology Map	NPS Geologic Resources Division	future
Soils Map	NPS Geologic Resources Division	future
Weather Data	NPS APPA, I&M, Air Resources Division	on going
Climate Divisions	NPS APPA, I&M, Air Resources Division	on going
Air Quality	NPS Air Resources Division	on going
Location of Air Quality Monitoring Stations	NPS Air Resources Division	complete
Water body location and classification	NPS APPA and Water Resources Division	on going
Water Quality Data	NPS APPA and Water Resources Division	future
Vegetation Map	NPS I&M, Vegetation Mapping Program	on going
Species List	NPSAPPA, I&M Networks	on going

Appendix A - Natural Resources Inventory - 12 Data Sets provides a more detailed analysis of the availability of these data.

Inventories of cultural resources are even less complete. Cultural resource overview and assessment surveys have been conducted along the Trail in two states (Pennsylvania and Connecticut). Cultural landscape inventories and List of Classified Structure inventories have been conducted in most of the National Park units crossed by the Trail; otherwise, these data sets are not available. The NPS Olmsted Center and NPS Appalachian Trail Park Office are currently developing a methodology for inventorying cultural landscapes along the Appalachian Trail. This plan, begun in 2005, is expected to be complete in 2008.

Cultural resource data sets that are available are described in more detail in Section II.F, according to category or designation, beginning with a cultural resource context, followed by an analysis of archaeological surveys, cultural landscape surveys, lists of classified structures, National Historic Landmarks, National Register properties, and contributing resources, and other historic resources.

However, significant needs remain in every aspect of cultural resource management to comprehensively identify and catalog cultural resources along the Appalachian National Scenic Trail. Table II.A.2 below describes the current status of cultural resource documentation:

Table II.A.2, Status of Cultural Resource Inventories on the Appalachian National Scenic Trail

Historic Context for the Appalachian Trail	complete 2002
Park Administrative History	not done*
Historic Resource Survey	not done
Archaeological Overview and Assessment	in progress
Cultural Landscape Inventory	in progress
Cultural Landscape Reports	not done
List of Classified Structures	not done
Museum Catalog Records for the National Catalog	not done
Ehtnographic Overview and Assessment	not done
National Historical Landmark and National Register Identification and documentation	in progress completed only for specific sites
Section 106 compliance	done for all projects
Curation agreement	done**

*Archival records maintained and catalogued by the Appalachian Trail Conservancy
**An arrangement currently exists with the NPS National Capital Region Museum Resource Center for curation of artifacts and objects located during archaeological surveys on NPS APPA lands; other agencies have similar arrangements in places within their own administrative structures

B. Geology and Soil Resources

1. Geologic History of the Appalachian Trail Environment

The Appalachian Trail, which crosses or is immediately proximate to five major geologic subprovinces along its 2,175-mile long traverse of the Appalachian Mountains, provides a unique perspective into the geologic history of the Appalachians. These five geologic subprovinces include the Piedmont, Blue Ridge, Valley and Ridge, Appalachian Plateau, and New England subprovinces.

The Appalachian Mountains – a fold and thrust belt extending from Alabama to Newfoundland – contain some of the oldest rocks and mountains in the world. The Appalachian Trail, situated on the crest of these mountains from its southern terminus at Springer Mountain, Georgia, to its northern terminus, at Katahdin, Maine, follows an unusually diverse geologic record. This extraordinary rock record ranges in age from more than one billion years during the Pre-Cambrian era to 140 million years during the Jurassic geologic time scale.

The formation of the present Appalachian Mountains was the result of a series of tectonic convergences that created pulses of "mountain building events," or orogenies, spanning the past four hundred and seventy million years. These orogenies – the Taconic, the Acadian, and the Alleghenian – are considered the primary orographic catalysts for the current topographic landscape of the Appalachian Mountains. During and after these events, the Appalachians (which some geologists speculate were once as tall as the modern-day Himalayas) were worn down by hundreds of millions of years of

physical and chemical erosion, leaving the distinctively unique landscape we find today.

The Taconic Orogeny, which occurred approximately 450 to 470 million years ago, was the first in this series of influential mountain-building events. It began as a result of the initial subduction of the Eastern Iapetus oceanic plate under the current North American plate, which formed a clastic wedge of sedimentary rock that served as the base for all other layers of rock to build upon. These ancient rocks, generally of the Ordovician Age (430 to 500 million years old), are classified as sedimentary and consist mostly of sandstones, shale and carbonates. The effects of this event can be seen distinctly in the rocks of the Taconic Mountains of New York and Bear Mountain and Mount Riga in Connecticut. Other prominent examples can be found in northern Pennsylvania, Connecticut and Massachusetts.

The Acadian Orogeny, which took place approximately 410 to 380 million years ago, occurred when the North American plate collided with Baltica, a drifting plate that is now considered Europe. At its peak intensity, this massive collision produced a mountain range that extended from southern Virginia to Newfoundland. Rocks of this chain are considered to be of the late Silurian/Devonian Age (350 to 410 million years old) and consist primarily of sedimentary rocks such as limestone, sandstone, and shale. However, metamorphosed rocks from the Acadian Orogeny, such as schist and granite, also are prevalent in the northern states crossed by the Appalachian Trail.

According to Collins Chew, author of *Underfoot: A Geologic Guide to the Appalachian Trail*, evidence of the Acadian Orogeny can be found in numerous places along the Trail. Chew states, “an assortment of Devonian sedimentary rocks, including limestone, shale, sandstone, and mixtures of sand, silt and lime, are found in Pennsylvania. In Virginia and other southern states, the deposits of Devonian sediments are much thinner... The A.T. is on Devonian granite rock at Katahdin in Maine, and a number of areas are underlaid with this granite in Maine and New Hampshire. Other mountains of this rock are Sugarloaf, Saddleback, and Moxie Bald in Maine and Kinsman and Velvet Rocks in New Hampshire.”

The third major mountain-building event, the Alleghenian Orogeny, took place approximately 290 to 250 million years ago. The effects of this event are most pronounced in the central and southern Appalachian Mountains. The Alleghenian Orogeny produced different effects in various subregions: compressional folding and faulting of the Valley and Ridge Province, westward thrusting of the Blue Ridge, and folding and minor metamorphism and igneous intrusion in the Piedmont Province.

Warping and faulting, accompanied by non-marine sedimentation and some volcanism, continued through the late Triassic and early Jusassic era some 220 to 180 million years ago.

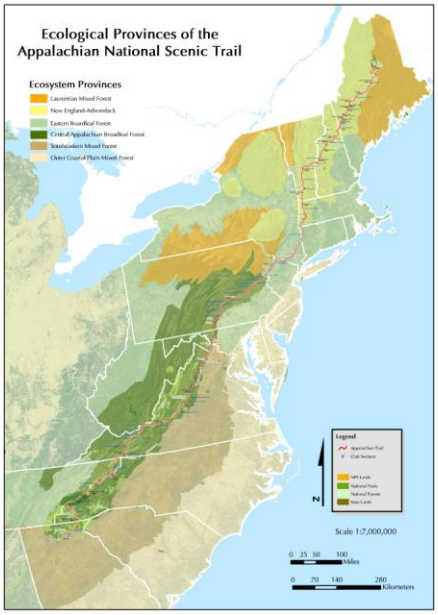
The most recent geologic occurrence affecting the Appalachians took place during the

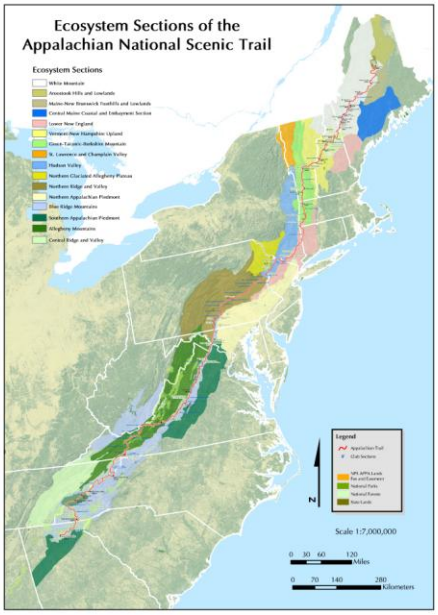
The most recent geologic occurrence affecting the Appalachians took place during the Pleistocene Era, which started roughly 1.8 million years ago and ended approximately 11,000 years ago. During this time, glaciation modified the landscape of much of New England and the mid-Atlantic region. Moraines, striations, glacial till, and other evidence of this activity are still readily apparent in many areas throughout the northern half of the Appalachian Trail environment.

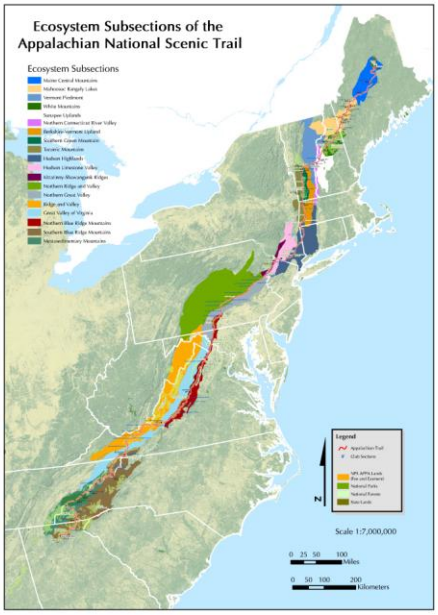
Of course, erosion during, between, and after these orogenic events represents the final factor in the complex geologic story of the Appalachians – in effect, creating the classic modern-day Appalachian landscape of rolling ridges and rounded summits of the Appalachians, from the Longfellow Mountains of Maine to the Blue Ridge Mountains of Virginia, Tennessee, North Carolina, and Georgia.

2. Geomorphology, Lithology, Stratigraphy, and Soil Taxa

The following summary of geographic features is excerpted and adapted from Ecological Subregions of the United States*, R.G. Bailey, USDA Forest Service (scale 1:7,500,000, revised 1994). The Appalachian National Scenic Trail crosses three provinces, eight ecological sections, and 20 ecological subsections in its traverse of the Appalachian Mountains. The following description is organized by ecological section, with a description of geomorphology, lithology, stratigraphy, and soil taxa provided for each section*. Table II.C.1, Ecosystem Provinces, Sections, and Subsections along the Appalachian Trail *provides a tabular summary of the respective categories, and* Maps II.C.1, Ecoregions of the Appalachian National Scenic Trail; II.C.2, Ecological Units of the Eastern United States (Provinces); II.C.3, Ecological Units of the Eastern United States (Sections); II.C.4, Ecological Units of the Eastern United States (Subsections) *illustrate the regional and subregional boundaries.*







Section M212A - White Mountains Section (within the following subsections: M212Ac Maine Central Mountains, M212Ad White Mountains, M212Ae Mahoosuc Rangeley Lakes, and M212Af Connecticut Lakes; and following geographic areas: western Maine,

north-central New Hampshire)

Geomorphology:
The White Mountains Section, which is part of the New England geomorphic province, overlaps the Appalachian Trail for a distance of 400.6 miles from Katahdin in central Maine to Mt. Moosilauke in west-central New Hampshire. It is a glacially scoured, maturely dissected, irregular highland characterized by clusters of low, rounded mountains and scattered monadnocks. Highest elevations occur in a wide belt trending southwest to northeast through the Section, ending in central Maine. Glacial features are most evident in the Section's southern half and include cirques carved into the high peaks and U-shaped valleys, as well as kames, eskers, and drumlins. Mass wasting, fluvial erosion, transport and deposition are the primary geomorphic processes. General elevation ranges from 1,000 to 4,000 ft (300 to 1,200 m); isolated peaks are greater than 5,000 ft (1,500 m); local relief ranges from 1,000 to 3,000 ft (300 to 900 m). Gentle slopes cover 20 to 50 percent of the area; 75 percent of gentle slopes occur in the lowland. Sub-envelop elevation ranges from 200 to 1,800 (60 to 550 m).

Lithology and Stratigraphy:
Thin, stony Pleistocene till and stratified drift mantle the bedrock except in the Connecticut River valley, where lacustrine sediments and terraces are thick. In the northern half of the Section, bedrock is mostly Devonian and Silurian sedimentary rocks which become metamorphosed to quartzite, slate, and schist toward the southwest. The mountainous belt is underlain by Paleozoic igneous rocks (granite, diorite, gabbro, rhyolite, and basalt) that either intrude or both intrude and cover lower Paleozoic schists, and by Proterozoic and Cambrian gneiss. Much younger Mesozoic granites occur at the southern end, intruding the most abundant rock types there, gneiss and amphibolite.

Soil Taxa:
Haplorthods, Haplaquepts, and Dystrochrepts with frigid temperature regime and udic and aquic moisture regimes comprise most of the soils. Cryorthods and Cryaquods with cryic temperature regime and udic and aquic moisture regimes are common at the highest elevations.

Section M212B - Vermont – New Hampshire Upland Section (within the following subsections: M212Ba Vermont Piedmont, M212Bb Northern Connecticut Valley, and M212Bc Sunapee Uplands; and the geographic area of western New Hampshire and eastern Vermont)

Geomorphology:
The Vermont – New Hampshire Upland Section, which is also part of the New England geomorphic province, overlaps the Appalachian Trail for a distance of 95.9 miles from Glencliff in west-central New Hampshire to the town of Bridgewater in

eastern Vermont. It is a glacially scoured, maturely dissected peneplain with open, low mountains and mondanocks. Glacial features include kames, eskers, drumlins, and lacustrine plains. Mass wasting, fluvial erosion, transport and deposition are the primary geomorphic processes operating. Elevation ranges from 600 to 3,000 ft (180 to 900 m); local relief ranges from 1,000 to 3,000 ft (300 to 900 m). Gently sloping land covers 20 to 50 percent of the area; more than 50 percent is found in lowlands. Sub-envelop elevation ranges from 200 to 1,800 (60 to 550 m).

Lithology and Stratigraphy:
Thin, stony Pleistocene till and stratified drift mantle the bedrock, except in the Connecticut River valley where lacustrine sediments and terraces are thick. In the northern half of the Section, bedrock is mostly Devonian and Silurian quartzite, slate, and schist, with small granitic intrusions. Toward the southern end, lower Paleozoic granite and higher-grade metamorphics (mostly gneiss) dominate, with a north to south belt of volcanics.

Soil Taxa:
Haplorthods, Haplaquods, and Haplaquepts with frigid temperature regime and udic and aquic moisture regimes are common. Fragiochrepts and Dystrochrepts with mesic temperature regime and udic moisture regime are common in the northern Connecticut River valley.

Section M212C - Green, Taconic, and Berkshire Mountains Section (within the following subsections: M212Cb, Taconic Mountains, M212Cc Berskhire-Vermont Upland, and M212Cd Southern Green Mountain; and the geographic area of southern Vermont and western Massachusetts)

Geomorphology:
The Green, Taconic, and Berkshire Mountains Section, which is also part of the New England geomorphic Province, overlaps the Appalachian Trail for a distance of 207 miles from the Green Mountains in Vermont to the far southwestern corner of Massachusetts. North of central Vermont, the Green Mountains are north to south trending, linear ranges. To the south, they and the Berkshires are highlands characterized by dissected, flat-topped plateaus (up-warped peneplains) with scattered monadnocks. The Taconic Mountains are west of and separated from the southern Green and Berkshire Mountains by a broad, nearly continuous valley (the Marble Valley) about 1,500 ft (460 m) lower than the highlands on either side. The Taconic Mountains contrast with the plateaus to the east by being more deeply cut into peaks, sharper ridges and canyons with a linear, north to south topographic trend. Scattered glacial features include kames and eskers; the mountains have been smoothed and rounded by glacial scour. Mass wasting, minor karst solution, fluvial erosion, transport and depositions are the primary geomorphic processes operating. Elevation ranges from 600 to 4,000 ft (180 to 1,200 m) with isolated peaks greater than 4,300 ft (1,300 m). Local relief ranges from 1,000 to 3,000 ft (400

to 900 m). Gentle slopes cover less than 20 to 50 percent of the Section; 75 percent occurs in lowlands. Sub-envelop elevation ranges from 200 to 1,800 (60 to 550 m).

Lithology and Stratigraphy:
Thin, stony Pleistocene till and stratified drift mantle the bedrock. Upper Proterozoic and lower Cambrian metaconglomerate, quartzite, schist, and metavolcanics underlie the northern ranges. Lower Ordovician and Cambrian marble, dolomite, and limestone occupy the long valley. Bedrock in the southern plateaus is mostly Proterozoic gneiss and amphibolite with scattered granitic plutons. Rocks of the Taconic allochthon once rested atop the rocks in the Green Mountains as the whole range was undergoing the tectonic events that created them. During uplift the present Taconic range slid on a plane of weakness, under the force of gravity, to its present position; concomitant folding produced a strong north to south stuctural grain. Because these rocks were on top, they are mostly of lower metamorphic grade slate, phyllite, and schist, with lesser quartzite and gneiss.

Soil Taxa:
Haplorthods, Haplaquepts, and Dystrochrepts with frigid temperature regime and udic and aquic moisture regimes are most common in the Green and Berkshire Mountains. Cryorthods and Cryaquods with cryic temperature regime and aquic and udic moisture regimes are common at the highest elevations. The Taconic mountains are characterized by Eutrochrepts, Dytrochrepts, and Udipsamments, with mesic temperature regime and udic moisture regime on lower mountain slopes and in the Marble Valley; Fragiochrepts and Dystrochrepts with frigid temperature regime and udic moisture regime occur at higher elevations.

Section 221A - Lower New England Section (within the following subsections: 221Ae Hudson Highlands; and the geographic area of northwestern Connecticut and southeastern New York)

Geomorphology:
The Lower New England Section, which comprises parts of the New England, Piedmont, and Coastal Plain geomorphic provinces, overlaps the Appalachian Trail for a distance of 153.6 miles from the far southwestern corner of Massachusetts to the northwestern corner of New Jersey. Glacial features such as small to large delta plains, lacustrine basins, eskers, and extensive drumlin fields are widespread. The Section gradually descends in a series of broad, hilly plateaus to the coastal zone. Central Connecticut and western Massachusetts are characterized by a north to south trending basin, a lowland plain, punctuated with a central linear ridge. Primary geomorphic processes along the Appalachian Trail in this section are fluvial erosion, transport and deposition, and mass wasting. Elevation ranges from sea level to 1,500 ft (450 m). Some high hills (monadnocks) are 2,000 ft (600 m). Local relief ranges from 100 to 1,000 ft (30 to 300 m). Gentle slopes cover less than 20 to 80 percent of the area; 50 to 75 percent are in lowlands. Sub-envelop elevation

ranges from 0 to 650 ft (0 to 200 m).

Lithology and Stratigraphy:
Surficial geology is Pleistocene age. In the northeastern part, coastal lowlands are covered by glacial marine sediment (mostly clay). Thin, stony till and glacial fluvial and glacial lacustrine sediment overlie bedrock inland. The bedrock geology is varied and complex. Intense, northeast to southwest trending, faulting, and folding, and plutonic and volcanic episodes have resulted in variegated sedimentary, igneous, and metamorphic rocks. These include Triassic-Jurassic red conglomerate, sandstone and shale (the north to south trending lowland), with a prominent diabase sill (the linear ridge); Carboniferous sandstone, conglomerate, shale and dolostone; Paleozoic granites and volcanics; lower Paleozoic and Proterozoic quartzite, marble, schist, gneiss, and greenstone; and massive Proterozoic granite, granodiorite, diabase, and gabbro. Minimum elevations range from about 200 ft (61 m) in the north to near sea level. Maximum local elevations are generally under 500 ft (152 m) but range to 1,000 ft (305 m). Gentle slopes cover 50 to 80 percent of the area; 50 to 75 percent occurs in uplands.

Soil Taxa:
Interior Section taxa near the Trail include Dystrochrepts and Haplaquepts with udic and aquic moisture and mesic temperature regimes.

Section 221B - Hudson Valley Section (within the following subsections: 221Ba Hudson Limestone Valley, 221Bd Kittatinny-Shawangunk Ridges; and the following geographic areas: southeastern New York, northern New Jersey, and eastern Pennsylvania)

Geomorphology:
The Hudson Valley Section, which is the northernmost extension of the Ridge and Valley geomorphic province, overlaps approximately 72.9 miles of the Appalachian Trail along the northwestern New Jersey/northeastern Pennsylvania border. It is characterized by a linear lowland, a glacial lake plain in part, bounded on either side by high escarpments. The lowland was created by graben-faulting, easily eroded bedrock, and glacial scour. Fluvial erosion, transport and deposition, and mass wasting are the primary geomorphic processes operating. Minimum elevations along the Trail range from about 125 to 200 ft (61 m). Maximum local elevations are generally under 500 ft (152 m) but range to 1,000 ft (305 m). Gentle slopes cover 50 to 80 percent of the area, 50 to 75 percent slopes occur in uplands.

Lithology and Stratigraphy:
The northern half of the central lowland is covered by Pleistocene lacustrine sediments; the remainder is covered by Quaternary alluvium. The uplands have thin, stony till over bedrock. Ordovician carbonate, shale, siltstone, and sandstone form bedrock in the lowlands. Uplands to the east are Ordovician-Cambrian metasediments and metavolcanics; to the west are Silurian conglomerates and

Devonian limestones.

Soil Taxa:
Dystrochrepts and Fragiochrepts with udic moisture regime and mesic temperature regime are most common in the lower Hudson River valley and along the margin of the Catskill and Taconic Mountains. Hapludalfs with mesic temperature regime and udic moisture regime are more commmon in the upper valley.

Section M221A - Northern Ridge and Valley Section (within the following subsections: M221Aa Ridge and Valley Subsection, M221Ad Northern Great Valley Subsection; and the following geographic areas: east-central Pennsylvania)

Geomorphology:
The Northern Range and Valley Section overlaps approximately 169.1 miles of the Appalachian Trail in Pennsylvania. It forms part of the Ridge and Valley geomorphic province and is characterized by a series of parallel, southwest to northeast trending, narrow valleys and mountain ranges (high ridges) created by differential erosion of tightly folded, intensely faulted bedrock. Drainage is structurally controlled, dominantly trellis with some dendritic patterns. Mass wasting, karst solution, and fluvial erosion, transport and deposition are the dominant geomorphic processes currently active. Elevation ranges from 300 to 4,000 ft (100 to 1,200 m). Local relief is 500 to 1,500 ft (150 to 450 m).

Lithology and Stratigraphy:
A veneer of unconsolidated materials overlies most bedrock: residuum on flat and gently sloping uplands, colluvium on slopes, and alluvium in valley bottoms. Shale, siltstone, sandstone, chert, and carbonates form bedrock in this section. Ordovician and Silurian units dominate the northern part of the Section, with some Devonian, Mississippian, and Pennsylvanian units (including coal) exposed in the larger synclines, and Cambrian limestone exposed in a few anticlines. The southern part is dominated by Devonian units with lesser amounts of Silurian and Ordovician rocks in some anticlines, and Mississippian and Pennsylvanian rocks in some synclines. Cambrian rocks show up along a few major thrust faults. Sandstone, chert, and some of the tougher carbonates hold up most of the upland portions of the Section. Weaker carbonates and shale underlie most valleys.

Soil Taxa:
Soils are mostly Ultisols, Alfisols, and Inceptisols, with mesic temperature regimes and mostly udic moisture regime. They are derived from heavily-weathered shale, siltstone, sandstone residuum and colluvium, cherty limestone, and limestone residuum.

Common at higher elevations, while Hapludults are dominant in broad valleys. Rhodudults have formed over rocks with a high content of mafic minerals. Soils are

generally moderately deep and medium textured. Boulders and bedrock outcrops are common on upper slopes, but are not extensive. These soils have a mesic temperature regime, a udic moisture regime, and mixed mineralogy. Similar soils with a frigid temperature regime are typically present at elevations above 4,800 feet. Soils receive adequate moisture for growth of vegetation throughout the year.

Section M221B - Allegheny Mountains Section (M221Ba Ridge and Valley, and M221Bb Great Valley of Virginia; and the following geographic areas: southwestern Virginia and south-eastern West Virginia)

Geomorphology:

The Allegheny Mountains Section, which overlaps the Trail for approximately 203.5 miles as it swings west in southwestern Virginia and southeastern West Virginia, comprises part of the Appalachian Plateaus geomorphic province. It is a maturely dissected plateau characterized by high, sharp ridges, low mountains, and narrow valleys. It has a prominent structural and topographic grain created by broad, northeast to southwest trending folds in the bedrock. Drainage is dendritic to trellis, but primarily the former. Mass wasting, karst solution, and fluvial erosion, transport and deposition are the primary geomorphic processes operating. Elevation ranges from 1,000 to 3,000 ft (300 to 900 m). Local relief generally ranges from 1,000 to 2,500 ft (300 to 600 m).

