

### SECTION 3: AFFECTED ENVIRONMENT

This section describes the characteristics of the existing environmental components previously identified as impact topics. This description provides a baseline for a comparative analysis of the potential effects of each of the alternatives presented in the Environmental Consequences section.

#### AIR QUALITY

The Clean Air Act of 1970 established national policy for protection, preservation, and enhancement of air quality. The 1977 Clean Air Act Amendments offered the highest level of air quality protection to National Parks with areas greater than 6,000 acres. These areas, including Great Smoky Mountains National Park, are designated Class I areas. Additional means of achieving this level of protection were provided in the 1990 Amendments to the Act. The Clean Air Act requires that federal land managers take responsibility for ensuring that air quality and air quality-related values in Class I areas are not degraded.

The U.S. Environmental Protection Agency, Tennessee Department of Environment and Conservation, and various local level administrative authorities are jointly responsible for protecting air quality within the state. The quality of air in a given region is managed under the auspices of the CAA by tracking the presence of certain airborne constituents known to have adverse effects on human health and the environment. These constituents are generally referred to as the “criteria” air pollutants, for which the U.S. Environmental Protection Agency has set both primary and secondary national ambient air quality standards. Primary standards represent air quality concentrations that are protective of public health. Secondary standards or “welfare” standards represent air quality concentrations that safeguard visibility, comfort, animals, and property from the deleterious effects of poor air quality. If the concentrations of these regulated airborne constituents are measured over a sustained period to be greater than the national standards, the subject region is designated as “non-attainment” for that regulated air pollutant. Specifically, national standards were established for the following air pollutants: carbon monoxide, lead, nitrogen dioxide, sulfur dioxide, ozone, and particulate matter. Under the national standards, particulate matter is regulated as  $pm_{10}$ , which are airborne particles with aerodynamic diameters of 10 microns or less in size; and  $pm_{2.5}$ , which are particles with aerodynamic diameters of 2.5 microns or less.

Blount County, as well as a number of other counties in the Knoxville Urban Area, were designated “non-attainment” for the 8-hour standard for ozone on April 15, 2004. In response to a proposal from the Governors of Tennessee and North Carolina, the entire Great Smoky Mountains National Park was also designated non-attainment for the 8-hour ozone standard. Consequently, steps needed to be taken to reduce emissions from both stationary and mobile sources in the non-attainment counties. On December 17, 2004, Blount County, as well as several other counties, was also designated as “non-attainment” for  $pm_{2.5}$ . Plans to meet the air quality standards for ozone were required by June 2007 and attainment was achieved by June 2009. Attainment of the particulate matter air quality standard must be achieved by April 2010.



Failure to meet air quality standards within this time frame could result in the loss of federal transportation funding in the region (East Tennessee Regional Clean Air Coalition 2006). In 2003, the East Tennessee Regional Clean Air Coalition was created by county governments to provide a regional focus on solving the air quality problems in the area. The coalition is a liaison between local government and industry and the Tennessee Department of Environment and Conservation to ensure that all parties remain involved in improving regional air quality.

The Great Smoky Mountains National Park has one of the most comprehensive air quality monitoring programs in the national park system. The current system includes nine weather stations, three atmospheric deposition sites, and seven air quality monitoring stations. Over the past 24 years, air quality research and monitoring in the park indicates that emissions carried into the park by wind and air currents have significantly impacted park resources, visitor satisfaction, and public health. The primary source of emissions is the burning of fossil fuels such as coal, oil, and gas that produce sulfur dioxide and nitrogen oxides. Those primary pollutants chemically react with other compounds in the environment to produce secondary pollutants that include sulfates, nitrates, and ozone (NPS 2006a).

The following sections describe three parameters that are important indicators of air quality: visibility, ground-level ozone, and acid precipitation.