Lithology and Stratigraphy:

Bedrock is overlain by residuum on the ridges and mountain tops, colluvium on the slopes, and alluvial materials in the valleys. Devonian shale and siltstone, Mississippian carbonates and sandstones, and Pennsylvanian shale, sandstone, and coal form bedrock in the Section. Sandstone and some of the tougher carbonates hold up most of the upland portions; weaker carbonates and shale underlie most valleys.

Soil Taxa:

Soils are dominantly Ultisols, Inceptisols, and Alfisols, with mesic temperature regime and udic moisture regime. They are derived from heavily weathered shales, siltstones, sandstone residuum and colluvium, and limestone residuum. Spodosols with frigid temperature regime and aquic moisture regime occur in isolated pockets at the highest elevations.

Section M221D - Blue Ridge Mountains Section (M221Da Northern Blue Ridge Mountain, M221Dc Southern Blue Ridge Mountain, and M221Dd Metasedimentary Blue Ridge Mountain; within the following geographic areas: southeastern Pennsylvania, central Maryland, the eastern panhandle of West Virginia, northern, central, and southern Virginia, eastern Tennessee, western North Carolina, and northern Georgia)

Geomorphology:

The Blue Ridge Mountains Section, which is located entirely in the Blue Ridge geomorphic province, overlaps the Appalachian Trail in two places: for 381.7 miles in southern Pennsylvania, Maryland, and central Virginia, and then for 506.3 miles in Tennessee, North Carolina, and Georgia. It was formed by tectonic faulting and uplift of resistant, crystalline bedrock into a relatively narrow band of highly metamorphosed, somewhat parallel mountain ranges. The northern part of this section (north of Roanoke Gap in Virginia) is characterized by a single, broad (5 to 10 mi, 8 to 16 km) ridge that extends into southern Pennsylvania. The southern half of the Section is broader, higher, more mountainous, and displays little or no structural grain. Though high (46 peaks are over 6,000 ft (1,820 m) in elevation), the mountains are rounded and generally lack prominent angularity. Drainage is structurally controlled, dominantly trellis in the north; dendritic patterns dominate the southern half. Landforms on about 80 percent of the section are low mountains. The remainder of the section consists of open lowlands. Elevation ranges from 1,000 to over 6,000 ft (300 to 1,800 m). Local relief ranges from 500 to 1,000 ft (150 to 300 m).

Lithology and Stratigraphy:

Bedrock is overlain by a veneer of residuum on the ridges and mountain tops, colluvium on the slopes, and alluvial materials in the valleys. Although structural grain is not evident in the south half, the whole section is bounded on the eastern and western margins by southwest to northeast trending thrust faults, between more faults and tight folds. Bedrock is composed primarily of Proterozoic metasediments (quartzite, schist, and gneiss) and meta-igneous rocks (granite, rhyolite, basalt, and gabbro). Smaller areas underlain by Paleozoic granite occur along the eastern edge of the Section, with lower Cambrian sandstone, shale and dolomite, and broad zones of intensely sheared and altered rock. Lower Cambrian rocks occur intermittently along the western edge as well.

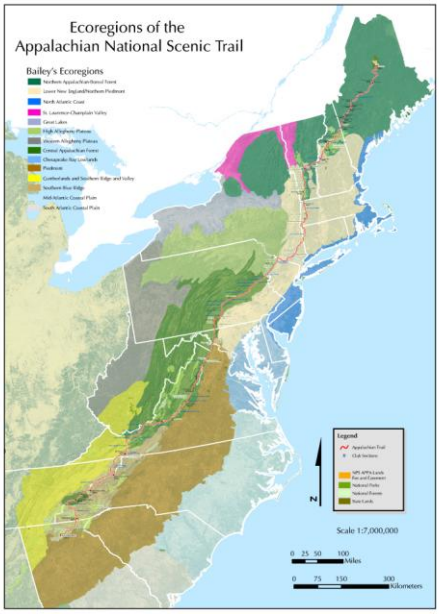
Soil Taxa:

Soils are dominated by Ochrepts and Udults. Dystrochrepts are on steep slopes of lower elevation mountains. Hapludults are on the low foothills, and Haplumbrepts have formed on foot slopes and in valleys.

C. Biological Resources

1. Forest Vegetation, Fauna, and Community Types

The following summary of potential natural vegetation and fauna is excerpted and adapted from Ecological Subregions of the United States, R.G. Bailey, USDA Forest Service (scale 1:7,500,000, revised 1994). The sections on vegetation community types come primarily from the A.T. natural heritage inventories and are specific to the Appalachian Trail.



Several important tables and maps accompany this section. Table II.C.1, Ecosystem Provinces, Sections, and Subsections along the Appalachian Trail *provides a tabular summary of the respective categories, and* Maps II.C.1, Ecoregions of the Appalachian National Scenic Trail; II.C.2, Ecological Units of the Eastern United States (Provinces); II.C.3, Ecological Units of the Eastern United States (Sections); II.C.4, Ecological Units of the Eastern United States (Subsections) *illustrate the regional and subregional boundaries.*

Section M212A - White Mountains Section The northernmost 401 miles of the Appalachian Trail in central and western Maine and northern New Hampshire lies within the White Mountains Ecosystem Section. (within the following subsections: M212Ac Maine Central Mountains, M212Ad White Mountains, M212Ae Mahoosuc Rangeley Lakes, and M212Af Connecticut Lakes; and the following geographic areas: western Maine, north-central New Hampshire)

Potential Natural Vegetation:

Kuchler vegetation types include northern hardwood, northern hardwood-spruce, and northeastern spruce-fir forest. Regionally-defined important vegetation types include northern hardwood-conifer, montane spruce-fir, lowland spruce-fir, alpine krummholz, and alpine meadow. Robbin's cinquefoil is a globally rare plant, unique to alpine communities of the Presidential Range in New Hampshire.

Fauna:

Spruce grouse, black-backed woodpecker, gray-cheeked thrush, long-tailed shrew, red squirrel, snowshoe hare, and moose characterize the colder conifer sites. Ruffed grouse, pileated woodpecker, broad-winged hawk, mourning warbler, chestnut-sided warbler, red-eyed vireo, barred owl, rose-breasted grosbeak, masked shrew, northern bog lemming, northern flying squirrel, and white-tailed deer characterize the hardwood-conifer sites. Eastern woodland caribou, wolverine, mountain lion, and timber wolf were extirpated. A few lynxes, bobcats, coyotes, black bears (seasonally), and humans are the larger predators today. Pine martens are increasing and fishers

are common. Spotted salamander, redback salamander, wood frog, northern leopard frog, mink frog, and eastern garter snake characterize a smaller herpetofaunal component compared to warmer and more southerly Sections in Maine and New Hampshire. The common loon, osprey, and otter commonly use the larger lakes, rivers, and flowages in the Section. Beech provides the primary source of hard mast in the Section.

***Vegetation Community Types*:**
This ecosystem section has some of the rarest and most significant plant communities in the Northeast. Alpine vegetation (above treeline) is one of the rarest community types in the eastern United States, found on only a fraction of one percent of the land. The alpine floristic community that is found on some of the highest summits over which the A.T. passes is considered to be unique in the United States. More than 60 species of plants here are considered to be true arctic-alpine species. This alpine plant community is composed primarily of low-growing shrubs, cushion plants, and graminoids. Dominant alpine species include Bigelow sedge (*Carex bigelowii*), three-forked rush (*Juncus trifidus),* deer-hair sedge (*Scirpus cespitosus*), blueberries and bilberries (*Vaccinium* spp.) diapensia (*Diapensia lapponicum*), mountain sandwort (*Minuartia groenlandica)*, three-toothed cinquefoil (*Potentilla tridentata*), and black crowberry (*Empetrum nigrum*).

In Maine, alpine ridge communities may be found at Mt. Katahdin, Bigelow Mountain, Baldpate Mountain, Goose Eye Mountain, and Saddleback Mountain. The only alpine area in NPS ownership along the full length of the A.T. is at Saddleback Mountain. The other four alpine areas are within State of Maine ownership. On Saddleback Mountain and Whitecap Mountain, krummholz plant communities may be found in the ecotone between alpine areas and spruce-fir forest. Treeline along the A.T. in Maine generally occurs above 3,500 feet. Alpine tarn plant communities along the A.T. in Maine are found at Bigelow/The Horns and Mahoosuc Arm/ Speck Pond. Speck Pond, located at an elevation of about 3,400 feet, is the highest tarn in Maine. Approximately 1,800 acres of alpine plant communities are found within the A.T. corridor in Maine. This acreage, combined with alpine plant communities along the Trail in New Hampshire, represents the only alpine area within a NPS unit in the eastern United States.

In the Presidential Range of New Hampshire's White Mountains, the A.T. crosses the largest continuous alpine area in the eastern United States. From Mt. Madison to Mt. Pearce (Mt. Clinton), the A.T. follows alpine ridges and mountains for 12.7 miles. Approximately 4,400 acres of alpine area lie within the A.T. corridor along this segment of the Trail, almost all of it within White Mountain National Forest. Along the middle portion of this segment, the A.T. crosses Mt. Washington, the highest peak in the Northeast at 6,288 feet. On average, alpine ridge communities are found above 4,700 feet here, but on Mt. Webster, the alpine area extends down to 3,800 feet. In addition to the alpine ridge community, numerous small alpine/subalpine bogs and a

few alpine/subalpine ponds (tarns) are found within the A.T. corridor in New Hampshire. To the east of the Presidential Range, a small alpine area that extends down to 3,700 feet is located on the summit of Shelburne Moriah Mountain. Southwest of the Presidential Range, the A.T. crosses alpine plant communities on Mt. Guyot, South Twin Mountain, Mt. Garfield, Mt. Layfayette, Mt. Lincoln, and Mt. Moosilauke.

Below treeline, high elevation or montane spruce-fir forest lies between about 2,200 feet and 4,000 feet in elevation. Red spruce (*Picea rubens*) and balsam fir (*Abies balsamea*) are the dominant species, with paper birch (*Betula papyrifera*) and mountain ash (*Sorbus americana*) also being present. Below this may be found lowland spruce-fir forest and a transitional northern hardwood-spruce forest. The northern hardwood forest dominates up to approximately 2,500 feet, with beech (*Fagus grandifolia*), sweet birch (*Betula lenta*), and sugar maple (*Acer saccarum*) being the predominant species. Hemlock (*Tsuga canadensis*) is often a significant component of this association. Other smaller community types include moist subalpine heathlands, acidic rocky summits, spruce woodlands, cold-air talus woodland, and streamshore and pondshore wetlands.

Section M212B - Vermont – New Hampshire Upland Section Approximately 96 miles of the A.T. corridor lies within this ecosystem section. (within the following subsections: M212Ba Vermont Piedmont, M212Bb Northern Connecticut Valley, and M212Bc Sunapee Uplands; and the geographic area of western New Hampshire and eastern Vermont)

Potential Natural Vegetation:
Kuchler vegetation types include northern hardwood and northern hardwood-spruce forest. Regionally-defined important vegetation types include montane spruce-fir, lowland spruce-fir, northern hardwood-conifer, and transition hardwood-conifer.

Fauna:
Gray jay, Cape May warbler, dark-eyed junco, red bat, snowshoe hare, red squirrel, fisher, and moose characterize the colder conifer sites in this Section. Ruffed grouse, pileated woodpecker, turkey, red-tailed hawk, chestnut-sided warbler, Nashville warbler, black-throated blue warbler, red-eyed vireo, rufous-sided towhee, scarlet tanager, smoky shrew, northern and southern flying squirrel, and white-tailed deer characterize the hardwood-conifer sites. Timber rattlesnake (in the southern part), American elk, timber wolf, and mountain lion were extirpated through land clearing and settlement activities. Coyotes, bobcats, a few lynxes, black bears (seasonally), and humans are the larger predators today. Pine martens and fishers are locally common. Beaver-created wetlands in this Section are common. Bullfrog, green frog, black duck, wood duck, hood merganser, northern harrier, great horned owl, meadow vole, mink and otter characterize the variety of wetlands. Spotted salamander, redback salamander, American toad, grey treefrog, spotted turtle, wood turtle, northern water

snake, and ribbon snakes characterize a richer herpetofaunal component than more northerly Sections. Oak and beech are primary sources of hard mast.

***Vegetation Community Types*:**
The Vermont-New Hampshire Upland Section contains many of the same forest communities as the preceding section, with the primary exception being that there are no alpine plant communities. The predominant vegetation community through which the A.T. passes in this section is the beech-birch-maple forest. This forest type extends up to about 2,500 feet above sea level. The primary trees in this vegetation community are beech (*Fagus grandifolia)*, sweet birch (*Betula lenta*), sugar maple (*Acer sa*ccarum), red maple (*Acer rubrum*), white pine (*Pinus strobus*), red oak (*Quercus rubra*), hemlock (*Tsuga canadensis*), and basswood (*Tilia americana*). On steep lower slopes or north slopes where soil is deep, a rich northern hardwood forest, high in species diversity, is present. In ravines on north-facing slopes and on dry thin-soiled west slopes, dense stands of Eastern hemlock and white pine are sometimes present. South and west-facing hills, because they are drier and generally warmer, have a greater proportion of red oak (*Quercus rubra*) and white oak (*Quercus alba*) in the overstory. Oaks are also more common in the Connecticut River Valley. At elevations above 2,000 feet, the beech-birch-maple forest intermixes with the spruce-fir forest type. Some community types of limited extent within this section of the A.T. are fens, seeps, bogs, a black spruce (*Picea mariana*) swamp, a red maple-tamarack (*Larix laricina*) peat swamp, and a calcareous rocky summit.

Section M212C - Green, Taconic, and Berkshire Mountains Section Approximately 207 miles of the A.T. corridor lies within this ecosystem section. (within the following subsections: M212Cb, Taconic Mountains, M212Cc Berskhire-Vermont Upland, and M212Cd Southern Green Mountain; and the geographic area of southern Vermont and western Massachusetts)

***Potential Natural Vegetation*:**
Kuchler vegetation types include northern hardwood, northern hardwood-spruce, and northeastern spruce-fir forest. Regionally-defined important vegetation types include montane spruce-fir, lowland spruce-fir, northern hardwood-conifer, and transition hardwood-conifer.

***Fauna*:**
The mountainous regions of southern and central Vermont and western Massachusetts have undergone tremendous changes in habitat conditions as a result of European settlement, the agrarian nature of that settlement, and continued human occupation of these mountains. The timber wolf and mountain lion were extirpated through land clearing activities and European settlement in the early 1900's. Other large vertebrates such as elk and moose were also eliminated from this region with encroaching settlement. Other species were also greatly reduced by human

inhabitants (e.g., beaver), as have been "noxious" species like the timber rattlesnake. With the re-establishment of forests on abandoned agricultural lands beginning in the late 1800's and early 1900's, many species have expanded to their original distributions. Wolves, mountain lions and elk have not returned. However, moose, beaver, bobcat, and black bear have steadily increased both in range and population with the changing habitat conditions. Efforts to re-establish species like the fisher and wild turkey have also proven successful. Common wildlife species include red-back salamander, red-spotted newt, gray treefrog, ruffed grouse, wood duck, barred owl, yellow-bellied sapsucker, black-capped chickadee, veery, red-eyed vireo, blackpoll warbler, ovenbird, little brown bat, snowshoe hare, northern flying squirrel, red-backed vole, white-tailed deer, and porcupine.

***Vegetation Community Types*:**
The Green-Taconic-Berkshire Section contains many of the same forest communities as the Vermont-New Hampshire Upland Section. A beech-birch-maple forest is found at lower elevations. In Vermont's Green Mountains, this forest type intermixes with spruce-fir forest at elevations above 2,000 feet. On the highest ridges of the Green Mountains can be found montane-spruce-fir forest. Above 3,800 feet, on Pico and Killington peaks, balsam fir (*Abies balsamea*) occurs in stunted form as krummholz.

In Massachusetts, the most extensive forest community in the A.T. corridor is the northern hardwood-hemlock forest at elevations of 1,000 to 2,000 feet. The dominant trees in this forest type are beech, black cherry (*Prunus serotina*), yellow birch (*Betula alleghaniensis*), paper birch (*Betula papyrifera*), red maple, sugar maple, red oak, white ash (*Fraxinus americana*), and Eastern hemlock. Mesic forest communities are dominated by sugar maple and white ash, and they have a high diversity of herbaceous plants. A dry, low-diversity, oak dominated forest with red oak, white oak, and red maple in the canopy is present on much of the long ridgeline between Jug End Summit and Sage's Ravine. Pitch pine (*Pinus rigida*) woodlands are scattered on rocky, exposed summits. A rarer dry forest type in the A.T. corridor is a calcareous mixed hardwood-hemlock forest that is present in the Vossburg Hills. A red spruce-balsam fir forest is found at elevations above 2,900 feet in Mt. Greylock State Reservation. Red spruce (*Picea rubens*) intermixes with the northern hardwood forest down to about 2,000 feet. Among the more limited plant community types found within the A.T. corridor in the Green-Taconic-Berkshire Mountains Ecosystem Section are shrub swamps, shrub fens, wet meadows, calcareous seepages, a calcareous marsh, and a forested swamp.

Section 221A - Lower New England Section Approximately 154 miles of the A.T. corridor lies within this ecosystem section. (within the following subsections: 221Ae Hudson Highlands; and the geographic area of northwestern Connecticut and southeastern New York)

***Potential Natural Vegetation*:**
Kuchler vegetation types include northern hardwood, Appalachian oak, and northeastern oak-pine forest. Regionally-defined important vegetation types include northern hardwood-hemlock-white pine, and central hardwoods.

***Fauna*:**
Disturbance of the original ecosystems and their faunal component resulted from European settlement. Large vertebrates were exterminated (*e.g.*, moose), reduced, or restricted (*e.g.*, white-tailed deer, wild turkey) by hunting and habitat loss. Original distributions were re-established or exceeded for some species with the re-establishment of forests on abandoned agricultural lands, in some cases, with higher population densities. The large predators have not returned; their niche has been partially filled by mid-size predators (*e.g.*, bobcat, coyote). This ecological shift, combined with hunting access restrictions, has resulted in imbalances between herbivores and plant resources. Extensive areas of regenerating forest and associated early successional habitat are lacking. Hard tree mast (*e.g.*, acorns, beechnuts) drives many faunal processes. Common wildlife species include the white-tailed deer, gray squirrel, white-footed mouse, red-eyed vireo, and red-spotted newt.

***Vegetation Community Types*:**
The Trail corridor in Connecticut consists primarily of mixed deciduous forests on lower slopes and oak/heath forests on middle and upper slopes. The mixed deciduous forest is a moist, mid-successional forest located on lower to middle slopes on all the ridges from Ten Mile Hill to Lion's Head. Sugar maple, white ash, black cherry (*Prunus serotina)*, and red oak are the major canopy species in this community. The second primary community type along the A.T. corridor in Connecticut is an oak-dominated forest that occupies drier, less fertile soils on middle and upper slopes for the entire length of the A.T. corridor in Connecticut. Red oak and chestnut oak (*Quercus montana*) are the most common trees, and ericaceous (heath) shrubs are primary components of the shrub layer. Eastern hemlock stands are common in ravines and on north-facing slopes. Rarer natural communities along the Trail corridor in Connecticut are floodplain forest, red maple-skunk cabbage (*Symplocarpus foetidus*) swamp, black spruce woodland swamp, circumneutral seepage forest, sugar maple-yellow oak (*Quercus muehlenbergii*)-hemlock forest on marble bluffs, rocky summit shrublands, and a shagbark hickory (*Carya ovata*)-Pennsylvania sedge (*Carex pensylvanica*) forest.

In New York's Appalachian Trail corridor, the most extensive plant communities are mixed coniferous-deciduous forests, dominated by hemlocks and several hardwood species, and upland deciduous forests, dominated by oaks. On lower slopes with moist soil, a relatively high diversity hardwood forest dominated by maples, oaks, hickories, black cherry, white ash, black birch, and hop hornbeam (*Ostrya virginiana*) is present. On mid-slopes, a drier, less diverse Appalachian oak-hickory forest consisting of red oak, chestnut oak, black oak (*Quercus velutina*), pignut hickory (*Carya glabra*),

black birch and red maple is present. On steep north or west-facing slopes and in ravines, a hemlock-northern hardwood forest frequently occurs. On upper slopes, a chestnut oak forest with ericaceous shrubs is present on thin, dry soils. On rocky ridgetops, a pitch pine-oak forest or pitch pine-oak-heath rocky summit community occurs.

Smaller scale upland habitats found within New York's A.T. corridor include oak-tulip poplar (*Liriodendron tulipifera*) forest, beech-maple forest, acidic talus slope woodland, and rocky summit grassland. Wetland vegetation types include red maple-hardwood swamp, floodplain forest, shrub swamp, highbush blueberry bog thicket, shallow emergent marsh, rich sloping fen, and inland Atlantic white cedar (*Chamaecyparis thyoides*) swamp.

Section 221B - Hudson Valley Section Approximately 73 miles of the A.T. corridor pass through the Hudson Valley Ecological Section. (within the following subsections: 221Ba Hudson Limestone Valley, 221Bd Kittatinny-Shawangunk Ridges; and the following geographic areas: southeastern New York, northern New Jersey, and eastern Pennsylvania)

***Potential Natural Vegetation*:**
Kuchler vegetation types include northern hardwood and Appalachian oak forest. Regionally-defined important vegetation types include central hardwoods, transition hardwoods, and pockets of northern hardwoods grading from south to north.

Fauna:
With European settlement, the original forest ecosystems and their forest-dependent fauna were reduced to marginal areas. With the re-establishment of forest on abandoned agricultural lands, many forest wildlife species have returned to their pre-settlement distributions and numbers. Large predators have not re-established themselves, either naturally or by re-introductions; and the reduced predation on major herbivores, especially white-tailed deer, has resulted in increasingly widespread overpopulation of these herbivores. Acorns are an important resource of forest habitats, providing an energy source that drives many wildlife processes. Fragmentation of forest cover by residential development is an important concern. Common wildlife species include white-tailed deer, gray squirrel, white-footed mouse, red-eyed vireo, and red-spotted newt.

***Vegetation Community Types*:**
In spite of its name, this part of the A.T. corridor is actually located in northwestern New Jersey and adjacent Pennsylvania. Most of the A.T. corridor in New Jersey passes through a dry, rocky chestnut oak forest dominated by chestnut oak and red oak, with associate species of red maple, black birch, black oak, and pignut hickory (*Carya glabra*). The shrub layer of this chestnut oak forest is dominated by ericaceous species such as mountain laurel (*Kalmia latifolia*) and blueberries (*Vaccinium* sp.). The

chestnut oak forest dominates the Trail corridor in Stokes State Forest, Worthington State Forest, High Point State Park, and Delaware Water Gap National Recreation Area. East of High Point State Park, chestnut oak forest covers the upper slopes of Pochuck, Wawayanda, and Bearfort mountains.

A more diverse mesic inland mixed oak forest dominates lower and midslope forests east of High Point State Park, with red oak, white oak, sugar maple, white ash, hop hornbeam, beech, and black cherry being common components. A mesic hemlock-hardwood forest community occurs in ravines and on sheltered north and west-facing slopes. A ridgetop pitch pine-scrub oak forest is often found on high, exposed ridges throughout New Jersey's A.T. corridor. Two rarer upland community types are dry-mesic calcareous forest and talus slope communities. Small-scale wetland community types found within the corridor include inland red maple swamp, floodplain forest, black spruce swamp, calcareous seepage swamp, and emergent and graminoid marsh.

Section M221A - Northern Ridge and Valley Section Approximately 169 miles of the Appalachian Trail lies within the Northern Ridge and Valley Ecological Section in east-central Pennsylvania. (within the following subsections: M221Aa Ridge and Valley Subsection, M221Ad Northern Great Valley Subsection; and the following geographic areas: east-central Pennsylvania)

Potential Natural Vegetation:
Because much of this area lies in the rain shadow of the Allegheny Mountains Section, vegetation reflects drier conditions. Kuchler types are mapped as Appalachian oak forest, oak-hickory-pine forest, and some northern hardwoods forest. Braun classified much of the area as oak-chestnut. Before arrival of the blight that decimated the chestnut, this Section was a stronghold of the species. Oaks now dominate. As a broad generalization, red and white oaks occur on more productive, mesic sites. Eastern white pine can occur, with white oak on the lower portions of slopes. Scarlet and black oaks are more common on drier sites. On the driest sites, oaks are mixed with pitch, table mountain, or Virginia pines. The latter can also occur as pure stands.

***Fauna*:**
The black bear is the sole representative of large carnivores. White-tailed deer are abundant and can have a major impact on understory flora. Smaller mammals include the gray and fox squirrels, deer mouse, meadow jumping mouse, weasels, and bats. The endangered Virginia big-eared and Indiana bats are associated with karst areas. Bird species are diverse and include a wide variety of both residents and neotropical migrants. Game birds include ruffed grouse and wild turkey. Bald eagles and peregrine falcons were never abundant historically. In recent years eagles have entered the area, and falcons have been reintroduced. Fish species include brook trout and sculpins at higher elevations, with the addition of smallmouth bass, rock bass, minnows, and darters at lower elevations. Amphibians and reptiles are abundant.

Insect life is highly diverse. Some butterfly and moth species are still being identified.

***Vegetation Community Types*:**
The dominant vegetation type here is mixed oak forest, which is present along the ridgetops that the A.T. frequently follows through this section. Primary components of the mixed oak forest are red oak, white oak, chestnut oak, scarlet oak (*Quercus coccinea*), red maple, tulip poplar, black birch, and several species of hickory. Scrub oak barrens of pitch pine, scrub oak (*Quercus ilicifolia*), sassafras (*Sassafras albidum*), and mountain laurel are found in the most xeric habitats. The Trail occasionally passes through Eastern hemlock-yellow birch ravines and forest stands. As the Trail crosses the Cumberland Valley, it passes through many disturbed and successional areas, but it occasionally passes through floodplain forest, mature oak-hickory forest, and xeric shale slopes of eastern red cedar (*Juniperus virginiana*). Small wetland areas within this ecological section include acidic seeps, grassy meadows, acidic shrub swamps, and rich seepage swamps.

Section M221B - Allegheny Mountains Section Between Roanoke and Marion, VA, to the west of Interstate 81, approximately 200 miles of the Appalachian Trail passes through the Allegheny Mountains Ecological Section. (M221Ba Ridge and Valley, and M221Bb Great Valley of Virginia; and the following geographic areas: southwestern Virginia and south-eastern West Virginia)

***Potential Natural Vegetation*:**
Kuchler mapped this Section as northeastern spruce-fir, northern hardwoods, mixed mesophytic, and oak-hickory-pine. Strongly influenced by elevation and aspect, the vegetation of the Allegheny Mountains can be placed in four broad groups: red spruce, northern hardwoods, mixed mesophytic, and oaks. Red spruce is characteristic above 3,500 ft (1,060 m) and includes stands of American beech and yellow birch. Beech is more common on northerly aspects, and yellow birch on southerly. The northern hardwood group features sugar maple occurring with beech and black cherry. The mixed mesophytic represents a transition to drier types and presents a wide variety of successional pathways. Characteristic species are red oak, basswood, white ash, and tulip poplar. The productive, diverse cove hardwoods are included in this group. Oak sites occur mostly on foothills, but are much less common in this Section than in the Northern Ridge and Valley Section.

***Fauna*:**
The black bear is the sole representative of large carnivores. Prior to European settlement, forests featured wolves, fishers, and mountain lions, but all of these species were hunted or trapped to local extinction. Fishers have since been reintroduced with modest success. White-tailed deer are abundant and can impact understory flora. Varying hare, red squirrel, and the endangered Virginia northern flying squirrel are associated with the red spruce vegetation zone (above 3,500 ft and primarily west and north of the Appalachian Trail). Elsewhere, gray and fox squirrels

are more abundant. Throughout the Section, smaller mammals include the deer mouse, meadow jumping mouse, various weasels, and bats. Bird species include a wide variety of both residents and neotropical migrants. Ruffed grouse and wild turkey are prominent game species. Fish species include brook trout and sculpins at higher elevations, with the addition of smallmouth bass, rock bass, minnows, and darters at lower elevations. Amphibians and reptiles are abundant. Insect life is highly diverse. New butterfly and moth species are still being identified.

Vegetation Community Types:
Among the forest types found in this section of the A. T. are mixed hardwood forest, mixed oak forest, chestnut oak-red oak forest, white pine-mixed oak forest, oak-hickory forest, Eastern hemlock-mixed hardwood forest, Eastern hemlock-oak forest, Eastern hemlock forest, Eastern hemlock-yellow birch forest, Eastern hemlock-red spruce forest, and sandstone slope woodland and glade. Small areas of high-elevation seepage wetland and acidic seepage wetland are also present.

Section M221D - Blue Ridge Mountains Section Approximately 890 miles of the Appalachian Trail passes through the Blue Ridge Mountains Ecological Section, extending from approximately Pine Grove Furnace State Park in Pennsylvania most of the distance to the end of the Appalachian Trail in northern Georgia. (M221Da Northern Blue Ridge Mountain, M221Dc Southern Blue Ridge Mountain, and M221Dd Metasedimentary Blue Ridge Mountain; within the following geographic areas: southeastern Pennsylvania, central Maryland, the eastern panhandle of West Virginia, northern, central, and southern Virginia, eastern Tennessee, western North Carolina, and northern Georgia)

***Potential Natural Vegetation*:**
Kuchler classified vegetation in this Section as Appalachian oak forest, southeastern spruce-fir forest, and northern hardwoods. The predominant vegetation form is montane cold-deciduous broad-leaved forest dominated by the genus *Quercus* (oak). The oak forest type consists of black, white, and chestnut oaks that dominate dry mountain slopes; pitch pine is often a component along ridge tops. Mesophytic species such as yellow-poplar, red maple, northern red oak, and sweet birch dominate the valleys and moist slopes. Smaller areas of cold-deciduous broad-leaved forest with evergreen needle-leaved trees are present in the intermontane basins, with the hardwood-pine cover type of scarlet, white, blackjack, and post oaks and shortleaf and Virginia pines. Table Mountain pine, a fire-dependent species with serotinous cones, occurs on xeric ridge tops where fire was historically more common. Eastern white pine dominates small areas of coarse-textured soils and parts of the Blue Ridge escarpment joining the Southern Appalachian Piedmont Section. Mesic sites at higher elevations (4,500 ft.) are occupied by northern hardwoods (e.g., sugar maple, basswood, and buckeye); drier sites are dominated by northern red oak. The broad-leaved forest changes to evergreen needle-leaved forest with conical crowns (e.g., red spruce, Fraser fir) above altitudes of about 5,000 to 6,000 ft.

***Fauna*:**
Many species of small mammals and birds with northern or boreal affinities reach their southernmost range in eastern North America in the Blue Ridge Section. These include the New England cottontail rabbit, northern water shrew, rock vole, northern flying squirrel, blackburnian warbler, and saw-whet owl. This Section supports the largest diversity of salamanders in North America. At least 12 species of the genus *Plethodon* and six species of the genus *Desmognathus* are endemic to the Blue Ridge Section. Most endemic species are found in the central and southern subsections, where topographic relief is greater, peaks are more isolated, and higher rainfall occurs. Isolated populations of the green salamander and bog turtle are found in the southernmost subsection.

***Vegetation Community Types*:**
The Trail is not particularly diverse from southern Pennsylvania to Shenandoah National Park in Virginia, partly because of the minimal difference in elevation along this portion of the Trail. This region is characterized by a narrow chain of mountain peaks dominated by a canopy of oaks and hickories, interrupted by pockets of mesic forest with tulip poplar, maples, and beech. The dominant understory includes mountain laurel, flowering dogwood, spicebush (*Lindera benzoin*), and blueberries. Since most of the Trail follows ridgelines, conditions are lower in moisture with fewer ground layer species than in bottomland woods. Along the Potomac and Shenandoah rivers, the Trail passes through a floodplain forest. Along the West Virginia-Virginia border, the A.T. generally passes through a highly disturbed oak-hickory forest, with ericaceous shrub and ground layers and low species diversity. The Trail passes through a few small areas of basic seepage swamp.

In Shenandoah National Park, the A.T. has greater altitudinal variation, from less than 1,000 to more than 4,000 feet. Much of the Trail passes through mixed hardwood forest. In areas of greater moisture and on north slopes, the Trail passes through mixed hardwood-hemlock forest, with relatively small areas of Eastern hemlock forest, which have been heavily impacted by the hemlock woolly adelgid. Among the rarer plant communities along the Trail in Shenandoah National Park are both low and high-elevation greenstone glades. At the highest elevations of the Trail in the Park—around 4,000—the A.T. passes through scattered occurrences of red spruce (*Picea rubens*) and balsam fir (*Abies balsamea*).

In central and southern Virginia south of Shenandoah National Park, the Appalachian Trail passes through a variety of forest types, which is partly a result of the wide elevation change along this portion of the A. T. Among the more common forest types along this portion of the Trail are mixed oak forest, mixed hardwood forest, northern hardwood forest, oak-birch-heath forest, mixed oak-red maple forest, Eastern hemlock-mixed hardwood forest, Eastern hemlock forest, chesnut oak forest, pitch pine woodland, sugar maple forest, and Southern Appalachian cove hardwood forest. Less common vegetation types along the A. T. are several occurrences of shale slope

woodland, granitic glades, and low and high-elevation greenstone glades. At the Trail's highest elevations in Virginia (rising above 5,000 feet) at Mt. Rogers, Whitetop Mountain, and Pine Mountain are found several vegetation types unique to the state, such as red spruce-Fraser fir (*Abies fraseri*) forest, red spruce forest, Fraser fir forest, red spruce-yellow birch (*Betula alleghaniensis*) forest, and Southern Appalachian grassy bald.

In Tennessee and North Carolina, the elevation of the Appalachian Trail varies widely (from about 1,000-6,643 feet at Clingman's Dome), and the number of plant community types is possibly the greatest of any portion of the Trail. This is also the area of greatest tree diversity along the Trail. Among the more common vegetation types along this portion of the Appalachian Trail are montane oak-hickory forest, montane white oak forest, northern hardwood forest, high-elevation red oak (*Quercus rubra*) forest, Southern Appalachian northern hardwood cove forest, Southern Appalachian mesophytic cove forest, high-elevation mountain meadow, Carolina hemlock (*Tsuga caroliniana*) bluff forest, Eastern hemlock forest, pine-oak-heath forest, calcareous mesophytic forest, high-elevation rocky summits, montane acidic cliffs, boulderfield forest, high-elevation springs and seeps, Southern Appalachian bogs, heath balds, and riparian forests. A Southern Appalachian grassy bald plant community is found along much of the A. T. between Hump Mountain and Roan Mountain, as well as at Big Bald, generally at elevations above 5,000 feet. Red spruce-Fraser fir forest may also be found along sections of the Trail at Roan Mountain, Unaka Mountain, and at the highest elevations of Great Smoky Mountains National Park, generally above 5,000 feet. Both the red spruce – Fraser fir forest and the grassy balds are among the rarest plant community types along the entire Appalachian Trail.

In Georgia, the Appalachian Trail passes through a smaller number of forest types and plant communities than in Tennessee and North Carolina, partly due to the lower elevation range, which reaches a maximum at 4,458-foot Blood Mountain. There are no spruce-fir forests or Southern Appalachian grassy balds along the A. T. in Georgia. Among the more common forest types found along the Trail in Georgia are oak-hickory forest, cove hardwood forest, mixed mesophytic forest, tulip poplar forest, Eastern hemlock-white pine (*Pinus strobus*) forest, northern hardwood forest, boulderfield forest, rocky summits, and heath balds.

2. Rare, Threatened, and Endangered Species and Rare or Exemplary Natural Communities

More than 2,100 occurrences of rare, threatened and endangered (RTE) species and rare or exemplary natural communities have been identified at more than 515 natural heritage sites on Appalachian Trail lands. While some of these records are historic, the vast majority were identified or confirmed during recent surveys. The following

narrative summarizes these occurrences of rare, threatened, and endangered species by state, beginning in Maine and continuing south to the Trail's southern terminus in Georgia.

Occurrences of rare, threatened, and endangered (RTE) species were documented in a series of natural heritage inventories conducted on Appalachian Trail lands in each state between 1989 and 2001. *Table II.C.2, Inventories of Natural Heritage Resources Along the Appalachian Trail, by State, 1989 -2001* provides a summary of the occurrences found during these inventories. For the purposes of these natural heritage inventories, Appalachian Trail lands were defined as (a) all lands acquired by the National Park Service for the Appalachian Trail, (b) all lands affected by the Appalachian Trail prescription on National Forest lands, and (c) all lands in other jurisdictions, (such as state gamelands and state parks) within 500 feet either side of the footpath. State natural heritage program rankings were used to identify rare, threatened, and endangered species populations along the Trail. [See *Appendix C-1 State Natural Heritage Program Rankings*.]

Table II.C.2 Inventories of Natural Heritage Resources along the Appalachian Trail, by State, 1989 - 2001

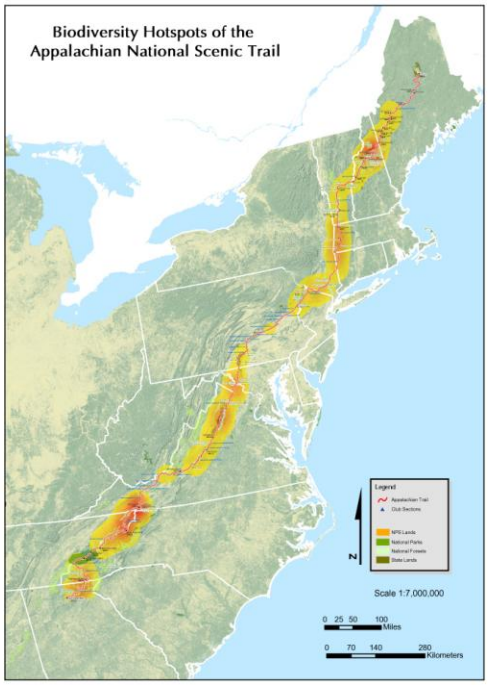
State	*Acreage Inventoried*	*Miles of A.T. Inventoried*	*Number of Natural Heritage Sites*	*Number of Natural Heritage Occurrences*	*Date Inventory Completed*
Maine	40,300	274.6	46	157	2000
New Hampshire	23,000	157.7	59	401	1991
Vermont	22,500	145.5	32	60	1991
Massachusetts	12,500	89.0	43	173	2000
Connecticut	6,000	46.7	27	57	1992
New York	12,292	90.9	21	56	2001
New Jersey	9,380	73.6	18	74	2001
Pennsylvania	30,000	229.8	15	25	1990
Maryland	5,372	37.0	8	32	2001
West Virginia	2,100	29.4	8	31	1997
Virginia	60,000	543.2	73	321	1994
Tennessee	10,800	73.2	58	167	1996
N. Carolina/Tenn.	27,500	234.0*	66	284	1993
Georgia	7,166	83.8**	41	214	2000

* Inventory includes approximately 88 miles of the A.T. that straddles the North Carolina/Tennessee border

**Inventory includes approximately 8 miles of the approach Trail to the Appalachian Trail at Amicalola Falls

The greatest number of rare, threatened, and endangered species, as well as many of the species of greatest rarity, are found on lands of the USDA Forest Service in New Hampshire, Virginia, Tennessee, North Carolina and Georgia. More than 200 occurrences of rare, threatened and endangered species and 70 rare or exemplary natural community occurrences are found on lands acquired by the National Park Service for the Appalachian Trail.

Additional occurrences of rare, threatened and endangered species are found near the Appalachian Trail in six other NPS units: Great Smoky Mountains National Park, Blue Ridge Parkway, Shenandoah National Park, Harpers Ferry National Historical Park, C & O Canal National Historical Park and Delaware Water Gap National Recreation Area. Data for RTE species in Great Smoky Mountains National Park exists, but it was not developed as part of the A.T. natural heritage inventories. Many additional RTE species within the A.T. corridor are found on state park and forest land, particularly in the states of Maine, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, and Maryland. [See *Map II.B.1, Biodiversity Hotspots along the Appalachian National Scenic Trail.*]



Trailwide, the three greatest concentrations of rare, threatened and endangered species along the A.T. are in the Presidential Range of New Hampshire, the Mt. Rogers-Whitetop area of southwest Virginia, and the Roan Mountain area along the North Carolina-Tennessee border. All of these areas are on USDA Forest Service land. In the Presidential Range, 215 rare species occurrences have been documented on Appalachian Trail lands; in the Mt. Rogers-Whitetop area, 79 rare species occurrences have been documented; and in the Roan Mountain area, 67 rare species occurrences have been documented. Of the 14 occurrences of species on Appalachian Trail lands that are listed as federally endangered and the single occurrence listed as federally threatened, 11 lie within the two Southern biological hotspots. Table II.C.3 Federally Endangered and Threatened Species Along the A.T.

Federally Endangered and Threatened Species Along the A.T.

Geum radiatum	Spreading avens	E	G2	Roan Mountain Massif, Cherokee and Pisgah National Forests, TN/NC
Gymnoderma lineare	Rock gnome lichen	E	G2	Roan Mountain Massif, Cherokee and Pisgah National Forests, TN/NC
Glaucomys sabrinus coloratus	Carolina northern flying squirrel	E	G5T1	Roan Mountain Massif, Cherokee and Pisgah National Forests, TN/NC
Glaucomys sabrinus fuscus	Virginia northern flying squirrel	E	G5T2	Mt. Rogers National Recreation Area, Jefferson National Forest, VA
Plethodon shenandoah	Shenandoah salamander	E	G1	Shenandoah National Park
Isotria medeoloides	Small whorled pogonia	T	G2	State of Connecticut Land
Hedyotis purpurea	Roan Mtn. bluet	E	G5T2	Roan Mountain Massif, Pisgah National Forest, NC
Solidago spithamaea	Blue Ridge goldenrod	T	G1	Roan Mountain Massif, Cherokee and Pisgah National Forests, TN/NC
Microhexura montivaga	Spruce-fir moss spider	E	G1	Roan Mountain Massif, Cherokee and Pisgah National Forests, TN/NC

Approximately 330 occurrences of globally rare species [defined as G1, G2, or G3, using the natural heritage program ranking criteria – see *Table C*] are found within about 170 natural heritage sites on all Appalachian Trail lands. The greatest numbers of globally rare species are found within the states of New Hampshire, Virginia, Tennessee, North Carolina, and Georgia.

The number of species that are officially listed as state endangered or state threatened varies greatly from state to state, primarily because states differ in what groups of taxa are well-studied, what taxa have been inventoried, what habitats are traversed by the Trail, and what the listing process requires in each state. As a result, differences in counts between states should be treated with caution. For example, on Appalachian Trail lands, only seven species have been listed as state endangered or threatened in Virginia, while in New Hampshire 55 species have been listed as state endangered or threatened; yet both states have similar numbers of rare species occurrences.

Maine

Several globally rare species were found along the A.T. in Maine; however, none are listed as federally threatened or endangered. Among the significant finds of the Maine Natural Heritage Inventory were the discovery of a plant never before recorded in Maine, *Pinguicula vulgaris* (common butterwort), and the rediscovery of a rare rush,

Juncus vaseyi. Several sites along the A.T. in Maine provide breeding habitat for *Catharus bicknelli* (Bicknell's thrush), a species of special concern in the state and a breeding bird conservation priority in the United States and Canada.

The most significant natural heritage sites surveyed along the A.T. in the state are Bigelow Mountain, Goose Eye Mountain, West Sugarloaf Mountain, and Saddleback Mountain. Three of these four summits rise into the alpine (above treeline) zone, while the fourth, West Sugarloaf, lies primarily in the subalpine zone. The first two of these sites are on state-owned land, and the latter two sites are primarily located on land administered by the NPS Appalachian Trail Park Office. The summit of Katahdin, which is also in the alpine zone, was not thoroughly surveyed as part of this study. However, the Maine Natural Areas Program considers Katahdin to be among the most important sites for RTE plants in the state.

Bigelow Mountain has ten RTE plant occurrences and five rare animal occurrences, the greatest number of any site along the A.T. in Maine. Three globally rare species have been identified from this site: *Prenanthes boottii* (Boott's rattlesnake root), *Potamogeton confervoides* (alga-like pondweed), and *Catharus bicknelli* (Bicknell's thrush). These three species represent the only globally rare species identified along the A.T. in Maine. Goose Eye Mountain has ten occurrences of RTE plants.

Seven RTE plants have been identified on Saddleback Mountain, though more may be present, since land recently acquired from Saddleback Ski Area has not been fully surveyed. On West Sugarloaf Mountain, five RTE plants and one rare animal were identified on Appalachian Trail lands.

New Hampshire

A total of 401 RTE species occurrences were found in 59 natural heritage sites along the A.T. in New Hampshire during the survey completed in 1991, the most occurrences of any of the 14 states through which the A.T. passes. A primary reason for the large number of RTE species in NH is that the A.T. passes over many peaks in the relatively rare New England alpine zone, with individual peaks lying in close proximity to one another providing habitat for numerous discrete populations of rare alpine plants.

One of the rarest plants along the entire A.T. is *Potentilla robbinsiana* (Robbins' cinquefoil), a G1 plant whose entire global distribution consists of only two occurrences at high elevations in the White Mountains. This species is not only globally rare, but was officially listed as an endangered species at the federal level. Recently, the species was taken off of the federal threatened and endangered species list, due to an increase in its population size at these two locations over a number of years, as a result of transplanting activities coordinated by the Appalachian Mountain Club.

In addition to *Potentilla robbinsiana*, the following globally rare species were identified on Appalachian Trail lands in New Hampshire: *Betula minor* (small birch), *Geum peckii* (mountain avens), *Prenanthes bootii* (Boott's rattlesnake root), and *Arnica lanceolata*

(arnica). All but the last two species are found at several locations on Appalachian Trail lands in New Hampshire.

The most significant natural heritage sites in New Hampshire are Lakes of the Clouds/Monroe Flats, Great Gulf, Mt. Lincoln, Mt. Eisenhower, and Mt. Monroe/Oakes Gulf. Each of these sites has more than 15 populations of RTE species. All of the sites lie at least partially within New Hampshire's alpine zone, which is a rare community type in the eastern United States. The section of the A.T. in New Hampshire's Presidential Range represents the longest stretch of the A.T. that passes through alpine vegetation.

Vermont

In Vermont, a relatively small number of RTE species were found along the Appalachian Trail, at least by comparison to New Hampshire. The natural heritage inventory of the A.T. in Vermont identified 60 occurrences of RTE species and rare or exemplary natural communities within 32 natural heritage sites, most of which are located on lands managed by the Green Mountain National Forest. Natural heritage sites in Vermont generally contain no more than a handful of rare plant species or communities. In contrast to New Hampshire, no portion of the A.T. in Vermont passes through an alpine zone. Two plant species, *Potamogeton confervoides* (Tuckerman's pondweed) and *Panax quinquefolius* (ginseng), are considered globally rare. A rare bird species, *Catharus bicknelli* (Bicknell's thrush), has been found at higher elevations on Stratton and Glastenbury mountains.

The most significant natural heritage sites in Vermont are West Hartford Seep, Killington and Little Killington Peaks, Stratton Mountain, and Griffith Lake. West Hartford Seep is located on private land, and the other three natural heritage sites are located at least partially within Green Mountain National Forest.

Several globally rare communities were identified in the natural heritage inventory of the A.T. in Vermont. West Hartford Seep is an example of a riverside seep community, and Thendara Camp Fen and Totman Hill Fen are examples of medium fens. The globally rare subalpine krummholz community is represented on Pico Peak and Killington and Little Killington Peaks. Lottery Road Swamp is an example of a red maple-tamarack peat swamp.

Massachusetts

In the inventory in Massachusetts (completed in 2000), approximately 175 occurrences of RTE species were identified at 43 natural heritage sites on Appalachian Trail lands. The number of rare species and sites is unusually high for a state with less than 100 miles of the A.T. The inventory of Appalachian Trail lands in Massachusetts included a complete inventory of rare, threatened, or endangered vascular plants and a more limited inventory of rare vertebrates and some invertebrates. One globally rare plant, *Panax quinquefolius* (ginseng), and two globally rare animals, *Stylurus scudderi* (zebra clubtail dragonfly) and *Pieris virginiensis* (West Virginia white butterfly), were found

within the A.T. corridor in Massachusetts. Of the rare plants, 10 species are considered state endangered and 10 are state threatened. No federally endangered or threatened species were recorded along the A.T. in Massachusetts.