*Visibility* is recorded as the distance one can see in miles. Over the past 50 years, visibility in the park has declined approximately 80 percent in summer and 40 percent in winter (NPS 2006a). Annual average visibility is 25 miles, much less than the estimate of natural visibility conditions (113 miles) (NPS 2005). At times, visibility has dropped to less than 1 mile (NPS 2006a). However, visibility has improved over the past decade by approximately 20 percent on the worst visibility days, in response to more favorable weather conditions and pollution reductions required by the acid rain prevention program. Many pollutants contribute to reductions in visibility, but sulfur dioxide is the primary contaminant of concern. Chemical reactions of sulfur dioxide emissions from coal burning power plants with other atmospheric compounds produce miniscule sulfate particles. These particles scatter light and significantly contribute (83%) to reduce visibility (NPS 2006a). In 1999, the U.S. Environmental Protection Agency instituted the Regional Haze Rule that calls for states and federal agencies to work together to improve visibility in various national parks and wilderness areas, including the Great Smoky Mountains National Park. The program requires states to develop a program to achieve natural visibility conditions on the haziest days by 2064 (Federal Register 1999). In fall 2001, the Tennessee Valley Authority announced that scrubbers would be installed on five coal burning power plants to reduce sulfur dioxide emissions, including two power plants nearest to the park (Environment News Service 2001). These controls are anticipated to reduce sulfur dioxide emissions from those plants by more than 95 percent (NPS 2005).

The quality of air in the Great Smoky Mountains National Park is largely reflective of ambient ozone levels, which are not under the park's control. Ground level ozone is not the same as the protective ozone layer in the upper atmosphere that prevents the sun's harmful ultraviolet rays from reaching the earth. Ozone at ground level is produced during sunny conditions when nitrogen oxides combine with hydrocarbons. While vehicles do not emit ozone directly, they do emit nitrogen oxides and volatile organic compounds that react in the sunlight of the



atmosphere to form ozone. Ozone at ground level has many direct impacts. When ozone reaches 85 to 104 parts per billion at ground level, it can adversely affect the health of people who are active outdoors, especially children and those with respiratory illnesses. Consequently, the U.S. Environmental Protection Agency recommends that people in those populations limit their outdoor activity time when ozone reaches those levels (NPS 2006a). Harmful effects on people include coughing, sinus inflammation, chest pains, throat irritation, lung damage, and compromised immune system. Studies show that even healthy people who exercise or otherwise physically exert themselves in areas with high ozone levels experience a reduction in lung capacity over the short term. In addition to human health effects, adverse impacts to vegetation were documented. Field surveys reveal that 90 species of plants show symptoms of damage due to ozone exposure.

Ozone concentrations in the park have exceeded the national standards designed to protect public health, and vegetation throughout the park has foliar injury caused by ozone. Ozone levels tend to be higher during the warmer months between May through September. This coincides with the highest visitation periods at the park. Controlled studies indicate that levels of ozone in the park are harmful to 30 species of plants (NPS 2006a). Generally, higher ozone levels and greater damage to leaves is observed at higher elevations in the park. In addition, reduced growth rates were observed in specific plant species such as yellow-poplar and black cherry.

Ozone levels were increasing at the park until 1999, when the number of days that the national standard was exceeded peaked at 37 days. However, the trend reversed in the 21st century. In 2005, there were only seven days that the national standard was exceeded. During 2004, there were only two days the national standard was exceeded. This marked decrease was likely due to weather conditions as well as significant reductions in nitrogen oxide emissions in the eastern United States. The level of the exceedance also decreased. In 1999, the average exceedance at Look Rock in the park measured 104 parts per billion, while in 2009, the average exceedance measured 48 parts per billion. Tables 9 and 10 present historical data on ozone levels in the park. This trend is consistent with efforts being made in Tennessee to reduce statewide nitrogen oxide emissions. The 1999 nitrogen oxide emission inventory showed about 2022 tons per day of nitrogen oxide being emitted in Tennessee, while the 2007 emission inventory projection showed 1,439 tons per day (NPS 2006a).