The most biologically significant site found along the A.T. in Massachusetts is the state's highest peak, Greylock Summit, in Greylock State Reservation. At the Greylock Summit natural heritage site, eight occurrences of RTE plants were identified. Of these, *Sorbus decora* (northern mountain ash), *Luzula parviflora* v. *melanocarpa* (black fruited woodrush), and *Vaccinium vitis-idaea* (mountain cranberry) are listed as endangered in Massachusetts. The occurrences of the latter two species on Mt. Greylock represent the only known locations for these species in Massachusetts. Occurrences of the state-rare *Dendroica striata* (blackpoll warbler) and *Desmocerus palliatus* (eastern elderberry longhorned beetle) were also observed on Greylock Summit.

Next in biological significance are natural heritage sites at Day Mountain and Hop Brook at Main Road. On Day Mountain, ten moderately rare species of vascular plants were identified within the rich mesic forest at this site, which is jointly owned by the NPS and the state. Three RTE animals were identified at the Day Mountain natural heritage site: *Accipiter cooperi* (Cooper's hawk), *Oporonis philadelphia* (mourning warbler), and *Pieris napi oleraceae* (mustard white butterfly). At Hop Brook at Main Road, on NPS land, are two RTE sedges, *Carex retrorsa* (hooked sedge) and *Carex tuckermanii* (Tuckerman's sedge), as well as four RTE animals – *Alasmidonta undulata* (triangle floater mussel), *Clemmys insculpta* (wood turtle), *Strophitus undulatus* (squawfoot mussel), and *Stylurus scudderi* (zebra clubtail dragonfly).

Other biologically significant natural heritage sites along the A.T. in Massachusetts are Hubbard Brook, Saddleball Ridge, Kitchen Brook Drainage, and the Dalton Gulf Area. At the Hubbard Brook site, the A.T. was rerouted a short distance to protect a population of the state-endangered *Agrimonia parviflora* (agrimony).

Two globally rare plant communities were documented in Massachusetts: a calcareous seepage swamp at the Shaker Campsite-Fernside Road site, and a silver maple-cottonwood floodplain forest at the Housatonic Floodplain natural heritage site.

Connecticut

The natural heritage inventory of Appalachian Trail lands in Connecticut was completed in 1992. The report documented 57 RTE species occurrences at 27 natural heritage sites along the Trail.

One globally rare (G2) and federally threatened plant, *Isotria medeoloides* (small whorled pogonia), is found on state land. This represents the only occurrence of this species in Connecticut. In 1998, the state prepared and implemented a management plan for the protection of this species by removing some trees to provide a more open habitat for the species.

Two globally rare animals are found on the A.T. in Connecticut: *Calephalis borealis* (northern metalmark butterfly), and *Papaipema* sp. *2* (ostrich fern borer moth).

The most significant natural heritage sites within or close to Appalachian Trail lands in Connecticut are Bingham Pond (private land), Bulls Bridge (NPS and Private land), Moore Brook/Spruce Swamp Creek (NPS land and private land), Bear Mountain (NPS land), and Lions Head and Wachocastinook Ravine (NPS land and private land).

Of the natural heritage sites in Connecticut, Bulls Bridge is the most significant site on NPS lands administered by the Appalachian Trail Park Office, and it has even been stated to be the most significant natural heritage site in the state of Connecticut. At Bulls Bridge, seven RTE plant occurrences, as well as two rare plant communities, circumneutral cliffs and dry circumneutral forest, were identified during the natural heritage inventory. In a subsequent inventory by a contract botanist in 2003, 13 RTE plant occurrences and five rare or exemplary natural communities were identified. Also found at the site is the globally rare *Calephalis borealis* (northern metalmark butterfly), a G3G4 species. The state endangered *Croatalus horridus* (timber rattlesnake) was observed at several locations along the Trail in Connecticut.

New York

A natural heritage inventory of RTE plants and animals along the A.T. in New York was completed in 2000. Field work for both plants and animals was undertaken by the New York Natural Heritage Office in 1999, with additional botanical field work performed by a contract botanist in 2000.

A total of 21 RTE plant occurrences, 13 RTE animal occurrences, and 22 rare community occurrences were identified at 21 natural heritage sites on Appalachian Trail lands in New York. No federally listed or globally rare plants were identified. One federally endangered and globally rare animal, *Accipenser brevirostrum* (shortnose sturgeon), was historically identified at the Hudson River natural heritage site. Another globally rare animal, *Enallagma lataerale* (New England bluet), was also identified within the A.T. corridor.

The most significant natural heritage site identified on Appalachian Trail lands in New York is Little Dam Lake, where several state-rare water plants were identified: *Potamogeton diversifolius* (water-thread pondweed), *Ceratophyllum echinatum* (prickly hornwort), *Megalodonta beckii* var. *beckii* (water marigold) and *Potamogeton pulcher* (spotted pondweed). Little Dam Lake also provides habitat for the state-endangered *Acris crepitans* (northern cricket frog). The most significant natural heritage site based on rare animal populations is the Hudson River near Bear Mountain Bridge, where *Accipenser brevirostrum* (shortnose sturgeon), *Falco peregrinus* (peregrine falcon), and *Haliaeetus leucocephalus* (bald eagle) have been identified. Nearby Iona Island, in the Hudson River, has been a well-documented bald eagle wintering area; the state has

designated this area as being off limits to all visitation.

Other significant rare species sites in New York are Hammersly Ridge, Bellvale Mountain, and South Mountain/Canada Hill. At Hammersly Ridge, The Nature Conservancy is a partial landowner and has been monitoring and managing the *Chamaelirium luteum* (blazing star) populations at the site.

Several globally rare plant communities were identified on Appalachian Trail lands in New York: an inland Atlantic white cedar swamp (G2G3) on Bellvale Mountain, a rich sloping fen (G3) on Hammersly Ridge, a floodplain forest (G3G4) community at Great Swamp, and a rocky summit grassland (G3G4) on Black Mountain and Bear Mountain. Several high-quality examples of three state-rare communities also exist on A.T. lands in New York: oak-tulip tree forest (six sites), pitch pine-oak-heath rocky summit (seven sites), and highbush blueberry bog thickets (four sites).

New Jersey

An inventory of RTE plants and rare or exemplary natural communities was completed on Appalachian Trail lands in New Jersey in 2001.

In this inventory, 54 occurrences of 41 rare plant taxa were identified at 18 natural heritage sites on Appalachian Trail lands. No federally-listed or state-listed taxa were identified on Appalachian Trail lands in New Jersey. However, two globally rare plants, *Poa languida* (drooping bluegrass) and *Panax quinquefolius* (ginseng) were found within the corridor. Thirteen occurrences of S1 plants (species that have been found in five or fewer locations in the state) were identified: *Amelanchier sanguinea* (round-leaved serviceberry), *Arceuthobium pusillum* (dwarf mistletoe), *Botrychium simplex* var. *simplex* (little grape fern), *Carex brunnescens* (brownish sedge), *Carex deweyana* (Dewey's sedge), *Kalmia polifolia* (pale laurel), *Lonicera canadensis* (fly honeysuckle), *Picea rubens* (red spruce), *Pinus resinosa* (red pine), *Rhododendron canadense* (rhodora), and *Streptopus roseus* (rosy twisted stalk). The occurrence of *Pinus resinosa* on Breakneck Mountain is the only known occurrence of this species anywhere in New Jersey.

The most significant natural heritage site along the A.T. in New Jersey is Breakneck Mountain, with its population of *Pinus resinosa* and three other S1 plants, *Amelanchier sanguinea*, *Carex deweyana*, and *Lonicera canadensis*. All four species have an endangered status in the state. Several less rare species are also found at this site. A state-rare talus slope community also is located here.

Next in significance among the natural heritage sites on A.T. lands in New Jersey are Tocks Swamp, Pochuck Creek Crossing, Dunnfield Creek, and Crater Lake. Tocks Swamp is a state-rare black spruce swamp that is home to the state-rare *Arceuthobium pusillum* (dwarf mistletoe), *Kalmia polifolia* (pale laurel), *Picea rubens* (red spruce), *Betula papyrifera* (paper birch), *Cornus canadensis* (bunchberry), and *Vaccinium oxycoccus* (small cranberry). The Pochuck Creek Crossing Natural Heritage Site contains nine

state-rare plants and three state-rare natural communities: calcareous seepage swamp, floodplain forest, and dry-mesic calcareous forest. The Dunnfield Creek Natural Heritage Site contains five state-rare plants and a mesic hemlock-hardwood forest, and the Crater Lake Natural Heritage Site has four state-rare plants and a state-rare example of a ridgetop pitch pine-scrub oak forest.

A total of 18 occurrences of seven rare natural community types have been identified on Appalachian Trail lands in New Jersey. State-rare plant communities found in upland areas include three examples of mesic hemlock-hardwood forest, six examples of ridgetop pitch pine-scrub oak forest, and two talus slope community sites. The only rare high-elevation wetland community identified in New Jersey is the black spruce swamp at Tocks Swamp. The calcareous Vernon Valley supports the possibly globally rare dry-mesic calcareous forest and the state-rare calcareous seepage swamp at Pochuck Creek Crossing. Pochuck and Wawayanda Creeks in the Vernon Valley and the Wallkill River have corridors of floodplain forest on river banks and terraces.

Pennsylvania

In spite of the length of the Trail's 229-mile route through Pennsylvania, a natural heritage inventory of Pennsylvania's A.T. lands completed in 1990 documented only 25 occurrences of RTE species and exemplary natural communities at 15 sites. The number of occurrences documented in the Pennsylvania inventory is smaller than any other Trail state, even states with fewer than 40 Trail miles, such as Maryland and West Virginia. One likely reason for the comparatively low number of occurrences documented in the Pennsylvania inventory is that only high potential sites and wetlands were targeted for field survey, compared to some smaller states, where all Trail miles were surveyed.

In 2002, a search of natural heritage records located on or near the Appalachian Trail in Pennsylvania uncovered an additional 49 occurrences of RTE species and exemplary natural communities. These records primarily resulted from a more thorough biological inventory of Cumberland County and from targeted animal surveys at other locations along the Trail. This tripling of natural heritage records along the A.T. in Pennsylvania illustrates the importance of surveying all A.T. lands (not just those of highest potential significance) and the dynamic nature of rare species occurrences over time.

No federally endangered plants or animals have been documented on Appalachian Trail lands in Pennsylvania. Two globally rare plants, *Carex polymorpha* (variable sedge) and *Euphorbia purpurea* (glade spurge) have been documented on Appalachian Trail Park Office lands. Two globally rare animals, *Papaipema* sp. *1* (Amainthium borer) and *Neotoma floridana* (Eastern woodrat), have been documented on state land along the A.T. in Pennsylvania.

The most significant natural heritage sites identified on Appalachian Trail lands in Pennsylvania are Big Flat Barren, Blue Mountain Ridge Top, Hunters Run, Big Offset Barren, and Stony Mountain. The Big Flat Barren and Blue Mountain Ridge Top sites

each contain several rare noctuid moth species. The *Papaipema* sp*. 1* at Blue Mountain Ridge Top is considered to be globally rare. The globally rare *Neotoma floridana* is documented at the Stony Mountain Natural Heritage Site.

The Hunters Run Natural Heritage Site has the greatest number of rare plant species documented along the A.T. in Pennsylvania, including the globally rare *Euphorbia purpurea*, as well as the state-threatened *Aster radula* (low rough aster) and *Solidago speciosa* (showy goldenrod). An occurrence of the globally rare *Carex polymorpha* (variable sedge) is located within the Big Offset Barren Natural Heritage Site. The two globally rare occurrences of *Euphorbia purpurea* and *Carex polymorpha* are the rarest species occurrences documented on Appalachian Trail Park Office lands in any A.T. state.

Maryland

A natural heritage inventory was conducted along 37 miles of the Appalachian Trail in Maryland in 2001. Although the inventory's primary concentration was to document RTE plants and exemplary natural communities, observations were also made of promising habitats for rare animal species. A total of 32 occurrences of RTE plants and five exemplary natural community occurrences were documented at eight natural heritage sites on Appalachian Trail lands.

The natural heritage inventory of Appalachian Trail lands in Maryland did not document any federally threatened or endangered species. One occurrence of *Neotoma magister* (Allegheny woodrat), a globally rare animal, was documented on NPS land in Harpers Ferry National Historical Park.

The most significant natural heritage sites in Maryland are on federal land within Harpers Ferry National Historical Park and the C & O Canal National Historical Park. The Maryland Heights site, which is located within Harpers Ferry National Historical Park, is the most significant natural heritage site identified along the Appalachian Trail in Maryland, followed by the Sandy Hook Floodplain and Weverton Floodplain sites along the C & O Canal.

The Maryland A.T. inventory documented five occurrences of exemplary natural communities. Two occurrences of silver maple wetland forest were documented where the A.T. passes through the C & O Canal National Historical Park. Two exemplary occurrences of sugar maple-yellow birch-American basswood forest were documented along the northern portion of the A.T. corridor in Maryland, and one occurrence of hemlock-sugar maple-yellow birch forest was documented in this same area.

West Virginia

Of the eight natural heritage sites that were identified along the Appalachian Trail in the Eastern Panhandle of West Virginia, five are within Harpers Ferry National Historical Park and three are on lands administered by the NPS Appalachian Trail Park Office.

There are no federally threatened and endangered species within this stretch of the A.T. The only globally rare species observed along the A.T. in West Virginia is *Scutellaria saxitalis* (rock skullcap).

No rare, threatened, or endangered species were found along a separate section of the Trail on the West Virginia-Virginia border several hundred miles to the south.

The most significant of the natural heritage sites along the A.T. in West Virginia lie within Harpers Ferry National Historical Park. Several rare plants in this section are known from only a few localities in West Virginia. Among these are *Scutellaria saxitalis*, *Maianthemum stellatum* (starry false Solomon's seal), *Melica nitens* (three-flower melic grass), *Arabis shortii* (Short's rockcress), and *Decodon verticillata* (hairy swamp loosestrife). One of the sites, Loudoun Heights, has four RTE plants, including the globally rare *Scutellaria saxitalis* (rock skullcap). This site also has two state rare animals, *Erynnis lucillus* (columbine duskywing) and *Eumeces laticeps* (broadleaf skink).

Several occurrences of significant natural communities, including rock outcrops, basic seepage swamps, and river floodplains, were identified along the Trail in northeastern West Virginia. The site with the greatest diversity of significant natural communities is the Wilson Gap/Devils Racecourse/Sand Spring site. This natural heritage site, located on Appalachian Trail Park Office lands as well as the adjacent Rolling Ridge tract (on which the Appalachian Trail Conservancy has an easement), contains several occurrences of state rare plant and animal species.

Virginia

Within Virginia, the Trail passes through 74 natural heritage sites containing 320 occurrences of RTE plant and animal species and rare or exemplary natural communities.

Seven occurrences of federally endangered rare animal species lie within the Trail corridor in Virginia. One of the rarest animals found along the entire length of the A.T. is the federally threatened *Plethodon shenandoah* (Shenandoah salamander). The entire global distribution of this species consists of a few occurrences within Shenandoah National Park, four of which are next to or overlap the Appalachian Trail. A federally endangered mammal, *Glaucomys sabrinus fuscus* (Virginia northern flying squirrel), occurs in three locations along the Appalachian Trail on U.S. Forest Service land in the Mt. Rogers National Recreation Area in southern Virginia. No federally endangered or threatened plants were documented on Appalachian Trail lands in Virginia, though many occurrences of globally rare plants were found.

The natural heritage inventory of Appalachian Trail lands in Virginia, which was completed in 1994, documented 56 occurrences of 23 globally rare plant and animal species within 29 natural heritage sites. The number of globally rare species found on Appalachian Trail lands in Virginia is the second highest number of any A.T. state. The

globally rare *Abies fraseri* (Fraser fir) is the rarest tree species documented along the entire A.T. Its global distribution is restricted to a few of the highest summits of the southern Appalachians. The Fraser fir's only location along the A.T. in Virginia is in the Mt. Rogers area. The rarest shrub documented along the entire A.T. is *Buckleya distichophylla* (piratebush), a G2 species found only in southwest Virginia and along the Tennessee-North Carolina border. In Virginia, piratebush is found on U.S. Forest Service land in the vicinity of Dragon's Tooth, McAfee Run, and Dismal Creek.

Other globally rare plant occurrences documented on Appalachian Trail lands in Virginia are: *Iliamna remota* (kankakee globe-mallow), *Carex polymorpha* (variable sedge), *Ilex collina* (long-stalked holly), *Paxistema canbyi* (Canby's mountain-lover), *Phlox buckleyi* (sword-leaved phlox), *Saxifraga caroliniana* (Carolina saxifrage), *Cardamine clematitis* (mountain bittercress), *Poa paludigena* (bog bluegrass), *Euphorbia purpurea* (glade spurge), *Hypericum mitchellianum* (Blue Ridge St. John's wort), *Prenanthes roanensis* (Roan rattlesnake root), *Cacalia muhlenbergii* (great Indian plantain), and *Phlox amplifolia* (large-leaved phlox). The single population of *Iliamna remota*, located on land owned by CSX Railroad adjacent to the former route of the Trail, apparently became extirpated several years ago. It also appears that the population of *Phlox amplifolia* on U.S. Forest Service land is no longer present. Several populations of *Poa paludigena* have been documented along the A.T. in Shenandoah National Park and the state-administered G. Richard Thompson Wildlife Management Area. *Carex polymorpha* has been documented in Shenandoah National Park and on U.S. Forest Service land at Punchbowl Mountain. *Ilex collina* and *Cardamine clematitis* occur at several localities along the A.T. in the Mt. Rogers area. The single A.T. populations of *Paxistima canbyi* and *Phlox buckleyi* occur in Shenandoah National Park, and several populations of *Euphorbia purpurea* occur within the A.T. corridor in the park. *Ilex collina*, *Hypericum mitchellianum*, *Prenanthes roanensis*, and *Cardamine clematitis* occur at several localities in the Mt. Rogers area.

Eight globally rare animal species and two federally endangered species have been documented along the A.T. in Virginia. The two federally endangered species, *Plethodon shenandoah* (Shenandoah salamander) and *Glaucomys sabrinus fuscus* (Virginia northern flying squirrel), have been previously noted. Other globally rare salamanders documented near or on the A.T. are *Plethodon hubrichti* (Peaks of Otter salamander) and *Plethodon welleri* (Weller's salamander). A globally rare bird, *Thryomanes bewickii altus* (Appalachian Bewick's wren) was documented from the Bluff City pasture area, but it is not known to currently exist at the site. Other globally rare animals identified on Appalachian Trail lands are *Stygobromus* sp. *nov*. (Sherando spinosoid groundwater amphipod) on Blue Ridge Parkway land, *Semionellus placidus* (a millipede) in Shenandoah National Park, and *Stygobromus spinosus* (Blue Ridge Mountain amphipod) in Shenandoah National Park and on lands administered by the NPS Appalachian Trail Park Office at Reservoir Hollow and Calf Mountain Springs natural heritage sites.

Several globally rare plant communities have been documented along the A.T. in Virginia: eutrophic saturated scrub, oligotrophic saturated scrub, oligotrophic herbaceous vegetation, oligotrophic scrub, mesotrophic scrub, submesotrophic scrub, and oligotrophic forest.

Based on the number and rarity of RTE species found at each site, the most significant natural heritage site along the A.T. in Virginia, and indeed the entire A.T., is Whitetop Mountain. This site, located on U.S. Forest Service land in Mt. Rogers National Recreation Area, contains 35 occurrences of 19 RTE plant and animal species and six occurrences of rare natural communities. Next in significance is the adjacent Mt. Rogers Natural Heritage Site, containing 29 occurrences of 23 RTE species, making this the third most significant site on the entire Appalachian Trail. Stony Man Mountain and Hawksbill Mountain in Shenandoah National Park are the next most significant natural heritage sites along the A.T. in Virginia. Pine Mountain near Mt. Rogers and The Pinnacle in Shenandoah National Park also contain a substantial number of RTE species occurrences.

Tennessee

In a 70-mile stretch of the A.T. in northeastern Tennessee (between the Virginia border and Roan Mountain on the Tennessee/North Carolina border), 167 occurrences of RTE species and rare or exemplary natural communities were documented within 58 natural heritage sites. Compared to the other state inventories, this is an unusually large number of rare species occurrences for such a short distance of the Trail. The Tennessee inventory, completed in 1997, documented 36 RTE plant species, four rare animal species, and 19 rare or exemplary natural communities. The four RTE animals that were documented on Appalachian Trail lands are *Corvus corax* (raven), *Limnothlypsis swainsonii* (Swainson's warbler), *Neotoma magister* (Allegheny woodrat), and *Pooecetes gramineus* (vesper sparrow). Almost all of the A.T. in northeastern Tennessee lies within the Cherokee National Forest, with a small portion occurring on Tennessee Valley Authority land near Watauga Lake.

None of the RTE species found along this portion of the A.T. are federally listed, though quite a few of them are globally rare. Two globally rare and state threatened trees, *Abies fraseri* (Fraser fir) and *Tsuga caroliniana* (Carolina hemlock), are found on Appalachian Trail lands in Tennessee. Sixteen occurrences of Carolina hemlock are found within the A.T. corridor. *Buckleya distochophylla* (piratebush), found within the Big Laurel Branch Wilderness, is the only globally rare shrub found within Tennessee on Appalachian Trail lands. There are seven species of globally rare herbaceous plants found along this portion of the A.T.: *Helianthus glaucophyllus* (white-leaved sunflower), *Prenanthes roanensis* (Roan rattlesnake root), *Gentiana austromontana* (Appalachian gentian), *Aconitum reclinatum* (Trailing wolfsbane), *Panax quinquefolius* (ginseng), Saxifraga *careyana* (Carey's saxifrage), and *Scutellaria saxitilis* (rock skullcap). One species of a globally rare mammal, *Neotoma magister* (Allegheny woodrat), was documented on Appalachian Trail lands near the Tennessee/Virginia border.

The most significant natural heritage site on Appalachian Trail lands in Tennessee (north of Roan Mountain, which is discussed in the next subsection) is Doll Flats Spring in Cherokee National Forest. This site contains the globally rare *Aconitum reclinatum*, *Prenanthes roanensis*, and *Saxifraga careyana*, as well as several less rare species. Other natural heritage sites on Appalachian Trail lands that contain at least two globally rare species are Big Laurel Branch Wilderness South, Doll Flats Meadow, Doll Flats Vista to Powerline, Doll Flats to Vista, Canute Place West Relocation, and Lost Pole Knob. Other natural heritage sites that have at least one globally rare species and five total RTE species occurrences are Dennis Cove Homesteads and Laurel Fork South.

Among the rare or exemplary natural communities found along the A.T. in Tennessee are acidic mesic and xeric cliffs, Carolina hemlock bluff forest, riverine forest, high elevation springs and seeps, boulderfield forest, grasslands, and high elevation meadows. At the present time, rarity rankings for these and other natural communities in Tennessee are lacking.

North Carolina (including portions of Tennessee where the Appalachian Trail follows the boundary between the two states)

The natural heritage inventory of the A.T. in North Carolina covers 234 miles of the Trail on U.S. Forest Service lands between Roan Mountain on the North Carolina/Tennessee border and the North Carolina/Georgia border. The North Carolina inventory was completed in 1993. It covers the lengthy portion of the A.T. that generally follows the North Carolina-Tennessee border from Roan Mountain to the Great Smokies, as well as the 70 miles south of the Smokies to the Georgia border. However, because biological inventories in the Smokies had already occurred or were underway, the section of the Trail passing through Great Smoky Mountains National Park was not surveyed as part of this A.T. inventory.

Within the 234 miles of the A.T. covered by the North Carolina inventory, 285 occurrences of RTE species and rare or exemplary natural communities were documented. The high elevation portion of the A.T. along Roan Mountain straddling the North Carolina/Tennessee border has one of the highest concentrations of RTE species occurrences along the entire A.T.

The North Carolina A.T. inventory was more extensive than inventories in many of the other A.T. states. Surveys were conducted for both vascular and non-vascular plants, as well as a number of animal groups. However, like some of the early A.T. natural heritage inventories in New England, the boundaries of occurrences of individual RTE species were not mapped.