The third parameter often examined when determining air quality is acid precipitation. The acidity of water is determined by the pH, a measure of hydrogen ion concentration. The pH is a log-base 10 scale from 0 to 14 in which a neutral solution, such as pure water, has a pH value of 7.0. Values lower than 7.0 are considered acidic, while those above 7.0 are alkaline (NPS 2006a). The pH of uncontaminated rainwater is 5.0 to 5.6 (slightly acidic). The pH of rainfall in the park averages 4.5, approximately 5 to 10 times more acidic than normal rainwater. Clouds with pH levels as low as 2.0 have been documented in areas of high elevation forests in the park (NPS 2006a).



<b>Year</b>	<b>Cades Cove</b>	<b>Clingmans Dome</b>	<b>Cove Mountain</b>	<b>Look Rock</b>	<b>Purchase Knob</b>
1990	ND	ND	4	5	ND
1991	ND	ND	1	2	ND
1992	ND	ND	3	5	ND
1993	ND	ND	7	4	ND
1994	2	3	6	10	ND
1995	ND	9	12	13	ND
1996	ND	7	12	8	ND
1997	ND	6	20	19	ND
1998	4	33	34	35	ND
1999	8	29	36	37	ND
2000	2	21	18	12	5
2001	ND	11	10	4	ND
2002	2	29	35	32	18
2003	1	3	3	9	ND
2004	ND	ND	1	2	ND
2005	ND	1	2	7	ND
2006	ND	20	19	17	2
2007	3	35	26	31	ND
2008	1	9	7	14	ND
2009	ND	0	0	1	ND

(1) Number of days that the National Ambient Air Quality Standard for Ozone (85 parts per billion) was exceeded

ND = No Data

Source: National Park Service air quality monitoring data from [www2.nature.nps.gov](http://www2.nature.nps.gov).

<http://www.nature.nps.gov/air/permits/ARIS/grsm/>



**Table 10 Ozone Exceedance Concentrations at Great Smoky Mountains National Park <sup>(1)</sup>**

Year	Cades cove	Clingmans Dome	Cove Mountain	Look Rock	Purchase Knob
1990	ND	ND	84	84	ND
1991	ND	ND	82	84	ND
1992	ND	ND	84	86	ND
1993	ND	ND	85	86	ND
1994	ND	ND	87	89	ND
1995	ND	79	90	93	ND
1996	76	84	91	93	ND
1997	76	88	93	95	ND
1998	79	94	97	98	ND
1999	83	98	100	104	ND
2000	85	102	101	104	ND
2001	81	98	96	96	ND
2002	79	98	96	94	ND
2003	76	92	92	92	ND
2004	73	87	86	91	82
2005	67	79	78	86	78
2006	56	62	58	58	53
2007	52	64	62	61	55
2008	47	58	56	56	52
2009	46	52	52	48	45

(1) Yearly arithmetic mean in parts per billion

ND = No Data

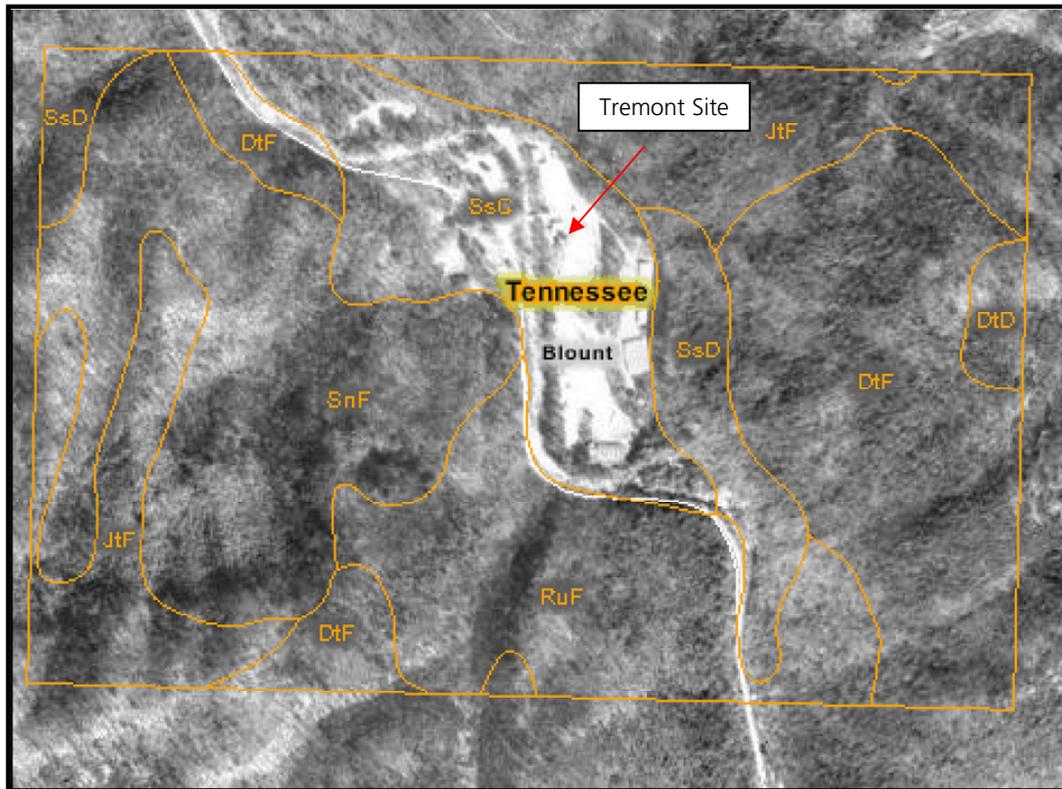
Source: National Park Service air quality monitoring data from [www2.nature.nps.gov](http://www2.nature.nps.gov).

Most streams at high elevations in the park have little buffering capacity to neutralize acids formed from sulfur and nitrogen emissions. The Noland Divide Watershed, located in the park in Swain County, North Carolina, receives some of the highest rates of nitrogen and sulfur deposition of any monitored location in North America (NPS 2006a). Research shows that certain high elevation forests receive so much airborne nitrogen that they suffer from advanced stages of nitrogen saturation. This condition limits the availability of forest nutrients, especially calcium, to plants and animals, and causes the release of toxic aluminum that can harm vegetation and stream-life.

## SOIL

Soil in the vicinity of Tremont has been mapped by the Natural Resource Conservation Service (USDA NRCS 2007a). A variety of soil types occur in the area, but only two soil types are present on the east side of the river in areas where construction is proposed, as shown in Figure 8.





**Figure 8. Soil Types on and in the Vicinity of the Tremont Institute site (SsC = Spivey-Santeetlah-Nowhere Complex; SsD = Spivey Santeetlah complex)(from NRCS 2007a).**

The following is a description of these two soil types:

- **Spivey-Santeetlah-Nowhere Complex:** This complex of stony soil occupies slopes of between 8-15 percent. This complex occupies the lower elevations on the site next to the Middle Prong of the Little River, and extends up to the base of the slope behind the activity center and dormitories. The dormitory and activity center are located on an elevated bench of soil created in the 1950s during construction of the original Civilian Conservation Center facilities. The bench was created by excavation of soil of this complex obtained from the area next to the river. Based on the soil map (Figure 8), the area occupied by the administration and maintenance building, staff quarters, Director’s home, main parking areas, roads, and the wastewater treatment ponds, as well as the area on the west side of the site across the river, are all occupied by the Spivey-Santeetlah-Nowhere Complex.
- **Spivey Santeetlah complex:** This complex occupies slopes of between 15-30 percent and is also very stony. This complex occupies the steeper slopes on the site above the activity center and dormitory, and the area above the wastewater treatment ponds.