The segment of the Appalachian Trail included in the North Carolina inventory contains by far the greatest number of globally rare species found in any A.T. state. Thirty-nine species of globally rare plants and seven species of globally rare animals were

documented from this portion of the A.T. One G1 plant – the federally threatened *Solidago spithemea* (Blue Ridge goldenrod) – has an extremely limited high-elevation distribution. Another G1 species, *Cephaloziella obtusilobula* (a liverwort) is not currently listed as federally endangered or threatened. *Microhexura montivaga* (spruce-fir moss spider) is a G1 federally endangered species. *Glaucomys sabrinus coloratus* (Carolina northern flying squirrel) is a G5T1 federally threatened species. *Trechus roanicus* (a ground beetle) may also be a G1 species, though its rarity is somewhat uncertain.

Fourteen species of plants and animals having a rarity rank of G2 (species that are known from six to 20 occurrences worldwide) were documented in the inventory. The following G2 plants occur on Appalachian Trail lands in this area: *Buckleya distichophylla* (piratebush), *Geum radiatum* (spreading avens), *Geum geniculatum* (bent avens), *Lysimachia fraseri* (Fraser's loosestrife), *Silene ovata* (mountain catchfly), *Hedyotis* (*Houstonia) purpurea var. montana*, *Brachydontium trichodes* (peak moss), *Plagiochila sullivantii* var. *sullivantii* (a liverwort), *Gymnoderma lineare* (rock gnome lichen), *Xanthoparmelia monticola* (a foliose lichen), and *Drepanolejeunea appalachiana* (a liverwort). Of these globally rare plants, *Hedyotis* (*Houstonia) purpurea var. montana, Geum radiatum,* and *Gymnoderma lineare* are federally endangered species.

The following G2 insects were also documented from the North Carolina portion of the A.T.: *Trechus luculentus luculentus* (a ground beetle), *Trechus luculentus wayahensis* (a ground beetle), and *Semiothisa fraserata* (Fraser fir angle).

Twenty-four G3 plants were documented on Appalachian Trail lands in the North Carolina inventory: *Trillium rugelii* (southern nodding trillium), *Trillium simile* (sweet white trillium), *Aconitum reclinatum* (Trailing wolfsbane), *Coreopsis latifolia* (broadleaf coreopsis), *Euphorbia purpurea* (glade spurge), *Helianthus glaucophyllus* (whiteleaf sunflower), *Lilium grayi* (Gray's lily), *Calystegia catesbiana* ssp. *sericata* (Blue Ridge bindweed), *Prenanthes roanensis* (Roan rattlesnake-root), *Carex misera* (wretched sedge), *Carex manhartii* (Manhart's sedge), *Panax quinquefolius* (ginseng), *Hypericum buckleyi* (Blue Ridge St. John's wort), *Hypericum mitchellianum* (St. John's wort), *Gentiana austromontana* (Appalachian gentian), *Stellaria corei* (Core's starwort), *Cardamine flagellifera* (Blue Ridge bittercress), *Thermopsis villosa* (Aaron's rod), *Saxifraga careyana* (Carey's saxifrage), *Disporum maculatum* (nodding mandarin), *Huperzia appalachiana* (Appalachian fir clubmoss), *Brachydontium trichodes* (peak moss) *Cephaloziella spinicaulis* (a liverwort), and *Hydrothyra venosa* (an aquatic lichen). *Erora laeta* (early hairstreak) is the only G3 animal documented along this portion of the A.T.

Roan Mountain, located along the North Carolina/Tennessee border, is the most significant natural heritage area documented along the A.T. in either state. Roan Mountain has so many RTE species that the mountain was divided into 6 natural heritage sites in the inventory. If taken as a whole, the six Roan Mountain natural heritage sites have the greatest number of RTE species and occurrences along the entire

A.T., with 45 occurrences of 24 different RTE plant species and 23 occurrences of 21 RTE animal species. More than one-half of the rare species occurrences on Roan Mountain are globally rare.

After Roan Mountain, the next most significant natural heritage sites documented in the North Carolina A.T. inventory are Standing Indian, with 10 rare plant and animal occurrences, and Big Bald, with 12 RTE plant and animal occurrences. Next in significance are the Rock Gap-Wallace Gap natural heritage site, with seven rare plant occurrences; Wayah Bald, with seven rare plant and animal occurrences; Hot Springs/Lover's Leap, with 11 rare plant and animal occurrences; and Wine Spring Bald, with six rare plant and animal occurrences.

Appalachian Trail lands in North Carolina also contain quite a few globally rare natural communities. The distribution of the red spruce-Fraser fir forest, which is a G2 natural community, is limited to the highest elevations of Roan Mountain, Unaka Mountain, and the Great Smoky Mountains. Grassy balds, also a G2 natural community, are found on Appalachian Trail lands on Roan Mountain, Grassy Ridge, and Big Bald. Other G2 natural communities found at natural heritage sites within the North Carolina portion of the A.T. are: high elevation rocky summit (found on Standing Indian, Muskrat Creek Shelter/Kitchens Knob/Raven Rock, Pinnacle Mountain/Big Spring Gap Shelter, and Rocky Bald); low elevation rocky summit (found at The Jump-up); boulderfield forest (found on Wine Spring Bald, Yellow Mountain, Rock Creek Headwaters, Indian Grave Gap, Stecoah Gap South, and Hogback); montane white oak forest (found at Siler Bald/Snowbird Gap and High Top); a swamp forest-bog complex (found at White Oak Swamp); and montane mafic cliff (found at Nantahala River North). High elevation seeps, a G3 natural community, also are found within this portion of the A.T. at several locations (Standing Indian, Standing Indian Shelter, Roan Mountain, Sassafras Ridge, Burningtown Bald/Cold Spring Shelter, Yellow Mountain, Walker Gap/Bee Cove, Muskrat Creek Shelter/Kitchens Knob/Raven Rock, and Rock Gap-Wallace Gap).

Georgia

The natural heritage inventory of the A.T. in Georgia was completed in 2000. In addition to covering 76 miles of the Appalachian Trail, the inventory also included the eight-mile approach Trail to Springer Mountain, which begins in Amicalola Falls State Park.

On Appalachian Trail lands in Georgia, 214 occurrences of RTE species were found in 41 natural heritage sites, which is a high number of occurrences for such a short stretch of the A.T. The Georgia A.T. inventory concentrated primarily on identifying RTE vascular plants, though some sections of the Trail were also inventoried for rare birds, reptiles, and amphibians. No federally endangered or threatened plants or animals were identified on Appalachian Trail lands in Georgia.

Seventy-six occurrences of 17 globally rare species were documented on Appalachian Trail lands in Georgia. Of all the globally rare species, *Frullania* cf. *appalachiana* (a

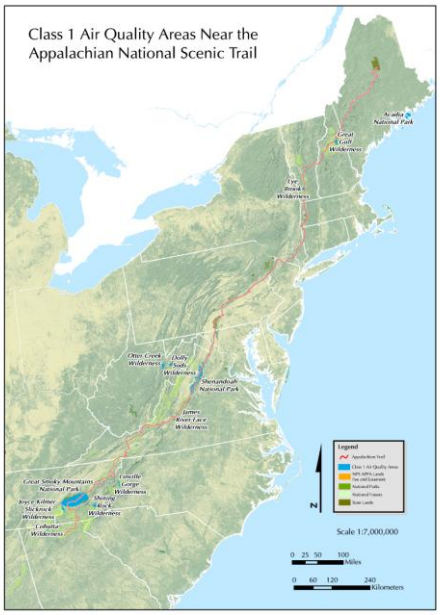
liverwort) is the only species that has a G1 status. The only G2 plant identified along the A.T. in Georgia is *Silene ovata* (mountain catchfly). A large number of G3 plants were identified within Georgia's A.T. lands: *Carex manhartii* (Manhart's sedge), *Coreopsis latifolia* (broadleaf tickseed), *Hypericum buckleii* (granite dome St. John's wort), *Hypnum cupressiforme* var. *filiforme* (a moss), *Trillium simile* (sweet white trillium), *Carex ruthii* (Ruth's sedge), *Vaccinium hirsutum* (hairy blueberry), *Calystegia catesbiana* ssp. *sericata* (silky bindweed), *Panax quinquefolius* (ginseng), *Pycnanthemum montanum* (Blue Ridge mountain mint), *Krigia montana* (false dandelion), *Cardamine flagellifera* (Blue Ridge bitter cress), *Carex amplisquama* (Fort Mountain sedge), and *Prosartes (Disporum) maculatum* (spotted mandarin). The only globally rare (G3) animal species that was identified on Appalachian Trail lands in Georgia was *Desmognathus aeneus* (seepage salamander).

By far the most significant natural heritage site identified in the A.T. inventory for Georgia is Blood Mountain, which is the highest elevation on the Georgia portion of the A.T. The inventory identified 17 occurrences of RTE species within this natural heritage site. The rarest of the species identified was the possible G1-ranked liverwort *Frullania* cf. *appalachiana*. Also identified on Blood Mountain are four other globally rare plants: *Hypericum buckleii*, *Vaccinium hirsutum*, *Krigia montana*, and *Pycnanthemum montanum*. A state rare bird, *Corvus corax* (northern raven), was also observed on Blood Mountain.

After Blood Mountain, the next most significant natural heritage site along the Trail in Georgia is Little Bald Knob, with ten RTE plant occurrences, including four globally rare species: *Carex ruthii* (Ruth's sedge), *Calystegia catesbiana* ssp. *sericata* (silky bindweed), *Cardamine flagellifera* (Blue Ridge bitter cress), and *Prosartes (Disporum) maculatum* (spotted mandarin). The next most significant natural heritage site in Georgia is Baker Mountain, with six rare plants, four of which are globally rare. Other significant natural heritage sites identified along the Georgia A.T. are Powell Mountain, Rich Knob, Tray Mountain, Spaniards Knob, and Blackwell Creek. Each of these natural heritage sites has at least six RTE species, and one of them, Tray Mountain, has twelve RTE species (although none of them are globally rare).

Though plant communities have not been ranked in Georgia for state rarity, several plant communities were identified as being rare in the state. A heath bald was identified on Springer Mountain, Blood Mountain, Tray Mountain, and along a ridgetop near Whitley Gap. A northern hardwood forest was identified on Tray Mountain and Dismal Knob. Boulderfield forest communities were identified in the Spaniards Knob and Unicoi Gap natural heritage sites.

D. Air Resources



As noted in Chapter I, the Appalachian National Scenic Trail passes through five mandatory Class I areas: Great Smoky Mountains National Park in Tennessee and North Carolina, Shenandoah National Park and the James River Face Wilderness Area in Virginia, the Lye Brook Wilderness Area in Vermont, and the Presidential Range-Dry River Wilderness Area, and skirts the perimeter of a sixth, the Great Gulf Wilderness Area in New Hampshire. These six Class I areas are administered by other National Park units or the USDA Forest Service. [See *Map II.E.1, Class I Areas along the Appalachian National Scenic Trail*.]

All other lands along the Trail, including all Appalachian Trail Park Office-administered lands, are designated Class II, and are allowed a moderate increase in certain air pollutants without being in violation of the Clean Air Act.

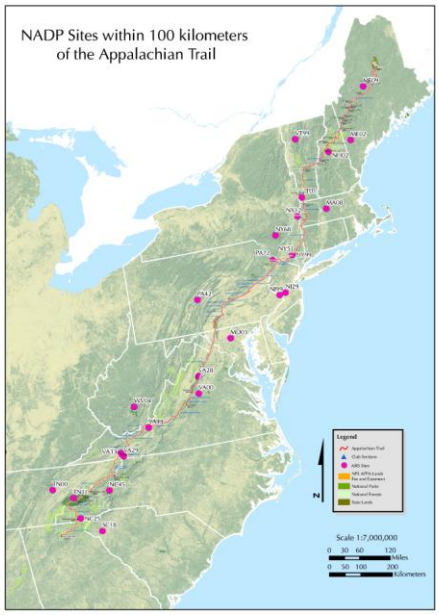
1. Condition of Air Resources

In order to monitor air pollution effectively, Trail managers need to (1) monitor the concentrations of pollutants in the air and (2) assess the effects of those pollutants on park resources. While neither the NPS Appalachian Trail Park Office nor the Appalachian Trail Conservancy currently operate any ambient air monitoring stations on the Appalachian National Scenic Trail, a number of national monitoring program stations located near the Trail monitor pollutants of primary concern to the National Park Service. The involved national monitoring programs include:

1) the *National Atmospheric Deposition Program/National Trends Network (NADP/NTN)*, a nationwide network of precipitation chemistry monitoring sites,
2) the *Clean Air Status and Trends Network (CASTNet)*, the nation's primary source for atmospheric data to estimate dry acidic deposition,
3) the *Interagency Monitoring of Protected Visual Environments (IMPROVE)* program, which monitors visibility (primarily in Class I areas), and
4) state- and federal-operated ozone monitors.

In general, these ambient monitoring stations appear to be fairly well distributed along the Trail, and are located in both urban and rural settings. However, it is likely that some monitors are not representative of conditions on the Trail, given differences in elevation and meteorology.

In 2002, the National Park Service Air Resources Division staff developed baseline air quality values for all NPS units. The project involved interpolating National Atmospheric Deposition Program/National Trends Network (NADP/NTN), Interagency Monitoring of Protected Visual Environments (IMPROVE), and ozone data nationwide to derive pollutant concentration isopleth maps for the U.S., with estimated values for specific NPS units. [See *Appendix C: Description of Parameters Used in Air Atlas Summary Table*]

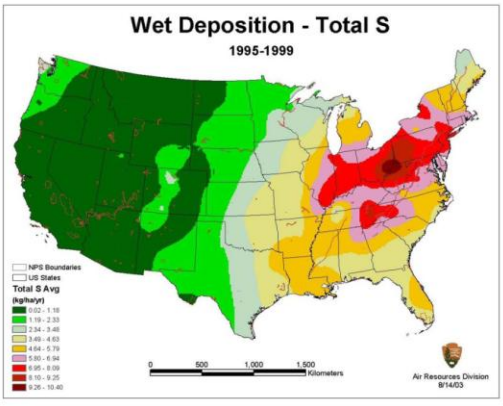


Given the length and complexity of the Appalachian National Scenic Trail, it was not possible to use interpolated values at a single location to represent air quality conditions for the entire Trail. As a result, Trail managers (with assistance from the NPS Northeast Regional Office Air Quality Program and the NPS Air Resources Division) relied on concentrated isopleth maps to indicate pollutant values along segments of the Appalachian Trail.

The following discussion focuses on the current condition of four basic measures of air quality: **Deposition**, **Visibility**, **Ozone Attainment Status**, and **Attainment Status for Other Air Pollutants**.

2. Wet Deposition as measured at NADP/NTN sites and Dry Deposition as reported for CASTNet sites

Air Atlas

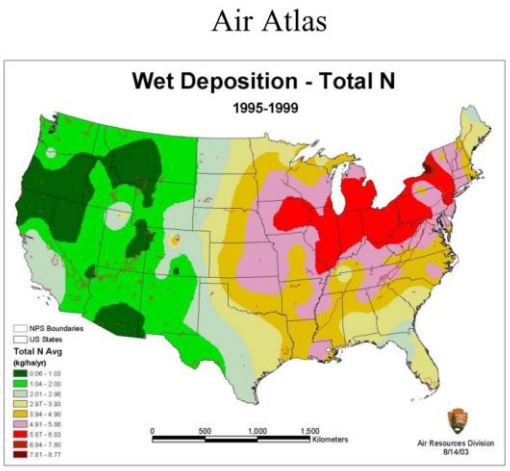


Wet Deposition: Atmospheric deposition of sulfur and nitrogen pollutants in precipitation can acidify soils and surface waters, which can have negative consequences for fish, plants, and other biota.

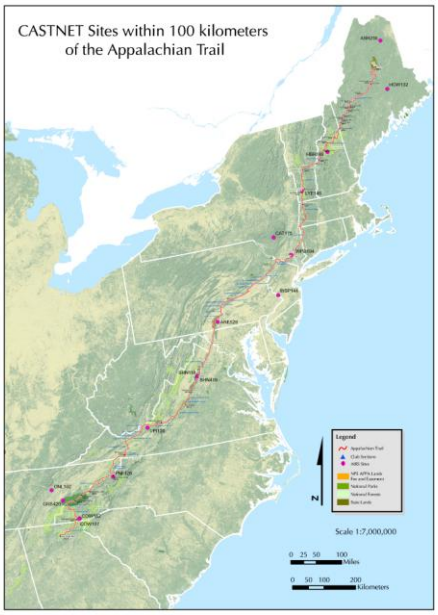
Map II.E.2, NADP Monitoring Program Sites within 100km of the Appalachian National Scenic Trail, depicts the location of NADP/NTN sites within 60 miles (100 kilometers) of the Appalachian National Scenic Trail. Descriptions of these sites also are provided in *Table II.E.1, Summary of Monitoring Sites Collecting Ambient Air Quality Data near the Appalachian Trail.*

Based on interpolated 1995-1999 NADP/NTN data, wet sulfur deposition was relatively high along the entire length of the Appalachian National Scenic Trail. Wet deposition was lowest in Maine, at 2.34 to 4.63 kilograms/hectare/year (kg/ha/yr) and highest in New York, New Jersey, Pennsylvania, Maryland, and some spots in the southern Appalachians, at 6.95 to 8.09 kg/ha/yr. [See *Map II.E.3, Average Annual Wet Deposition – Sulfur, 1995 – 2000*.]

Wet nitrogen deposition for the same timeframe was also relatively high, with the lowest concentrations again in Maine (2.97 to 3.93 kg/ha/yr), and the highest concentrations in New York, New Jersey, Pennsylvania, and Maryland (5.87 to 6.83 kg/ha/yr). [See *Map II.E.4, Average Annual Wet Deposition – Nitrogen, 1995 – 2000*.]



Dry deposition: Acidic pollutants are also deposited in dry form. Depending on the location, the relative contribution of dry deposition can be equal to, greater than, or less than that of wet deposition. Due to the limited number of CASTNet sites nationwide, data interpolation is not possible. Therefore, Appalachian Trail managers examined data from individual sites near the Trail. In 1995 through 1999, annual average dry sulfur deposition at CASTNet sites along the Appalachian Trail ranged from a low of about 0.4 kg/ha/yr in Vermont to a high of about 7.2 kg/ha/yr in Pennsylvania. Dry nitrogen deposition ranged from a low of about 0.4 kg/ha/yr in Vermont to a high of about 5.5 kg/ha/yr at Great Smoky Mountains NP in Tennessee. [See *Map E.5: CASTNet sites within 60 miles (100 kilometers) of the Appalachian Trail* and *Table II.E.1, Summary of Monitoring Sites Collecting Ambient Air Quality Data near the Appalachian Trail* and Map E.6: *NADP Isopleth Maps for the year 2006*



Acid Sensitivity: Although some limited sampling has taken place at several locations along the Trail, a comprehensive, coordinated Trailwide survey has not been conducted to determine if acid-sensitive soils and surface waters occur on the Appalachian National Scenic Trail. Perhaps the most thorough survey to date has been conducted by Dr. Ivan Fernandez of the

University of Maine at Orono, who has conducted surveys of acid deposition on soils and waters in Maine (including several sites along the Appalachian Trail) for more than 15 years. Acid sensitivity has been documented in other locations in the Southern Appalachian, Adirondack, and White Mountains, so it is likely that parts of the Trail that traverse these mountain ranges would have sensitive soils and surface waters, as well.

3. Visibility

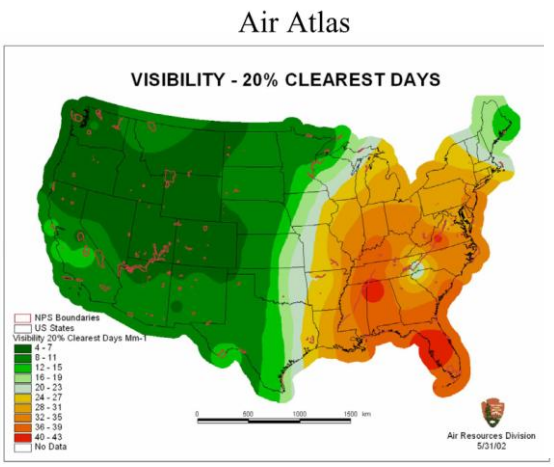
Small or "fine" particles in the air, typically those less than 2.5 micrometers in diameter, are the main cause of human-caused visibility impairment. The particles not only decrease the distance one can see; they also reduce the colors and clarity of scenic vistas. Moisture in the air enhances the impact, so areas in the eastern United States with higher relative humidity have worse visibility than areas in the arid West.

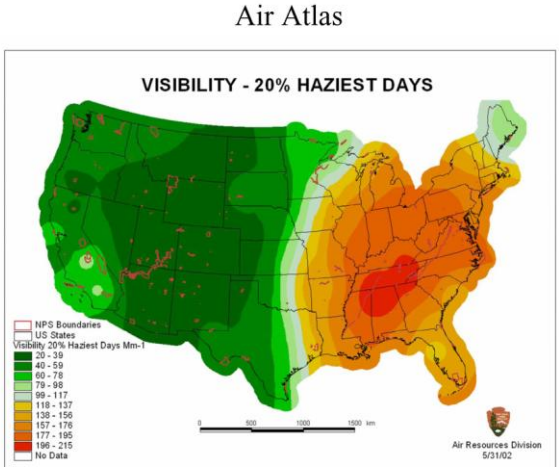
The primary contributor to visibility impairment in the eastern United States is sulfate, which is emitted by coal-fired power plants and oil refineries, among other sources. Other contributors include nitrates (from fossil fuel combustion), organics (from automobiles and manufacturing facilities), and light absorbing carbon (from woodburning). Soil, from windblown dust, is a relatively small contributor to visibility impairment in the East.

Visibility monitoring is conducted at a number of monitoring stations near the Trail, with visibility impairment documented at all locations. A review of the IMPROVE network's annual average visibility data for 1996-1998 showed that visibility was severely degraded in the southeast U.S., but that it gradually improved as one moved north. [See *Map II.E.7: IMPROVE sites within 60 miles (100 kilometers) of the Appalachian Trail*; and *Table II.E.2: Existing Visibility Monitoring near the Appalachian National Scenic Trail]*

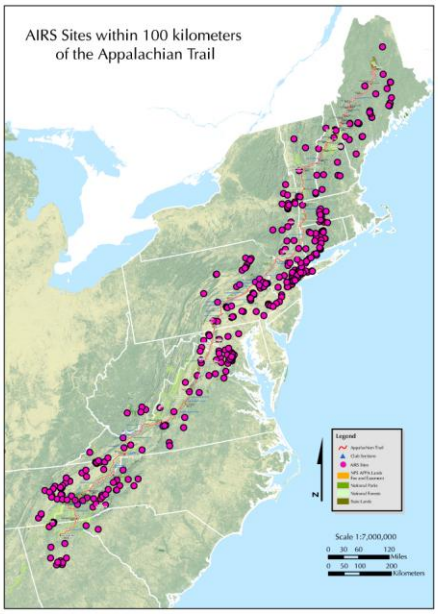
Visibility was worst at the IMPROVE site in the Cohutta Wilderness Area in Georgia, where standard visual range was 30 kilometers (20 miles). Based on interpolated data, standard visual range improved slightly to 38 to 45 kilometers (24 to 30 miles) in North Carolina, Tennessee, Virginia, Maryland and southern Pennsylvania. Standard visual range values in northern Pennsylvania, northern New Jersey, southern New York, Connecticut and southern Massachusetts averaged 45 to 60 kilometers (30 to 36 miles). Visibility was substantially better in northern Massachusetts, northern New York, New Hampshire, Vermont and southern Maine, with an annual average standard visual range

of 60 to 75 kilometers (36 to 45 miles). At the Moosehorn National Wildlife Refuge in eastern Maine (which is approximately 175 kilometers, or 110 miles from the Appalachian Trail), the 1996-1998 annual average standard visual range was 76 kilometers (45 miles). Nevertheless, the standard visual range at Moosehorn was still less than half the visual range at many sites in the Western U.S., and is significantly worse than conditions that would be experienced at the refuge in the absence of human-caused pollution. [See *Map II.E.8: Visibility along the Appalachian Trail; 20% Clearest Days*; and *Map II.E.9: Visibility along the Appalachian Trail: 20% Haziest ays*]





Only three IMPROVE sites in the Eastern U.S. – Acadia, Great Smoky Mountains, and Shenandoah National Parks – have been in operation long enough to assess trends in visibility impairment. Data from 1990-1999 indicate that visibility on the best and worst days has significantly improved at Acadia and Shenandoah National Parks, but there has been no significant trend at Great Smoky Mountains National Park. In spite of the improvement at the two eastern sites, the Environmental Protection Agency acknowledges that eliminating human-caused visibility impairment in the East will require substantial reductions in air pollution.