These soil complexes are a mixture of different separate soil types described below, based on excerpts from the Natural Resource Conservation Service soil series descriptions (USDA NRCS 2007b):

- **Spivey Series:** The Spivey series consists of very deep, well-drained, soil with moderately rapid permeability. It formed in colluvium derived from materials weathered from low-grade meta sedimentary rocks. It occurs along drainageways, on benches and fans, and in coves in the southern Blue Ridge mountains (Major Land Resource Area 130B). Slope ranges from 2 to 95 percent. This soil type is well-drained. Permeability is moderately rapid in the upper part and rapid in the lower part. Index of surface runoff is very low on slopes less than 8 percent and low to medium on strongly sloping to steep slopes. The seasonal high water table is greater than 6 feet throughout most of the year. This soil receives surface and subsurface water from surrounding uplands, and seeps and springs are common.
- **Santeetlah Series:** The Santeetlah series consists of very deep, well-drained, moderately rapidly permeable soil on benches, fans, drainageways, and foot slopes in coves in the southern Appalachian Mountains. This soil formed in colluvium derived from materials weathered from metasedimentary rocks such as phyllite, metasandstone, and slate. Slope ranges from 2 to 95 percent. This soil type is well-drained and is characterized by very slow runoff where forest litter has had little or no disturbance and medium to rapid runoff where litter has been removed. It is characterized by moderately rapid permeability.
- **Nowhere Series:** The Nowhere series consists of very deep, poorly and very poorly drained soil in lower coves in the Blue Ridge (Major Land Resource Area 130). Runoff is very low where forest litter has not been disturbed and medium to rapid where little has been removed. Permeability is moderately rapid above the high water table. This series formed in colluvium from metasedimentary rock such as phyllite, metasandstone, and slate.

## WATER QUALITY

Tremont is located along the Middle Prong of the Little River, approximately 2 miles south of the main stem of the Little River (Figure 9). The Middle Prong flows from south to north, and enters the Little River just inside the park boundary near Townsend, Tennessee (Figure 1).

The Little River originates in the Great Smoky Mountains National Park where it is an “ecoregion reference stream” and classified as an outstanding national resource. The Little River Basin drains 242,207 acres, including parts of Blount, Knox, and Sevier Counties. Most of the basin (173,447 acres) is in Blount County. The Little River Basin is subdivided into 18 watersheds” (TVA 2003). The Little River watershed is located within U.S. Geological Survey Hydrologic Unit Code 06010201.



Water quality is the net result of point and nonpoint sources of pollution arising from different sources. The water quality of the Middle Prong of the Little River at Tremont is excellent, primarily because the site is located in a naturally forested valley in the park with limited amounts of impervious surfaces. Nonpoint runoff into the Middle Prong occurs from naturally vegetated areas of the park, the single paved road running up the valley from the Little River to the headwaters, and the Tremont campus parking lots and roads. Nonpoint discharges from man-made impervious surfaces have had a minimal effect on water quality in the Middle Prong because these areas are small in comparison with the largely undisturbed surrounding watershed.

A single point source discharge of treated wastewater (maximum permitted discharge of 10,000 gallons per day) occurs from the wastewater treatment system at Tremont and is managed under National Pollutant Discharge Elimination System permit No. TN0022594 (Appendix B)(TDEC 2002). Appendix B includes summaries of the effluent limits and monitoring requirements for this facility. No other point source discharges occur on the Middle Prong of the Little River. The system is in compliance with the permit.

The National Park Service operates water quality monitoring stations along the Little River above the confluence with the Middle Prong. No appreciable degradation of the water quality currently occurs in the Little River inside park boundaries (NPS 2006a). The water quality of the Middle Prong is excellent, based on the information available from other sources, as discussed in the following sections.

#### **State of Tennessee Designated Uses**

The Tennessee water quality standards have three sections (excerpted from TDEC 2006a). The first section establishes seven designated uses for Tennessee waterways. The second section identifies numeric or narrative water quality criteria to protect each of the designated uses, and the final section is an antidegradation policy designated to protect existing water uses and prevent future damage to water quality.

The criteria are applied to waterbodies as follows (excerpted from TDEC 2006a):

- All waterbodies are classified for multiple uses and may have several criteria for each substance or condition (pollutants).
- When multiple criteria are assigned for different uses on a stream, the regulation states that the most stringent criterion must be met.
- The combination of classified uses, the most stringent criterion for those uses, and the requirements of the antidegradation policy create the water quality standard for each waterbody segment.



The Tennessee Water Quality Control Board is responsible for the designation of beneficial uses of streams, rivers, lakes, and reservoirs in the state, as follows(excerpted from TDEC 2006a):

- Each waterbody is classified for at least two public uses: protection of fish and aquatic life and recreation. These minimum use classifications comply with the goals of the federal Clean Water Act, which requires that all waters provide for the “...protection and propagation of a balanced population of. . .fish and wildlife, and allow recreational activities in and on the water...” (U.S. Congress 2000 in TDEC 2006a). Additional classifications assigned by the State include irrigation and livestock watering and wildlife, drinking water supply, and navigation and industrial water supply.

The Clean Water Act 305(b) reports assigns the following specific designated uses to the Middle Prong of the Little River (TDEC 2006a): Fish and aquatic life, Trout Stream, Recreation, Livestock Watering and Wildlife, and Irrigation. The following is a summary of these designated uses, excerpted from the 2006 Clean Water Act 305(b) water quality report (TDEC 2006a).

- **Fish and Aquatic Life** – This use classification is assigned to all waterbodies for the protection of fish and other aquatic life such as aquatic insects, snails, clams, and crayfish. While Tennessee does not currently have a system that creates tiers of aquatic life protection (e.g., warm water vs. cold water fisheries), the state has developed regional interpretations of some criteria such as nutrients and biological integrity. Additionally, trout waters have more stringent criteria for dissolved oxygen and temperature.
- **Recreation** – All waterbodies in Tennessee are classified for the protection of the public’s ability to swim, wade, and fish. Threats to recreational uses of streams include the loss of aesthetic values due to algae or turbidity, elevated pathogen levels, and the accumulation of dangerous levels of metals or organic compounds in fish tissue.
- **Irrigation** - This use classification is assigned to most waterways to protect the ability of farmers to use streams or reservoirs as a source of water to irrigate crops.
- **Livestock Watering and Wildlife** – This use classification protects waters to be used as an untreated drinking water source for livestock and wildlife.
- **Industrial Water Supply** - This classification is assigned to waters currently used for industrial purposes. If needed, additional waters may be designated as industrial water supplies.

Tennessee water quality standards also include an antidegradation policy, which protects existing uses of all surface waters and prevents degradation in waters identified as high quality. In high quality waters, degradation can only be allowed if it is in the public interest and there are no other options. Degradation in impaired waters cannot



be authorized for parameters of concern. The antidegradation policy (Chapter 1200-4-3-.06) employs the following system of tiers (TDEC 2006a):

- Tier I: Existing uses will be maintained by application of the general water quality criteria. Additional loadings of specific pollutants cannot be allowed if the water quality standard for those substances is currently being violated. Degradation can be allowed if the water has assimilative capacity, but only if nondegrading alternatives are unavailable. The degradation must be in the public's interests.
- Tier II: No degradation will be allowed unless and until it is demonstrated that a change is justifiable as a result of necessary economic or social development and will not interfere with or become injurious to any classified uses existing in such waters.
- Tier III (Outstanding National Resource Waters): These constitute an outstanding national resource, such as waters of national and state parks, wildlife refuges and waters of exceptional recreational or ecological significance. No degradation will be allowed in these waters.