Ozone Attainment Status

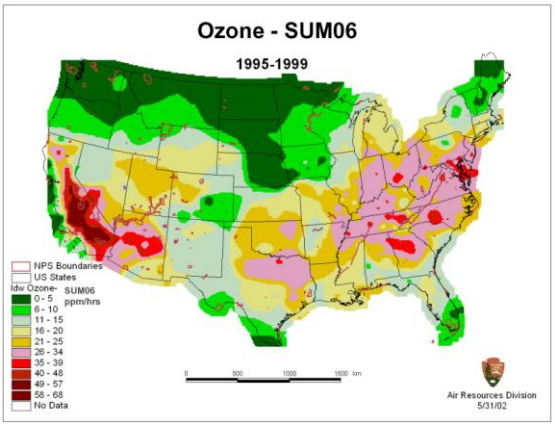
States monitor and assess compliance with Environmental Protection Agency's National Ambient Air Quality (NAAQS) standards for ozone. Appalachian Trail managers examined the Environmental Protection Agency's information about area attainment status to determine if any portions of the Appalachian National Scenic Trail pass through designated nonattainment areas for ozone. The Environmental Protection Agency's information is current as of September 17, 2004.

The new National Ambient Air Quality Standard for ozone is a 3-year average of the 4th highest daily maximum 8-hour ozone concentration. This value cannot exceed 85 parts per million (ppm), or the area will be designated nonattainment. Nonattainment areas are those areas where monitored pollution levels exceed concentrations established by the Environmental Protection Agency to protect human health and welfare. Numerous agencies and organizations have ozone-monitoring stations that are proximate to the Trail. [*See Map II.E.9: AIRS: Ozone Monitoring Sites within 60 miles (100 kilometers) of the Appalachian Trail; and Table II.E.1, Summary of Monitoring Sites Collecting Ambient Air Quality Data near the Appalachian Trail.*]

In August 2004, EPA published the list of counties they propose to designate nonattainment for the 8-hour ozone NAAQS. With the exception of New Hampshire, Vermont, and Maine, the Trail passes through proposed ozone nonattainment counties in all states. [See *Table II.E.3: 8-Hour Ozone State/Area/County Report*.]

While the National Ambient Air Quality Standard is designed to protect both human health and vegetation, other ozone metrics are more indicative of vegetation response. One such metric is the SUM06. SUM06 is the sum of all hourly average ozone concentrations greater than or equal to 60 parts per billion. In 1997, a group of ozone effects experts recommended 3-month, 8:00 a.m. to 8:00 p.m., SUM06 effects endpoints for natural vegetation, i.e., 8 to12 parts per million-hours (ppm-hrs) for foliar injury to natural ecosystems and 10 to 15 ppm-hrs for growth effects on tree seedlings in natural forest stands. [See *Map II.E.10: Ozone SUM06 Values along the Appalachian Trail 1995-199l*.] A recently completed ozone injury risk assessment indicates a moderate to high likelihood of ozone injury along significant portions of the Trail.

4. Attainment Status for Other Air Pollutants



States monitor five other air pollutants for which the Environmental Protection Agency has established National Ambient Air Quality Standards, and assess compliance with those standards. Appalachian Trail managers examined the Environmental Protection Agency's (EPA) information about area attainment status to determine if any portions of the Appalachian National Scenic Trail pass through designated nonattainment areas. The Environmental Protection Agency's information is current as of September 17, 2004.

The Trail does not pass through any designated lead, particulate matter, nitrogen dioxide, or carbon monoxide nonattainment areas. Part of Warren County, New Jersey, is designated nonattainment for sulfur dioxide, but the nonattainment area does not include the part of the county through which the Trail passes.

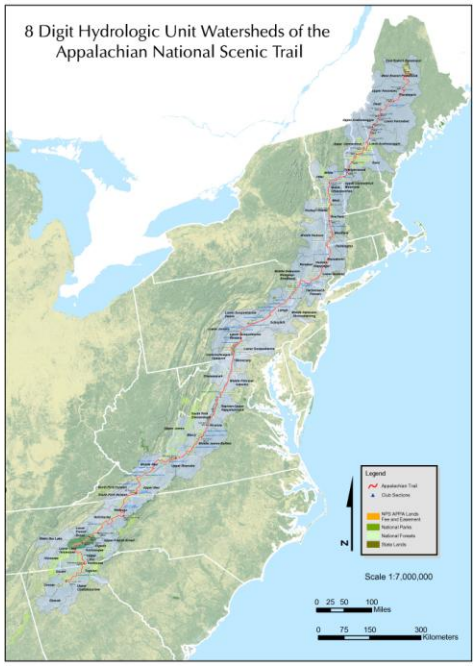
E. Water Resources

1. Introduction

The NPS Water Resources Division and Servicewide Inventory and Monitoring Program have conducted a preliminary water resource inventory for the Appalachian National Scenic Trail based on the U.S. Geological Survey's (USGS) 1:100,000 scale National Hydrography Dataset (http://nhd.usgs.gov/) and a corridor of land 500 feet on each side of the footpath.

This preliminary analysis identified approximately 196.1 miles of perennial rivers and streams; 33.64 miles of intermittent streams; 760 acres of lakes, ponds, and reservoirs, and 38.19 miles of shoreline. The Water Resources Division is in the process of acquiring the 1:24,000 scale National Hydrography Dataset for entire Trail, which will significantly increase these hydrographic statistics and provide a more accurate count of springs and seeps.

The Water Resources Division and the Servicewide Inventory and Monitoring Program have also prepared "baseline water quality data inventory and analysis reports" for all six other National Park units traversed by the Trail. These reports (http://www.nature.nps.gov/water/horizon.htm) summarize publicly available water quality data contained in the Environmental Protection Agency's Storage and Retrieval (STORET) national water quality database (http://www.epa.gov/storet/) and the USGS' National Water Information System (http://waterdata.usgs.gov/nwis/) for these parks. A Baseline Water Quality Data Inventory and Analysis Report specifically for the Trail corridor will be prepared during the next year.



2. Surface Water Characteristics

The following summary of water resources along the Appalachian Trail is excerpted and adapted from Ecological Subregions of the United States, R.G. Bailey, USDA Forest Service (scale 1:7,500,000, revised 1994). [See *Map II.F.1, 8-Digit Hydrologic Watersheds and Surface Waters of the Appalachian National Scenic Trail*]

Section M212A--White Mountains Section (within the following subsections: M212Ac Maine Central Mountains, M212Ad White Mountains, M212Ae Mahoosuc Rangeley Lakes, and M212Af Connecticut Lakes)

***Surface Water Characteristics*:**
Perennial streams provide an abundance of water. This Section includes the headwaters of numerous streams and rivers that intersect the Appalachian Trail, including the Penobscot, Kennebec, Piscataquis, and Androscoggin rivers. Drainage networks have deranged, rectangular, and dendritic patterns which developed as stream courses imposed from the Cenozoic were modified during the Pleistocene. Stream gradients are moderate to steep. Average annual runoff ranges from 16 to 24 in (410 to 610 mm) generally and from 16 to 50 in (410 to 1,270 mm) in the more rugged terrain of Maine and New Hampshire. Runoff increases locally with elevation. Maximum monthly stream flows occur in March and April. Extreme peak flows can occur any time of year and are usually associated with hurricanes or rain-on-snow events. Minimum monthly flows occur in August, September, and October. The section contains numerous lakes and "great ponds," including Rainbow Lake, Nahmakanta Lake, Pemadumcook Lake, Lower-Jo Mary Lake, Lake Hebron, Moxie Pone, Pleasant Pond, and Flagstaff Lake.

Section M212B - Vermont – New Hampshire Upland Section (within the following subsections: M212Ba Vermont Piedmont, M212Bb Northern Connecticut Valley, and M212Bc Sunapee Uplands)

Surface Water Characteristics:
Perennial streams are important water sources. Small lakes and wetlands occur in headwater and valley positions. The Connecticut River and its tributaries, including the White and Ottauquechee Rivers, dominate the unit. Trellis and dendritic drainage patterns occur. Metasedimentary bedrock is exposed in some streambeds, while Proterozoic rock and alkalic plutonic rock are more likely to be found in boulder beds. Stream gradients range from low to moderate and steep. Streams are generally incised. Average annual runoff ranges from 16 to 28 in (410 to 710 mm). High values reflect differences in local topography. Maximum monthly streamflows occur in March and April. Extreme peak flows can occur any time of year and are usually associated with hurricanes or rain-on-snow events. Minimum monthly flows occur in August, September, and October.

Section M212C - Green, Taconic, and Berkshire Mountains Section (within the following subsections: M212Cb, Taconic Mountains, M212Cc Berskhire-Vermont Upland, and M212Cd Southern Green Mountain)

***Surface Water Characteristics*:**

Perennial streams and small lakes provide abundant water. Rivers and streams range from low to steep gradients. Channels are generally incised. The headwaters of streams in northern Vermont are located in the piedmont to the east, and the major stream courses are imposed from a previously eroded surface. Primary features of the Appalachian Trail are the Housatonic and Hoosic Rivers, Upper Goose Pond, and the headwaters of numerous small rivers, brooks, streams, and mountain ponds. Average annual runoff ranges from 16 to 40 in (410 to 1,020 mm), increasing locally with elevation. Maximum monthly flows occur in March and April. Extreme peak flows can occur any time of year and are usually associated with hurricanes or rain-on-snow events. Minimum monthly flows occur in August, September, and October.

Section 221A - Lower New England Section (within the following subsections: 221Ae Hudson Highlands)

***Surface Water Characteristics*:**

Abundant water resources include perennial streams, natural and artificial lakes and ponds, fresh and saltwater wetlands, and estuaries. Streams exhibit deranged, dendritic, and trellis patterns due to a complex geomorphic history of stream imposition, differential weathering, glaciation, continental rebound, and stream capture. Stream gradients are generally low but steepen locally near the Connecticut River and in areas approaching the uplands and mountains. The Housatonic River and its tributaries, including Ten Mile River, are the predominant hydrologic features in Connecticut. The southern reach of the Hudson River dominates further west. Average annual runoff ranges from 18 to 24 in (460 to 610 mm). Maximum monthly streamflows occur in March and April. Extreme peak flow may occur any time of year and usually are associated with hurricanes or rain-on-snow events. Minimum monthly flows occur in August, September, and October. Most lakes and impoundments are small.

Section 221B--Hudson Valley Section (within the following subsections: 221Ba Hudson Limestone Valley, 221Bd Kittatinny-Shawangunk Ridges)

***Surface Water Characteristics*:**

Tributaries of the Hudson River, including the Wallkill River and Pochuck Creek crossings of the Appalachian Trail in northern New Jersey, dominate the unit. Perennial streams, small lakes, and fresh water and saltwater wetlands occur. The Hudson River, which intersects the Appalachian Trail just south of this section, is a low gradient incised stream. The Delaware River intersects the Trail at the southern

tip of this section. Major tributaries from the Taconics and Allegheny plateau have moderate and steep gradients. Under natural conditions, daily saltwater tides in the Hudson River would reach as far upstream as Albany, New York. Average annual runoff ranges from 10 to 22 in (250 to 560 mm). March and April are the months of highest streamflow. Lowest streamflow occurs in August.

Section M221A - Northern Ridge and Valley Section (within the following subsections: M221Aa Ridge and Valley Subsection, M221Ad Northern Great Valley Subsection)

***Surface Water Characteristics*:**
Major rivers crossed by the Appalachian Trail include the Lehigh, Schuykill, Susquehanna, and Juniata Rivers. Streams are most active in the spring, reflecting relatively frequent rainfall and snowmelt. Many smaller streams dry up in the summer and are not recharged until October to November. Stream patterns are trellis shaped, reflecting the regular folding of the geomorphology. Streams are generally more alkaline and productive than in the Allegheny Mountains. Wetlands are scarce.

Section M221D - Blue Ridge Mountains Section (M221Da Northern Blue Ridge Mountain, M221Dc Southern Blue Ridge Mountain, and M221Dd Metasedimentary Blue Ridge Mountain)

***Surface Water Characteristics*:**
This Section is generally characterized by a mature, dendritic drainage network. The Appalachian Trail crosses a number of major rivers in this section, including the Potomac and Shenandoah Rivers in northern Virginia, Maryland, and West Virginia, the James and Tye in central Virginia, and the French Broad in North Carolina. Natural lakes are rare to non-existent, except in the northeastern extremity of the Section, which was covered by Pleistocene glaciation. Watuga Lake in Tennessee and Fontana Lake in North Carolina are major, man-made impoundments. Small impoundments are common along upper reaches of streams. A few bogs, swamps, and salt marshes occur in areas adjacent to the Atlantic coast and Chesapeake Bay. The lower extremities of some of the major streams are affected by tides. There is ample water for farm, urban, and industrial uses. Urban development is affecting water yields. Good ground water recharge areas are being impacted by encroaching development.

Section M221B - Allegheny Mountains Section (M221Ba Ridge and Valley, and M221Bb Great Valley of Virginia)

***Surface Water Characteristics*:**
The drainage pattern is well established, dendritic to trellis, but primarily the former. Much of the Trail's route through this section is captured by the New

River and its tributaries, which eventually drain into the Ohio River to the west. However, the Trail also crosses the headwaters of the Holston River in this section. The Holston drains to the south. Streams are generally more acidic and less productive than in the Northern Ridge and Valley Section. Wetlands are scarce.

3. Water Quality

No comprehensive, previously published scientific investigations are known to exist that describe the current state of water quality along the entire A.T., although several past and ongoing studies have investigated water quality along segments of the Trail. Examples include stream studies in Shenandoah National Park, Great Smoky Mountains National Park and Delaware Water Gap National Recreation Area, and several locations in New England where streams and ponds are sampled as part of the Hubbard Brook Long Term Ecological Research (LTER) program.

Although no comprehensive A.T. specific studies are known to exist, the U.S. Environmental Protection Agency (USEPA) has compiled water quality data from myriad sources and makes these data as well as many other useful resources available to the public through their Water Program web site (http://www.epa.gov/water/). These data reside in the USEPA STORET database (http://www.epa.gov/storet/), and are largely the same data that are used by the National Park Service Water Resources Program to prepare "horizon" reports for individual parks (see above).

Among the resources available on the USEPA web site are a series of technical guidance manuals designed to help states and other entities "…*produce section 304(a) criteria*…". While the current focus is not to develop or legally establish section 304(a) criteria for water resources associated with the Appalachian Trail, the USEPA technical guidance manuals make it possible to produce a set of baseline water quality standards that resource managers can use to assess the ecological condition of water resources along the Appalachian Trail. The technical guidance manuals attempt to depict "reference conditions," or those conditions that might be anticipated where human induced impacts are minimal. This is accomplished by setting recommended standards using parameter values that correspond to the 25th percentile for each parameter set (except for secchi disk which is based on the 75th percentile). The resulting water quality parameter values are believed to represent less impacted waters within each of the target ecoregions or sub-ecoregions.

The USEPA technical guidance manuals are further organized around the types of waters found in each ecoregion. Manuals for Lakes and Reservoirs, and Rivers and Streams are available for the two ecoregions through which the Appalachian Trail passes. Each of these manuals aggregates data obtained from waters that represent the entire range of each type of water found within the two ecoregions or four sub-regions. Consequently, water quality standards established for the Appalachian Trail using the technical guidance manuals may be based, in part, on data obtained from

certain types of waters that are typical of the particular ecoregion or sub-ecoregion, but may not be well represented on the Appalachian Trail. As a result, the baseline values established using the technical guidance manuals may not accurately estimate the level for certain parameters. Despite this potential problem, the baseline values established using the technical guidance manuals will help establish a meaningful starting point, or reference for future resource management and monitoring efforts.

The ecoregion system used by USEPA (Omernik, 1987) divides the Continental United States into 14 areas that share similar geographic and nutrient characteristics (USEPA, 2000a; 2000b; 2000c, 2001). This ecoregion scheme differs from the U.S. Forest Service ecoregion system (Bailey, 1987) that was used earlier in this section to characterize the types of surface water resources typically found along the Appalachian Trail (see above). Both systems have merit, and neither system is clearly superior to the other. The Omernik (1987) ecoregion system is preferred for setting water quality standards because USEPA makes data summaries for the regions and sub-regions readily available.

Based on the Omernik (1987) system, the Appalachian Trail crosses two ecoregions and four sub-regions (Figure x1).

Extending from the northwest corner of New Jersey through Maine, the Trail is within the Nutrient Poor Largely Glaciated Upper Midwest and Northeast ecoregion, Region VIII (Figure x2). The Trail remains in the Northeastern Highlands sub-region throughout most of this ecoregion except for the northwest corner of New Jersey which is within the North Central Appalachian sub-region. The Nutrient Poor Largely Glaciated Upper Midwest and Northeast ecoregion is defined accordingly:

> *"The Nutrient Poor Largely Glaciated Upper Midwest and Northeast is cool and moist. It is characterized by extensive forests, nutrient-poor soils, a short growing season, limited cropland, and many marshes, swamps, lakes, and streams. Less cropland and fewer people occur here than in neighboring nutrient regions; related nutrient problems in surface waters are also less. Water quality issues center around the effects of acid precipitation, logging, lake recreation, and nearlake septic systems.*
>
> *Perennial streams are common and are often fed by water stored in the glacial deposits that overlie non-calcareous bedrock. Streams typically have low concentrations of alkalinity, sulfate, chloride, and dissolved solids due, partly, to the insolubility of the bedrock. Levels of fecal coliform, total nitrogen, total phosphorus, and suspended sediment are also usually low; stream concentrations of these constituents are typically much less than in nearby, more developed nutrient regions.*
>
> *Many oligotrophic and mesotrophic lakes occur in Region VIII. Total phosphorus*

concentrations are usually much lower, and Secchi transparencies are much higher than in the lakes of the Corn Belt and Northern Great Plains (VI). Acid precipitation caused by airborne emissions from upwind industrialized regions is a major water quality problem in the eastern portion of Region VIII and can threaten fish survival in weakly buffered glacial lakes."

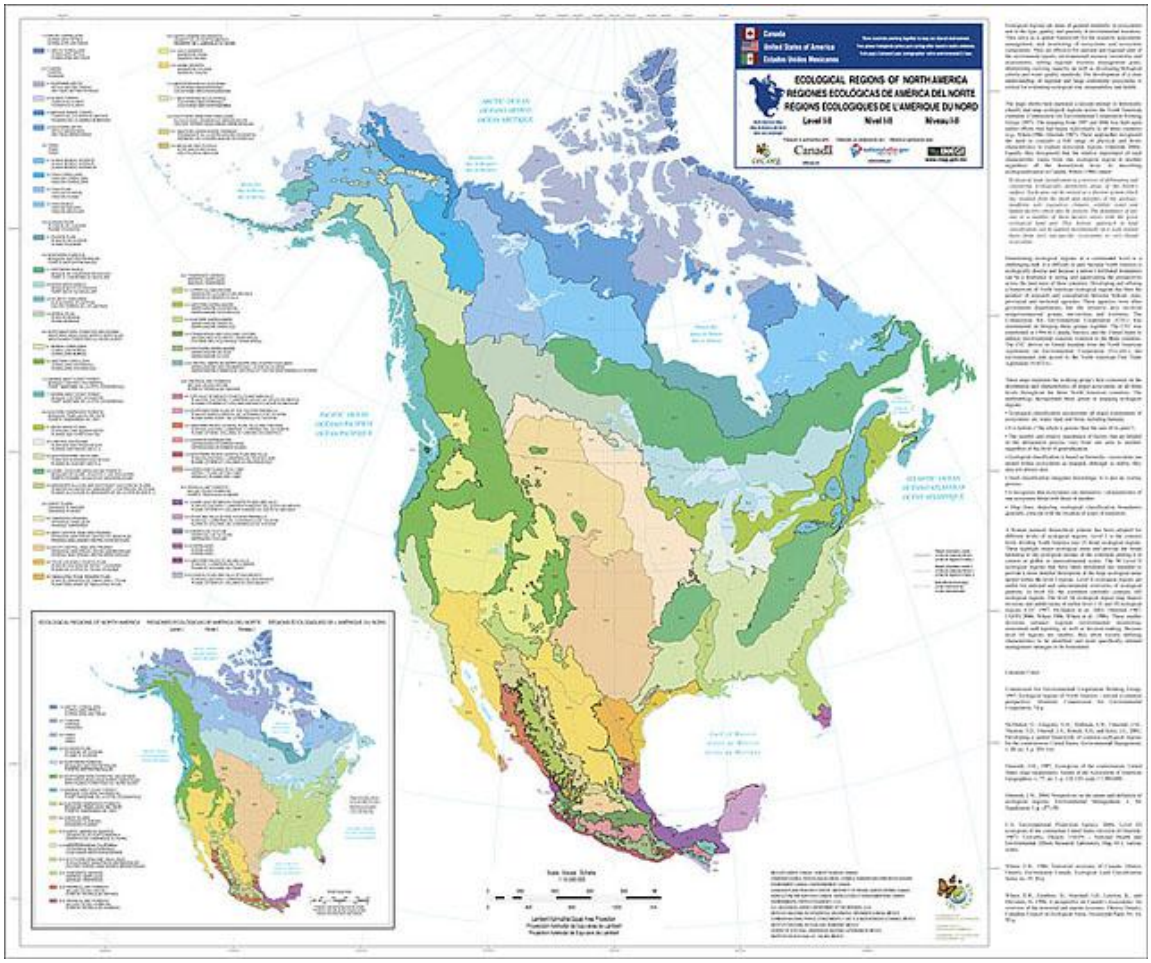


Figure G.1 - Ecoregions of North America

The Northeastern Highlands sub-region (# 58, Figure G.2) is described by USEPA in the following statement:

"The Northeastern Highlands comprise a relatively sparsely populated region characterized by nutrient poor soils blanketed by northern hardwood and spruce fir forests. Land-surface form in the region grades from low mountains in the southwest and central portions to open high hills in the northeast. Many of the numerous glacial lakes in this region have been acidified by sulfur depositions originating in industrialized areas upwind from the ecoregion to the west."