High quality waters are those identified as having good water quality, important ecological significance, or outstanding scenic or recreational characteristics. The waters with the highest degree of protection are identified as Outstanding National Resource Waters. These waters are specifically designated by the Water Quality Control Board and are listed in the regulation. No new discharges, expansions of existing discharges, or other regulated activities that would cause degradation may be permitted in these waters. The Little River inside the park is officially designated as a Tier III Outstanding National Resource Waters by the State of Tennessee. This would include the Middle Prong of the Little River.

### **303(d) List**

The 303(d) list is a compilation of streams and lakes in Tennessee that are “water quality limited” or are expected to exceed water quality standards in the next two years and need additional pollution controls (TDEC 2006b). Water quality limited streams are those that have one or more properties that violate water quality standards. They are considered impaired by pollution and not fully meeting designated uses (TDEC 2006b). Additionally, the 303(d) List prioritizes impacted streams for specialized studies called Total Maximum Daily Load. The Little River within the park, including the Middle Prong, are not included on the State of Tennessee 303(d) list (TDEC 2006b).

## **AQUATIC RESOURCES**

Aquatic resources located within the project area include fish, reptiles, amphibians, and benthic invertebrates. Many reptiles and invertebrates, and all amphibians spend a portion of their life cycles in aquatic environments. Approximately 41 species of reptiles, including 24 snakes, nine lizards, and eight turtles are known to occur in the park. The



park also contains 31 species of salamander and 13 species of frogs and toads (NPS 2007b). Aquatic resources in the vicinity of the proposed project are associated primarily with the Middle Prong of the Little River and the two man-made wastewater treatment ponds located on the east side of the river.

### **Middle Prong of the Little River**

#### ***Benthic Invertebrates***

As described in the Water Quality Section, the Little River is classified as an Outstanding National Resource Water and was also chosen by the Tennessee Division of Water Pollution Control as a reference site in a program to help implement water quality standards. Because the Middle Prong is part of the Little River watershed within the park boundaries, conditions for benthic invertebrates are similar, but not identical, to the main stem of the Little River. Since no detailed quantitative studies of the benthic invertebrates of the Middle Prong have been published, and because water quality is also very high in the Middle Prong, the following conclusions made for the Little River apply in general to the Middle Prong (these are excerpted from the Environmental Impact Statement for the Elkmont Historic District Project)(NPS 2006a):

- Benthic community research supports water quality data indicating that the Little River contains water that is not degraded and has low levels of contaminants.
- Benthic invertebrate surveys are conducted annually on the Little River by park personnel at a sample site located approximately 3 miles upstream from Elkmont, with access from the Little River Trail. Researchers follow protocols similar to the Rapid Bioassessment Protocols of North Carolina's Department of Environment/Water Quality. They assess species diversity and determine a Biotic Index score (ranging from poor to excellent) for each stream site. Since invertebrate species vary in their level of tolerance for chemicals and contaminants in water, species composition and richness tend to change as water quality declines. The biotic index takes into account both the number of species present and the level of tolerance the species show for pollutants. The highest value is assigned to species that are most sensitive to pollution, and the lowest is given to species found in polluted waters as well as clean aquatic ecosystems.
- Calculation for the biotic index utilizes both species abundance and the tolerance value, and then assigns an index value from poor to excellent based on a particular range. From 1993 to 2000, surveys found between 52 and 82 invertebrate species at the Little River sampling site, and biotic index scores ranged from good to excellent (Table 11).



**Table 11 Little River Benthic Invertebrate Data**

Year	Number of Species	Biotic Index Score
2000	63	Good
1999	64	Excellent
1998	52	Good
1997	72	Good
1996	No Data	No Data
1995	76	Excellent
1994	82	Excellent
1993	No Data	No Data
<i>Source: NPS 2006a</i>		

Because conditions are also excellent for benthic invertebrates in the Middle Prong, it would be expected that benthic populations in the Middle Prong would also be characterized by highly diverse and abundant populations. This also implies fish in the Middle Prong are provided with a diverse and abundant supply of food in the form of aquatic insects.