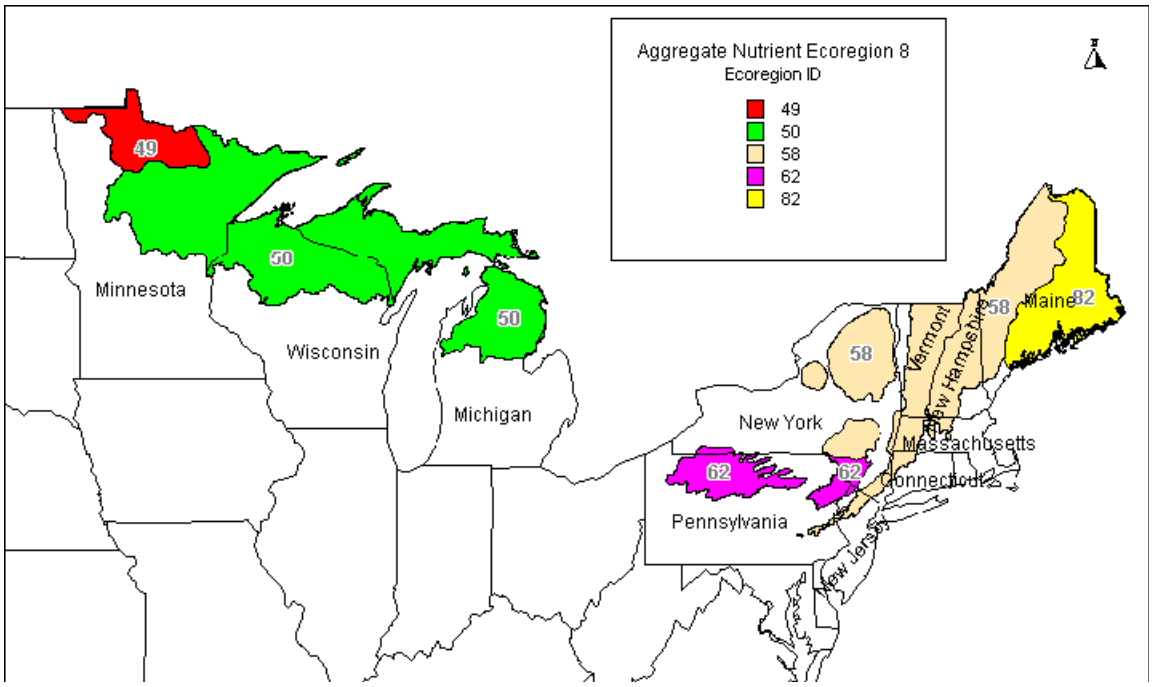


Figure G.2 - Aggregate Ecoregion VIII with level III ecoregions shown (from USEPA, 2000c)

The North Central Appalachian sub-region (# 62, Figure G.2) is described by USEPA in the following statement:

> *"More forest covered than most adjacent ecoregions, the North Central Appalachians ecoregion is part of a vast, elevated plateau composed of horizontally bedded sandstone, shale, siltstone, conglomerate, and coal. It is made up of plateau surfaces, high hills, and low mountains, which unlike the ecoregions to the north and west, was largely unaffected by continental glaciation. Only a portion of the Poconos section in the east has been glaciated. Land use activities are generally tied to forestry and recreation, but some coal and gas extraction occurs in the west."*

From the Northeast corner of Pennsylvania through Georgia, the Appalachian Trail is within the Central and Eastern Forested Uplands ecoregion, Region XI (Figure x3). Two sub-regions, the Blue Ridge and the Ridge and Valley sub-regions, extend laterally in a northeast to southwest orientation and typify the portion of the Central and Eastern Forested Uplands ecoregion through which the Appalachian Trail passes. The Central and Eastern Forested Uplands ecoregion is generally described accordingly:

> *"The Central and Eastern Forested Uplands Ecoregion is disjunct and comprises most of the unglaciated, forested low mountains and upland plateaus in the central and eastern United States. It is underlain primarily by sedimentary and metasedimentary rocks and is characterized by forests, high relief terrain, steep slopes, and high gradient streams. Region XI is higher and more rugged than the*

neighboring Regions VI, VII, IX, and X. Streams are generally faster moving and clearer than the lower gradient streams of surrounding regions. Lakes are far less common than in cooler, glaciated areas such as Region VIII. Dominant land uses in the Central and Eastern Forested Uplands (XI) are logging, recreation, and grazing. The erosion hazard can be severe on steep slopes if the soil or vegetation is disturbed by logging or road building. Land slides and sheet flow have contributed sediments to streams which, in turn, have affected benthic habitat, turbidity, hydrology, stream temperature, and stream biota. Coal mining is locally common. It has contributed dissolved solids, suspended sediment, and acidic drainage to streams which have, in turn, impacted fish and aquatic invertebrates. Cropland agriculture and urban activity are generally less common than in nearby, lower and less-rugged regions; related water quality issues such as nutrient runoff to streams is also less. Nevertheless, in Region XI, there are a few urban areas as well as scattered croplands such as the Great Valley. Major poultry and aquaculture operations are found in Region XI along with associated inputs of nutrients."

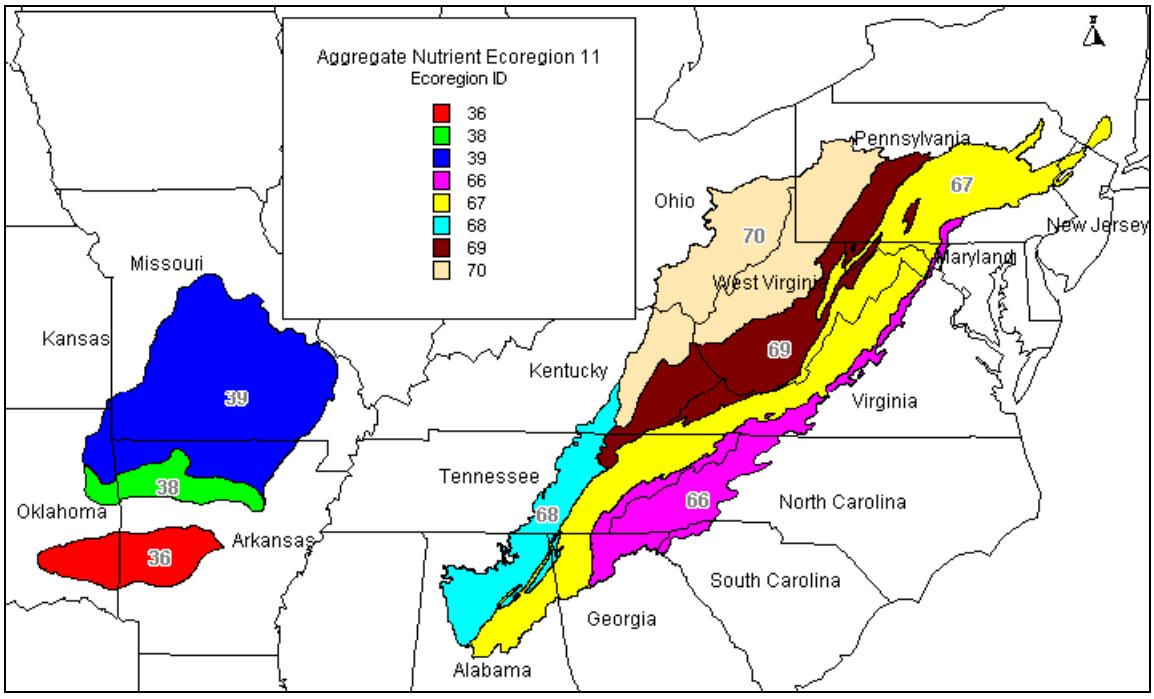


Figure G.3 - Aggregate Ecoregion XI with level III ecoregions shown (from USEPA, 2000b)

The Blue Ridge sub-region (# 66, Figure G.3) is described by USEPA in the following statement:

"The Blue Ridge extend (sic) from southern Pennsylvania to northern Georgia, varying from narrow ridges to hilly plateaus to more massive mountainous areas with high peaks. The mostly forested slopes, high-gradient, cool, clear streams, and rugged terrain occur on a mix of igneous, metamorphic, and sedimentary

geology. Annual precipitation of over 200 centimeters can occur on the well-exposed high peaks of the Great Smoky Mountains that reach over 1830 meters. The southern Blue Ridge is one of the richest centers of biodiversity in the eastern U.S. It is one of the most floristically diverse ecoregions, and includes Appalachian oak forests, northern hardwoods, and Southeastern spruce-fir forests. Shrub, grass, and heath balds, hemlock, cove hardwoods, and oak-pine communities are also significant."

The Ridge and Valley sub-region (# 67, Figure G.3) is described by USEPA in the following statement:

"This northeast-southwest trending, relatively low-lying, but diverse ecoregion is sandwiched between generally higher, more rugged mountainous regions with greater forest cover. As a result of extreme folding and faulting events, the region's roughly parallel ridges and valleys have a variety of widths, heights, and geologic materials, including limestone, dolomite, shale, siltstone, sandstone, chert, mudstone, and marble. Springs and caves are relatively numerous. Present-day forests cover about 50% of the region. The ecoregion has a diversity of aquatic habitats and species of fish."

Water Quality Standards

Water quality recommendations available from USEPA are intended to assist states and other entities set standards for nutrient criteria. Data for many other water quality parameters are also available from the USEPA STORET database, but USEPA only recommends standards for parameters such as Secchi disk, Chlorophyll a, Phosphorus, and Nitrogen – those measures that most directly associated with assessing the nutrient status of a waterbody. The number of waters surveyed, the number of stations, and the number of actual records for each parameter that were used by the USEPA to set the various standards is shown in Table x1 and Table x2 for Lakes and Streams respectively.

Definitions

Secchi Disk Transparency

A secchi disk is a simple device used to measure water transparency. A measurement is made by recording the depth at which point the disk is no longer visible in a column of water. Secchi disk measurements are not ordinarily taken in streams or rivers.

Turbidity

Turbidity is a measure of suspended particulate matter present in a column of water, and relates to water transparency. There are several common methods used for determining turbidity, none of which report values that are interchangeable.

	Northeastern Highlands sub-region	North Central Appalachian sub-region	Blue Ridge sub-region	Ridge and Valley sub-region
# of Lakes / Reservoirs	849	15	76	52
# of Lake Stations	1898	39	236	228
- # of records for Secchi depth	24,451	4,591	1,352	1,163
- # of records for Chlorophyll *a* (all methods)	11,478	3,101	974	1,361
- # of records for Total Kjeldahl Nitrogen (TKN)	6,014	4,927	1,240	479
- # of records for Nitrate + Nitrite (NO2 + NO3)	7,692	4,758	1,669	1,408
- # of records for Total Nitrogen (TN)	193	4	4	18
- # of records for Total Phosphorus (TP)	16,590	5,122	1,565	1,776
Total # of records for key nutrient parameters	66,418	22,503	6,804	6,205

Table G.1. Lake records for Aggregate Ecoregion VIII & XI (USEPA, 2001 & 2000b)

	Northeastern Highlands sub-region	North Central Appalachian sub-region	Blue Ridge sub-region	Ridge and Valley sub-region
# of Stream Names	370	205	123	911
# of Stream Stations	803	349	282	2,009
- # of records for Turbidity	22,682	4,405	7,120	18,446
- # of records for Chlorophyll *a* (all methods)	31	10	272	2,079
- # of records for Total Kjeldahl Nitrogen (TKN)	17,034	3,833	5,578	18,169
- # of records for Nitrate + Nitrite (NO2 + NO3)	19,854	4,821	6,078	10,611
- # of records for Total Nitrogen (TN)	82	115	46	1,672
- # of records for Total Phosphorus (TP)	21,228	10,504	7,245	32,983
Total # of records for key nutrient parameters	80,911	23,688	26,339	83,960

Table G.2. River and Stream records for Aggregate Ecoregion VIII & XI (USEPA, 2000a & 2000c)

Nitrogen

Total Kjeldahl Nitrogen, or TKN is the sum of all forms of organic nitrogen (ammonia + ammonium). $NO_2 + NO_3$ Nitrogen is the sum of Nitrite and Nitrate. Total Nitrogen is reported in two ways, calculated and reported. The calculated value is the sum of TKN and NO2 + NO3, whereas the reported TN values represent those values derived from newer analytical techniques. The calculated value is currently the more common way to report this value.

Total Phosphorus

Total Phosphorus (TP) is a measure of all forms of phosphorus present in a sample, and has been used to determine the trophic classification of lakes (Vollenweider, 1968; Sawyer, 1947) because Phosphorus was traditionally thought to be the limiting, or "lacking" nutrient in most freshwater systems. Based on the assumption that the amount of available Phosphorus "drives," or "limits" productivity, lakes with TP concentrations less than 10 ug/L are classified as oligotrophic (low productivity); 10 – 20 ug/L as mesotrophic (moderately productive); 20 ug/L or higher as eutrophic (highly productive). Insight into which of the major nutrients (Nitrogen or Phosphorus) limit productivity in a water resource is gained by calculating the Total Nitrogen to Total Phosphorus (TN:TP) ratio. Ratios of 7:1 or less suggest that Nitrogen may limit productivity, while ratios of approximately 10:1 or higher suggest that Phosphorus is the limiting nutrient (USEPA, 2000d).

Chlorophyll *a*

Chlorophyll *a* is an important photosynthetic pigment, and measures of this component of primary productivity are useful for determining the trophic status of a water resource. Higher measures of chlorophyll *a* indicate greater amounts of primary productivity. One additional measure of chlorophyll *a*, Periphyton Chlorophyll *a* is available for streams and rivers in the Ridge and Valley sub-ecoregion. Periphyton is biological material that is attached or grows upon submerged surfaces such as rocks, thus, periphyton chlorophyll *a* is a measure of primary productivity associated with material that is attached to the stream or river substrate.

Lakes and Reservoirs

The following tables identify the USEPA recommended standards for the four sub-ecoregions through which the Appalachian Trail passes: Northeast Highlands (Table x2); North Central Appalachians (Table x3); Blue Ridge (Table x4); and, Ridge and Valley (Table x5).

Parameter	No. of Lakes	Reported Values		25th Percentiles based on all seasons data for the Decade P25* all seasons
		Min	Max	
TKN (mg/L)	21	0.05	0.97	0.33
NO2 + NO3 (mg/L)	91	0.003	1.11	0.014
TN (mg/L) - calculated	NA	0.053	2.08	0.344
TN (mg/L) - reported	107	0.16	1.41	0.20
TP (ug/L)	535	1.0	228.17	7.0
Secchi (M)	611	0.5	13.1	5.1
Chlorophyll *a* (*u*g/L) - F	73	0.66	37.09	2.52
Chlorophyll *a* (*u*g/L) - S	1	7.27	7.27	7.27
Chlorophyll *a* (*u*g/L) - T				

Table G.2 – Reference conditions for Northeastern Highlands sub-region (# 58, Figure G.2)

Parameter	No. of Lakes	Reported Values		25th Percentiles based on all seasons data for the Decade P25* all seasons
		Min	Max	
TKN (mg/L)	8	0.06	0.44	0.14
NO2 + NO3 (mg/L)	12	0.01	0.3	0.06
TN (mg/L) - calculated	NA	0.07	0.74	0.20
TN (mg/L) - reported	2	0.44	0.60	0.44
TP (ug/L)	14	5.5	62.5	9.25
Secchi (M)	11	1.7	4.5	4.0
Chlorophyll *a* (*u*g/L) - F	9	2.13	11.3	2.70
Chlorophyll *a* (*u*g/L) - S	--	--	--	--
Chlorophyll *a* (*u*g/L) - T				

Table G.3 – Reference conditions for North Central Appalachian sub-region (# 62, Figure G.2)

Parameter	No. of Lakes	Reported Values		25th Percentiles based on all seasons data for the Decade P25* all seasons
		Min	Max	
TKN (mg/L)	18	0.175	0.542	0.288
NO2 + NO3 (mg/L)	21	0.017	0.668	0.142
TN (mg/L) - calculated	NA	0.192	1.21	0.43
TN (mg/L) - reported	9	0.205	2.405	0.38
TP (ug/L)	40	7.375	80.375	17.5
Secchi (M)	29	0.938	83.375	2.102
Chlorophyll *a* (*u*g/L) - F	5	2.375	38.513	3.275
Chlorophyll *a* (*u*g/L) - S	22	2.75	25.3	5
Chlorophyll *a* (*u*g/L) - T		--	--	--

Table G.5 – Reference conditions for Ridge and Valley sub-region (# 67, Figure G.3)

Parameter	No. of Lakes	Reported Values		25th Percentiles based on all seasons data for the Decade P25* all seasons
		Min	Max	
TKN (mg/L)	52	0.025	1.235	0.086
NO2 + NO3 (mg/L)	60	0.003	0.588	0.029
TN (mg/L) - calculated	NA	0.028	1.823	0.115
TN (mg/L) - reported	2	0.12	0.32	0.12
TP (ug/L)	27	2.5	61.125	5
Secchi (M)	54	1.025	6.45	4.369
Chlorophyll *a* (*u*g/L) - F	42	0.5	4.475	1.35
Chlorophyll *a* (*u*g/L) - S	22	1.157	8.7	2.5
Chlorophyll *a* (*u*g/L) - T	3	2.16	46.2	2.16

Table G.4 – Reference conditions for Blue Ridge sub-region (# 66, Figure G.3)

Rivers and Streams

The following tables identify the USEPA recommended standards for the four sub-ecoregions through which the Appalachian Trail passes: Northeast Highlands (Table G.6); North Central Appalachians (Table G.7); Blue Ridge (Table G.8); and, Ridge and Valley (Table G.9).

Parameter	No. of Streams	Reported Values		**25th Percentiles based on all seasons data for the Decade P25* all seasons**
		Min	Max	
TKN (mg/L)	122	0.05	1.20	0.10
NO2 + NO3 (mg/L)	77	0.01	2.85	0.16
TN (mg/L) - calculated				0.26
TN (mg/L) - reported	8	0.34	0.84	0.42
TP (ug/L)	149	2	450	5
Turbidity (NTU)	61	0.28	4.33	0.80
Turbidity (FTU)	34	0.25	7	0.25
Turbidity (JCU)	--	--	--	--
Chlorophyll *a* (*u*g/L) - F	--	--	--	--
Chlorophyll *a* (*u*g/L) - S	3	3.4	7	3.4
Chlorophyll *a* (*u*g/L) - T	--	--	--	--
Periphyton Chl *a* (mg/m^2)	--	--	--	--

Table G.6 – Reference conditions for Northeastern Highlands sub-region (# 58, Figure G.2)

Parameter	No. of Streams	Reported Values		**25th Percentiles based on all seasons data for the Decade P25* all seasons**
		Min	Max	
TKN (mg/L)	60	0.03	1.25	0.10
NO2 + NO3 (mg/L)	55	0.01	1.06	0.09
TN (mg/L) - calculated				0.19
TN (mg/L) - reported	37	0.13	6.88	0.32
TP (ug/L)	130	2	106	10
Turbidity (NTU)	61	0.30	7.23	0.80
Turbidity (FTU)	41	0.30	16.38	5.25
Turbidity (JCU)	--	--	--	--
Chlorophyll *a* (*u*g/L) - F	--	--	--	--
Chlorophyll *a* (*u*g/L) - S	3	0	0	0
Chlorophyll *a* (*u*g/L) - T	--	--	--	--
Periphyton Chl *a* (mg/m^2)	--	--	--	--

Table G.7 – Reference conditions for North Central Appalachian sub-region (# 62, Figure G.2)

Parameter	No. of Streams	Reported Values		**25th Percentiles based on all seasons data for the Decade P25* all seasons**
		Min	Max	
TKN (mg/L)	55	0.025	0.713	0.102
NO2 + NO3 (mg/L)	78	0.003	1.128	0.058
TN (mg/L) - calculated		0.028	1.841	1.06
TN (mg/L) - reported	5	0.233	1.208	0.28
TP (ug/L)	84	0	213.75	7.125
Turbidity (NTU)	12	0.325	8.725	1
Turbidity (FTU)	57	0.25	25	1.675
Turbidity (JCU)	10	0.55	6.675	0.8
Chlorophyll *a* (*u*g/L) - F	2	1.625	2	1.625
Chlorophyll *a* (*u*g/L) - S	8	1	6	2
Chlorophyll *a* (*u*g/L) - T				
Periphyton Chl *a* (mg/m^2)				

Table G.8 – Reference conditions for Blue Ridge sub-region (# 66, Figure G.3)

Parameter	No. of Streams	Reported Values		**25th Percentiles based on all seasons data for the Decade P25* all seasons**
		Min	Max	
TKN (mg/L)	188	0.025	2.55	0.169
NO2 + NO3 (mg/L)	289	0.003	5.96	0.23
TN (mg/L) - calculated		0.028	8.51	0.399
TN (mg/L) - reported	174	0.092	6.363	0.214
TP (ug/L)	533	0	1387.9	10
Turbidity (NTU)	146	0.625	52.25	2.4
Turbidity (FTU)	52	1.4	40	4.25
Turbidity (JCU)	16	1.325	20.575	3.425
Chlorophyll *a* (*u*g/L) - F	0	--	--	--
Chlorophyll *a* (*u*g/L) - S	33	0.595	17.3	1.063
Chlorophyll *a* (*u*g/L) - T	--	--	--	--
Periphyton Chl *a* (mg/m^2)	7	26.85	53.75	32.75

Table G.9 – Reference conditions for Ridge and Valley sub-region (# 67, Figure G.3)

Discussion

The Appalachian Trail crosses many of the highest peaks and traverses many of the highest ridgelines in the eastern United States. The Trail also descends to lower elevations, and crosses most of the major rivers at some point prior to reaching the Atlantic Ocean. The composite nature of habitat through which the Trail passes makes it difficult, or impossible to concisely evaluate the condition of water quality on the Trail and to make broad management recommendations. However, using the aforementioned USEPA ecoregion classification scheme, it is possible to build a set of nutrient parameter expectations for a portion of the water resources found along the Trail. Specifically, the reference values presented in Tables x2 through x9 may be a

useful tool for predicting the condition of water resources found where the Appalachian Trail is highest in a particular watershed. Streams that are high in a watershed, first and possibly second order streams, are less likely to be impacted by human activity and nutrient values would be expected to more closely track the predicted values presented in Tables x6 through x9. Similarly, higher elevation lakes and ponds should be less impacted by human impact and like first or second order streams are likely to have nutrient levels that are close to the predicted values in Tables x2 through x5. Thus, it is reasonable to evaluate data obtained from more remote, and/or high elevation waters found along the Appalachian Trail against the values contained in Tables x2 through x9. Lower elevation waters or waters that are in close proximity to more heavily developed areas may be expected to have nutrient parameter values that are greater than the 25th percentile levels, and may occasionally approach the maximum values presented in Tables x2 through x9. This dichotomy poses certain considerations for managers. First, high elevation or remotely located waters may require little active management beyond monitoring, though problems that are identified may be easier to rectify because the cause of the problem may be on lands owned or managed by the Appalachian Trail Park Office or the Appalachian Trail Conservancy. Conversely, lower elevation waters or waters that are close to developed areas are more likely to demand some form of management, but the necessary actions may not be possible given the complexities of multiple land ownership and distance between the cause and the Appalachian Trail.

There are other issues to consider with respect to water quality beyond trophic status. For example, each of the USEPA ecoregion and sub-ecoregion descriptions indicate that waters in these areas typically have low alkalinity levels, or ability to buffer acidic inputs. This is particularly true of streams that are high in a watershed and of ponds and lakes that have small watersheds like many found along the Appalachian Trail. Unfortunately, there is little baseline information available from USEPA upon which to build expectations. Summary data for alkalinity is only available from the northeast highlands sub-ecoregion (Table x10). The mean alkalinity level for lakes and ponds in the northeast highlands is quite low at just under 6 mg/L, whereas stream alkalinity is more moderate at approximately 54.7 mg/L. Like trophic status, alkalinity status presents a dilemma for managers because the source of acidification that these low alkalinity resources are believed to be so susceptible originates a great distance from the Appalachian Trail. Site specific remediation measures may be possible, but they are expensive and short term.

Parameter		**Statistics**				
Name	Units	No. of Obs.	Avg.	Std. Dev.	Min.	Max.
Lake & Pond Alkalinity	mg/L	2321	5.9938	6.245	0.1	98
Stream Alkalinity	mg/L	31	54.6581	18.8252	19.8	85.4

Table G.10 – Alkalinity for Northeast Highlands sub-region (# 58, Figure G.2)

Recommendations:

The configuration of the Appalachian National Scenic Trail presents logistical difficulties that make it difficult to systematically monitor the status of the water resources found along the Trail. Rather than attempt to develop a systematic water quality monitoring program for the Appalachian Trail, it is more realistic to identify and work with local and regional programs that already conduct water quality monitoring in watersheds that intersect the Appalachian Trail. In many instances, these local and regional programs may be collecting data that are directly relevant to Appalachian Trail water resource management concerns. Where existing programs do not already track information that is relevant to Appalachian Trail resource management needs, it may be possible to work with the local and/or regional programs to expand their efforts to incorporate the Appalachian Trail. Where existing programs do not exist, resource managers should try to identify organizations and/or agencies that may be interested in developing new monitoring programs. When information from one or more existing groups suggests that additional more focused investigation is warranted, resource management staff should seek resources for more detailed investigation.

F. Cultural Resources

This section summarizes baseline information about cultural resources along the Appalachian National Scenic Trail that is currently available to the Appalachian Trail Park Office and Appalachian Trail Conservancy. Because of the Trail's geographic scope, management complexity, and the fact that a substantial portion of Appalachian Trail lands has only recently been acquired, comparatively little systematic cultural resource inventory information exists for Appalachian Trail lands.

This section is organized according to types of cultural resource studies and baseline reports conducted by the National Park Service. These studies typically include documentation of historic contexts, a park administrative history, a historic resource survey, an archaeological overview and assessment, a cultural landscape inventory, cultural landscape reports, a list of classified structures, museum catalog records for the national catalog of museum objects, an ethnographic overview and assessment, and identification and documentation of National Historical Landmark and National Register of Historic Places properties, contributing resources, and other historic resources. In addition, a brief discussion of Section 106 compliance is provided at the end of this section.

1. Historic Contexts for the Appalachian Trail

A "historic context" identifies historical themes delineated by time periods and geographic areas to provide a framework within which individual cultural resources can

be evaluated and listed in the National Register of Historic Places. In 2002, Dr. Robert Grumet of the National Park Service's Northeast Regional Office completed a six-month study of the Appalachian Trail and submitted a report titled *Historic Contexts of the Appalachian National Scenic Trail*. According to Grumet:

> "The setting of Appalachian Trail history is unique, comprising a 2,175-mile-long undulating ribbon of ridge-line rarely more than 1,000-feet-wide at its broadest points. A complex history has unfolded on this mountain stage, one embracing a wide range of events, incidents, and characters. Overviews summarizing the full sweep of history along the Appalachian Trail reveal broad patterns of continuity and change useful in crafting vision statements and fixing management goals and priorities. Management and protection of particular Appalachian Trail cultural resources preserving vestiges of this history more often require smaller, more comprehensible increments of time, place, and theme."

Grumet described the following framework in *Historic Contexts of the Appalachian National Scenic Trail*:

The Appalachian Trail, 1920-Present.

- Building the Trail, 1920-1968.
- Managing the Trail (including protecting the Trail), 1968-Present.

The Quest for a Usable Wilderness, 1750-1968.

- Farms and Furnaces, 1750-1900.
- Development and Devastation, 1820-1968.
- Sublime Wilderness, 1850-1880.
- Rise of the Trail Movement, 1880-1920.

Native American Appalachians, 12,000 years ago to 1850.

- Contact, Coexistence, and Dispossession, 1500-1850.
- Emergence of Townlife, 1,500-500 years ago.
- Appalachian Hunters and Gatherers, 10,000-1,500 years ago.
- People Come to the Appalachians, >12,000-10,000 years ago

Grumet describes each of these contexts in greater detail, through an analysis of time periods, geographic areas, and historic themes. Of particular relevance is his summary of the historic context of the Appalachian Trail itself:

> Born in the mind of forester Benton MacKaye (1921), the Appalachian Trail became a reality in 1925 with the founding of the Appalachian Trail Conference (Waterman and Waterman 1989). Initially led by Arthur Perkins and later by

Myron Avery (1931-1952), the Appalachian Trail Conference coordinated efforts of club Trail construction crews. Assisted by New Deal-era Civilian Conservation Corps and Works Progress Administration agencies (Carr 1998; McClelland 1993), Trail crews completed construction of a continuous Trail route running from Maine to Georgia by 1937.

Rebuilt in the years following World War II, the Trail gradually became a vital Trailway used by thousands of hikers. The Trail came to symbolize many things to many people (Bryson 1998; Redick 2001; and Rubin 2000). Trail maintenance and management procedures employed a technology calculated to preserve values treasured by hikers (Birchard and Proudman 2000). Public concern for the Trailway finally resulted in its designation as one of the first National Scenic Trails created by the National Trail System Act of 1968 (Foster 1987). Since that time, a unique partnership of volunteer organizations and public agencies has worked together to manage and maintain the Appalachian National Scenic Trail as a cultural resource of unparalleled national significance.

Copies of Dr. Grumet's *Historic Contexts of the Appalachian National Scenic Trail* are on file in the offices of the Appalachian Trail Park Office and Appalachian Trail Conservancy.

2. Park Administrative History

A "park administrative history" describes how a park was established and how it has been managed to the present day. As of 2008, a formal administrative history for the Appalachian National Scenic Trail has not been conducted. The Appalachian Trail Conservancy's archives contain more than 80 years of archival records, as do many of the archives and libraries of the early Appalachian Trail clubs. Several efforts have been made to assemble a comprehensive picture of this material; the most recent being a concerted effort in the early 1990s by a research team headed by Dr. Jack G. Morrison of Shippensburg University that resulted in an unpublished manuscript titled The Archival Holdings of the Appalachian Trail Conference – A Preliminary Inventory (1991). The voluminous records that document the design and construction of the Appalachian Trail in Maine are located in the Avery Collection of the Maine State Library in Augusta, Maine. The Potomac Appalachian Trail Club also maintains extensive archival records of the early history of the Appalachian Trail.

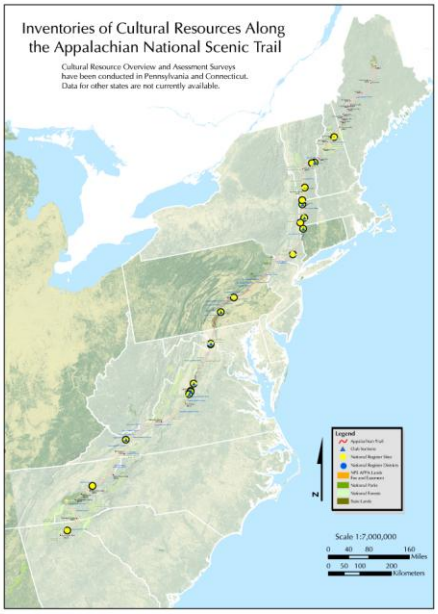
3. Historic Resource Study

A "historic resource study" (HRS) provides a historical overview of a park or region and identifies and evaluates a park's cultural resources within historic contexts. As of 2008, a Historic Resource Study for the Appalachian National Scenic Trail has not been conducted. Much of the developmental history of the Appalachian Trail is described in records retained in the archives of the Appalachian Trail Conservancy. Numerous historical and quasi-historical summations of the developmental history of the Appalachian Trail have been published. The most prominent of these efforts are: (1)

Trail Years: A History of the Appalachian Trail Conference, by Brian B. King (2003), and (2) The Appalachian National Scenic Trail: A Time to Be Bold, by Charles H. W. Foster (1987). The first document listed above is a publication of the Appalachian Trail Conservancy intended to provide ATC members and other interested parties with a summary account of the developmental history of the Trail. The second is an extensive published account of the combined efforts of the National Park Service, the Appalachian Trail Conservancy, states, other federal agencies, and many other private citizens and public agencies to secure federal and state protection for the Appalachian National Scenic Trail through passage of the National Trails System Act and public acquisition of a corridor of land surrounding the Trail. A Historic Resource Study could build upon these works and analyze the Trail's developmental history and other themes and contexts within the framework of Dr. Grumet's Historic Contexts of the Appalachian Trail.

4. Archaeological Overview and Assessments and Similar Studies

An "archaeological overview and assessment" describes known and potential archaeological resources for a park. Documentation of known and expected cultural resource properties along the Appalachian Trail – at least to the extent that it is available to the Appalachian Trail Park Office and Appalachian Trail Conservancy – is fragmentary and incomplete. In fact, overview and assessment studies have been completed for the Appalachian Trail in only two states: Pennsylvania (1999) and Connecticut (2004). [See *Map II.H.1: Inventories of Cultural Resources along the Appalachian National Scenic Trail*.]



In many locations along the Trail, National Park Service, U.S. Forest Service, and other Federal land managers have conducted surveys on lands under their jurisdiction to fulfill their responsibilities under Section 106 of the National Historic Preservation Act. Few, however, have had the funding resources to conduct a more comprehensive assessment of cultural resources on their lands in accordance with Section 110 of the Act. Several state agencies have conducted extensive research, particularly in state historic parks like Pine Grove Furnace State Park in Pennsylvania and Gathland State Park in Maryland. Professional and amateur historians and archaeologists also have conducted local or regional studies that contribute to the overall knowledge of cultural resource along the Trail. In other areas, however, little or no data exists. The following state-by-state narrative summarizes information that is currently available to the Appalachian Trail Park Office and Appalachian Trail Conservancy:

Maine: The Maine Appalachian Trail Club and the University of Maine conducted a secondary-reference inventory of cultural resources in 1986. Although never finalized, the draft inventory contains an extensive list of historically occupied sites and features along the Trail in Maine.

New Hampshire: The White Mountain National Forest has an extensive record of archaeological and historical research for lands under its administration. However, no studies specific to Appalachian Trail lands administered by the Forest have been conducted in New Hampshire.

Vermont: Surveys conducted by Green Mountain National Forest cultural resource personnel indicate that low elevations, gaps, and saddles along the Trail route in Vermont have the highest archeological potential. Some balds and mountain tops are reported to have sacred or traditional significance to Native Americans. Plans are currently being developed to interpret the archeological remains of the now abandoned Aldrichville townsite. Forest Archeologist David Lacey has identified seven additional cultural resource sites within the Appalachian Trail corridor on U.S. Forest Service lands in Vermont. These include one extensive prehistoric quartzite quarry stretching along a one kilometer stretch of the Trail, two quartzite flake scatters, a quartzite knife find spot, several stone cairns, and three places regarded as traditional cultural properties by Abenaki people. None of these locales have been subjected to intensive testing, and none are presently known to possess diagnostic artifacts or organic remains associated with human occupation.

Massachusetts: No comprehensive studies of cultural resources along the Appalachian Trail lands have been conducted in Massachusetts. In 2005, the NPS Omsted Center for Landscape Preservation began work on a methodology for conducting cultural landscape inventories along the length of the Appalachian Trail. This methodology, which is expected to be finished in 2009, will include a pilot study of the Appalachian Trail in Massachusetts.

Connecticut: In 2004, the Connecticut State Archaeologist and a subcontractor completed a comprehensive cultural resource overview and assessment project of the 52-mile section of the Appalachian Trail in Connecticut under a cooperative agreement with the Appalachian Trail Conservancy. This survey, which took three years to complete, identified 382 cultural resources along the Trail in that state and provided detailed ASMIS information, GPS coordinates, and management recommendations for all of the sites. This survey represents the most thorough assessment of cultural resources on the Appalachian Trail to date.

New York: No comprehensive studies of Appalachian Trail lands have been conducted in New York.

New Jersey: The Appalachian Trail Park Office and the Appalachian Trail Conservancy

are exploring the potential for conducting a cultural resource inventory and overview for Appalachian Trail lands in New Jersey. This study would use State Historic Preservation Office files and other cultural resource management documentation to build upon Ronald J. Dupont, Jrs.' *Hiking With History: Heritage on the Appalachian Trail in New Jersey* (Dupont 1994), which documents and describes more than 20 culturally important sites along the Trail in New Jersey.

Pennsylvania: A cultural landscape survey of Trail lands in the Cumberland Valley of Pennsylvania completed in 1998 documented a number of point features, such as stone wall steps, ponds, buildings, garden sites, a cemetery, and a large "resting tree" preserved to shade farmers while working; cluster features, such as farmsteads, farm fields, pastures, stone wall intersections, and hedgerow intersections; and linear features, such as stone walls, hedgerows, fence lines, abandoned farm roads, roads, and bridges. This survey included the following nine individually named cultural resources: Scott Farmstead, Bernhisel Bridge, Rutter House, White Oak Resting Tree, the US 11 Footbridge, Chambers Family Cemetery, Hertzler Farmstead, Boiling Springs Village, and the Sunday Farmstead.

In 1999, the Department of Anthropology of the Pennsylvania State University conducted a literature search of previously reported archeological resources along the Trail corridor in Pennsylvania under a cooperative agreement with the Appalachian Trail Park Office and Appalachian Trail Conservancy. The study identified 55 cultural resource sites or features, including one frontier fort (Fort Dietrich Snyder), four iron furnaces, numerous charcoal hearths, and one coal mining estate (the Stony Creek Coal Estate, also known as Saint Anthony's Wilderness, a broad area between the Susquehanna and Schuylkill rivers encompassing Rausch Gap and Yellow Springs). Researchers further identified fourteen previously recorded prehistoric resources (none presently known to contain diagnostic artifacts within intact features or deposits) and twenty-five areas (most coinciding with road, canal, or rail alignments) possessing potential to contain significant cultural resources. Additional field research by an extraordinary volunteer, an intern, and a National Park Service archaeologist in 2001 and 2002 provided additional documentation and field verification of the 55 sites identified in the report, as well as preliminary data for an additional 21 sites.

Maryland: In 1998, the Appalachian Trail Park Office, the Appalachian Trail Conservancy, the Potomac Appalachian Trail Club, and the Central Maryland Heritage League entered into a Memorandum of Understanding to develop a long-term management plan to survey and interpret the South Mountain Battlefield in Washington and Frederick Counties, Maryland.

In 2004, Indiana University of Pennsylvania completed a detailed archaeological survey and management plan for the Fox's Gap site of the Battle of South Mountain under a contract with the Appalachian Trail Conservancy, with additional guidance and direction provided by the Appalachian Trail Park Office, the Maryland Department of Natural

Resources, the Potomac Appalachian Trail Club, and the Central Maryland Heritage League.

Portions of the B & O Railroad Potomac River Crossing and the Harper's Ferry Historic District in Maryland and the Washington Monument, the first memorial to the nation's first president, are currently the only properties on the Appalachian Trail in Maryland listed in the National Register of Historic Places. Studies are currently underway to determine the potential eligibility of South Mountain battle sites at Crampton Gap, Fox's Gap, and Turner's Gap for listing in the National Register of Historic Places.

West Virginia: No comprehensive studies of Appalachian Trail lands have been conducted in West Virginia. Harpers Ferry National Historical Park has an extensive cultural resource management program. Forty years of archaeology in the Park have generated more than 50 reports and 500,000 objects. The Park's List of Classified Structures, updated in 1991, contains 157 structures. Two landscape plans were prepared between 1990 and 1992.

Virginia: In northern Virginia, Shenandoah National Park's List of Classified Structures lists twenty-eight properties, broken down into five property types, within Appalachian Trail corridor lands in park boundaries. Built or modified for park use by the Civilian Conservation Corps during the 1930s, these properties include the Appalachian Trail itself, fourteen cabins and shelters (including one National Register property), three stone walls, five fire pits and hearths, and five springs and springhouses.

George Washington and Jefferson National Forests archeologist Mike Barber reported in 2002 that 25 archeological sites had been identified within the Appalachian Trail corridor on U.S. Forest Service lands in Virginia. Two of these sites preserve remains of historic farmsteads. Diagnostic artifacts associated with particular time periods in prehistory have been recovered at six locales; scattered stone chips identified as debris left over from quarrying, tool manufacture, or resharpening activities, have been primarily found on the surface of the remaining 17 sites. In 2001, Forest Service staff assisted the Appalachian Trail Park Office in recording and stabilizing the Catawba Crest Archaeological Site.

Also in Virginia, the Blue Ridge Parkway maintains several historic structures within the immediate vicinity of the Appalachian Trail near Humpback Rocks, as well as extensive records of archaeological sites in the vicinity of the Trail.

Tennessee: No data are currently available for Tennessee.

North Carolina: The National Forests of North Carolina have surveyed only a small fraction of the 230 miles of Appalachian Trail under U.S. Forest Service jurisdiction. Archaeologist Rodney Snedecker reported identification of 46 prehistoric sites, 7 historic archeological sites, and 3 historic Trails (the Over Mountain Victory, Trail of Tears, and

Bartram Trails). He further reported that some sites have only surface components; others have subsurface and intact deposits and features. An unspecified number of cultural resources possessing intact subsurface deposits have been determined eligible for listing in the National Register of Historic Places. Several sacred sites and traditional gathering areas, and other traditional cultural properties are also reported on U.S. Forest Service Trail lands in North Carolina (Rodney Snedecker 2002: personal communication).

Georgia: No comprehensive studies of Appalachian Trail lands have been conducted in Georgia.

5. Cultural Landscape Surveys

The "cultural landscape inventory" (CLI) is a computerized inventory of all cultural landscapes in which the National Park Service has or plans to acquire a legal interest. Its purpose is to identify cultural landscapes within the National Park System and provide information on their location, historical development, features, and management. To date, no cultural landscape surveys have been conducted specifically for the Appalachian National Scenic Trail. Both Shenandoah National Park and the Delaware Water Gap National Recreation Area have completed cultural resource inventories that include portions of the Appalachian Trail.

However, the NPS Omsted Center for Cultural Landscapes is working closely with the Appalachian Trail Park Office and the Appalachian Trail Conservancy to develop a methodology for conducting cultural landscape inventories on the Appalachian Trail. A draft report was completed in 2006. In 2006, the Omsted Center contracted with the State University of New York at Syracuse to sponsor a field school and complete a CLI of the Appalachian Trail in Shenandoah National Park. This results of this inventory will be used to fine-tune the draft report. A final report is expected to be released in 2009.

6. List of Classified Structures

The "list of classified structures" (LCS) is a computerized inventory of all historic and prehistoric structures of historical, architectural, or engineering significance in which the National Park Service has or plans to acquire a legal interest. List of classified structures inventories are only just beginning along the Appalachian Trail. A review of an informal research project conducted by a volunteer and the data contained in the NPS Facility Management System (FMSS) indicates that at least 20 of the 95 Appalachian Trail shelters originally constructed by the Civilian Conservation Corps (the CCC) are still in existence. One of these shelters, the Rocky Run Shelter, is currently being renovated by the Potomac Appalachian Trail Club, with a grant provided by Preservation Maryland and technical assistance from the Maryland Department of Natural Resources, the Appalachian Trail Conservancy, the Appalachian Trail Park Office, and the NPS Preservation Center in Frederick, Maryland. More than a dozen other shelters

constructed by Trail clubs (including the huts constructed by the Appalachian Mountain Club in the White Mountains) and other organizations (such as the Works Progress Administration) are believed to be historically significant. Most of the remaining shelters along the Trail have been constructed since the 1960s.

Although a substantial number of structures were acquired as part of the Appalachian Trail protection program, the vast majority of these structures have been tract homes, sheds, outbuildings, and garages. Most of these "incidentally acquired" structures have been demolished or are slated to be demolished. In each case, Appalachian Trail Park Office personnel have consulted or are consulting with the state historic preservation officer to determine that the facilities slated for demolition do not have historical significance.

Only three structures among these incidentally acquired structures – the Prospect Mountain Ski Tow Cabin in Vermont, the Boiling Springs regional office in Pennsylvania, and the Kegley Farmhouse in southwest Virginia – have been identified as eligible for the National Register of Historic Places. All three have been retained. The Green Mountain Club, with assistance from the Appalachian Trail Conservancy, the Green Mountain National Forest, the Marsh-Billings National Historical Park, and the Appalachian Trail Park Office have stabilized and are restoring the Prosper Mountain Ski Tow Cabin. The Boiling Springs regional office has been restored and is utilized by the Appalachian Trail Conservancy as a regional office and visitor center. Necessary actions have been taken to stabilize and prevent vandalism at the Kegley farmhouse. A fourth National Register property, the April Hill Farm (also known as the Westover-Bacon-Potts Farm) in Massachusetts, is owned and maintained by the Appalachian Trail Conservancy

The Delaware Water Gap National Recreation Area currently lists Pennsylvania and New Jersey sections of the Appalachian Trail on its LCS inventory.

The following properties within Shenandoah National Park were built or modified for use as part of the Appalachian Trail by the Civilian Conservation Corps during the 1930s and are listed in the park's LCS (Stephen Clark 2001:personal communication):

Cabins and Shelters
- Pinefield Hut
- Black Rock Hut
- Pass Mountain Shelter
- Gravel Springs Hut
- Hightop Hut
- South River Maintenance Hut
- Rock Spring Hut
- Bearfence Hut

Trails
- Appalachian Trail

Stone Walls & Retaining Walls

Harpers Ferry National Historical Park, the C&O Canal National Historical Park, the Blue Ridge Parkway, and Great Smoky Mountains National Park may also have properties associated with the Appalachian Trail in their LCS inventories.

7. National Catalog of Museum Objects

The National Catalog lists all cultural objects that meet the criteria for museum objects in the National Park System. No catalog of museum objects has been developed for the Appalachian Trail.

8. Ethnographic Overview and Assessment

An ethnographic overview and assessment describes accessible archival and documentary data on park ethnographic resources and groups who traditionally define features within the park as significant to their ethnic heritage. No ethnographic overview and assessments have been prepared for the Appalachian Trail.

9. National Historic Landmarks and National Register Properties

The National Register of Historic Places is the nation's official list of districts, sites, buildings, structures, and objects that are significant in American history and culture.

Two sections of the Appalachian Trail itself have been determined to be eligible for the National Register of Historic Places: (1) a section of the Trail in northern New Jersey, where the Trail follows the New York-New Jersey state line; and (2) a section of the Trail in the Delaware Water Gap National Recreation Area in eastern Pennsylvania and northwestern New Jersey. Records of these determinations are available through the Appalachian Trail Park Office. Both determinations were made as part of a Section 106 review of the potential effects of a proposed utility project. Other sections of the Trail have not been evaluated. However, few sections of the Appalachian Trail are in their original location. In fact, most sections of the current Trail footpath on Appalachian Trail Park Office lands have been constructed in the last 20 years, subsequent to the completion of the land protection program that permitted the Trail to be relocated off public roads and back into a woodland environment.

Federal actions have resulted in the designation of the two National Historic Landmarks on lands within the Appalachian National Scenic Trail corridor listed below:

Crane and Company Old Stone Mill Rag Room, Massachusetts
Palisades Interstate Park, New Jersey and New York (pending boundary re-study)

Nineteen National Register of Historic Places properties and districts have been listed by Federal or State agencies on Appalachian Trail lands. Numerous others exist within one mile of the Trail. [See *Map II.F.2: National Register of Historic Places Properties along*

the Appalachian National Scenic Trail, *Table II.F.1: National Register of Historic Places Properties along the Appalachian National Scenic Trail*, and *Appendix D: National Register of Historic Places Properties Within One Mile of the Appalachian National Scenic Trail*.] The properties and districts that Grumet considered to be part of the Appalachian Trail are shown below in *Table II.F.1*:

Table II.H.1: National Register Properties and Districts on the Appalachian Trail
(districts are italicized*)*

New Hampshire
Tip-Top House (1853)

Massachusetts
Mount Greylock Summit Historic District
Tyringham Shaker Settlement Historic District
Westover-Bacon-Potts Farm

Connecticut
Bull's Bridge

Falls Village Historic District

New York
Bear Mountain Bridge & Toll House (1924)

New Jersey
High Breeze Farm

Pennsylvania

Boiling Springs Historic District
Carbon County Section of the Lehigh Canal
Waterville Bridge

Maryland
Washington Monument (1827; rebuilt 1934)
B & O Railroad Potomac River Crossing

West Virginia

Harpers Ferry Historic District

Virginia

Burke's Garden Rural Historic District

Skyline Drive Historic District

George T. Corbin Cabin and Stone Wall
Big Meadows Site

Georgia

Blood Mountain Shelter
Walasi-Yi Inn

The New Jersey Historic Preservation Office has determined that the following two properties within the Appalachian National Scenic Trail corridor in New Jersey are eligible for listing in the National Register of Historic Places:

Ring Quarry Prehistoric Archeological District
Delaware Water Gap National Recreation Area Section of the Appalachian Trail:

Potentially Contributing Resources: Grumet (2002) compiled a list of potential Contributing Resources (cultural resources that may be associated with National Register Properties) from literature sources, which include:

Herb Hiller Plaque
Kaiser Road
AMC Mohican Outdoor Center
Mohican Camp Road
Catfish Fire Tower (1922)
Millbrook-Blairstown Road
B-17 Crash Site (1944)
Housing Development Ruins
Blue Mountain Lakes Road (Flatbrookville Road)
Harding Lake Rockshelter
Rattlesnake Mountain Viewpoint
Bird Mountain Viewpoint
Brink Road Shelter (1970)
Brink Road
US 206/Worthington Bakery
Upper North Shore Road/Rt 636
Sunrise Mountain Road
Culver Fire Tower (1934)
Gren Anderson Shelter (1958)
Sunrise Mountain Pavilion (1937)

Sunrise Mountain Road
Crigger Road
Swenson Wood Road
Mashipicong Shelter (1936)
Deckertown Turnpike
Lake Rutherford
NJ 23
Rutherford Shelter (1967)
High Point Inn
  Kuser Family Mansion/
  High Point State Park Headquarters
High Point Monument (1930)
High Point Shelter (1936)

Other Potentially Historic Properties: In 2002, NPS cultural resource specialist Dr. Robert Grumet listed more than 1,290 individually named components of the Appalachian Trail's current built environment, using the most recent editions of Appalachian Trail guidebooks. These properties include shelters, viewpoints, improved roads, bridges, impoundments, buildings, monuments, towers, and railroad grades. At present, none of these features have been evaluated for their potential cultural significance. Resources already mentioned in this report, such as Trails, campsites, Trail heads, parking areas, and unnamed roads, rail grades, fences, walls, quarries, kilns, springs, and other features, are not included in these lists.

10. Section 106 Compliance

The Appalachian National Scenic Trail has worked with cultural resource specialists on staff at the NPS Northeast Regional Office, the Valley Forge Center for Cultural Resources, and Harpers Ferry National Historic Park to conduct Section 106 compliance actions. These undertakings include proposals by utility companies and transportation departments for pipelines, powerlines, road constructions, communication towers, and other utilities. Some of these undertakings, such as the Iroquois Pipeline, have been substantial. Section 106 compliance also is conducted for Trail management actions proposed by the Appalachian Trail Conservancy and Appalachian Trail-maintaining clubs, including parking areas, Trail relocations, shelters, footbridges, and Trailheads. Thus far, these have been small-scale developments, affecting fewer than 20 acres of Appalachian Trail lands during the past ten years.