Dr. Edward DeWalt conducts stonefly inventories in the Middle Prong of the Little River in the vicinity of Tremont and has published scientific papers on these and other benthic invertebrates in the area (DeWalt, et al. 2005; DeWalt, et al. 2007). Dr. DeWalt commented that some unusual species of stoneflies emerge in winter that are of special interest to all Taxa Biodiversity Inventory scientists.

### *Fish*

A total of 27 species of fish is reported for the Middle Prong of the Little River (Table 12). This is the largest number of species of any stream or river in the entire park (NPS 2007d). This is related to the outstanding water quality and abundant and diverse populations of benthic invertebrates in the Middle Prong of the Little River.

Table 12 summarizes the results of the fish sampling programs in the park (excerpted from the Elkmont Historic District Environmental Impact Statement)(NPS 2006a). This information was used to interpret the characteristics of fish populations in the Middle Prong of the Little River.



**Table 12 List of fish reported from the Middle Prong of the Little River (NPS 2006a)**

<u>Common Name</u>	<u>Scientific Name</u>
Rainbow Trout	<i>Oncorhynchus mykiss</i>
Brown Trout	<i>Salmo trutta</i>
Brook Trout	<i>Salvelinus fontinalis</i>
Central Stoneroller	<i>Campostoma anomalum</i>
Whitetail Shiner	<i>Cyprinella galactura</i>
Bigeye Chub	<i>Hybopsis amblops</i>
Warpaint shiner	<i>Lucilus coccogenus</i>
River Chub	<i>Nocomis micropogon</i>
Tennessee Shiner	<i>Notropis leucidus</i>
Silver Shiner	<i>Notropis photogenis</i>
Saffron Shiner	<i>Notropis rubricroceus</i>
Telescope Shiner	<i>Notropis telescopus</i>
Blacknose Dace	<i>Rhinichthys atratulus</i>
Longnose Dace	<i>Rhinichthys cataractae</i>
Creek Chub	<i>Semotilus atromaculatus</i>
Northern Hogsucker	<i>Hypentelium nigricans</i>
Black Redhorse	<i>Moxostoma duquesnei</i>
Rock Bass	<i>Ambloplites rupestris</i>
Small Mouth Bass	<i>Micropterus dolomieu</i>
Greenside Darter	<i>Etheostoma blennioides</i>
Redline Darter	<i>Etheostoma rufilineatum</i>
Tennessee Snubnose Darter	<i>Etheostoma simoterum</i>
Wounded Darter	<i>Etheostoma vulneratum</i>
Tangerine Darter	<i>Percina aurantiaca</i>
Gilt Darter	<i>Percina evides</i>
Mottled Sculpin	<i>Cottus bairdi</i>
Banded Sculpin	<i>Cottus caroliniae</i>

The ongoing fishery management program at the park was initiated in the mid-1980s by the park's Fisheries Division of the Natural Resources Branch in the Division of Resource Management and Science. Overall program objectives are to assess fish communities and annual variation in both population density and biomass in large and small stream sites that best represent in-stream habitat. Sampling sites were selected to provide elevation profiles typical of mountain streams in the park, and data are generally collected on an annual basis. Specific program objectives include: (1) monitoring native brook trout distribution, (2) monitoring large stream fish communities and evaluation of angle use, (3) restoring populations of native brook trout in selected streams, and (4) monitoring atmospheric and geological deposition throughout the park. A total of four sampling sites are located within or near the Elkmont District, including two sites on the Little River and two sites on Jakes Creek. One of the Little River sites is located just below the Elkmont Road junction with U.S. 73 at elevation 1,980 feet; the other site is located upstream near the Little River truck road turnaround (elevation 2,300 feet). The two sites on Jakes Creek are located upstream from the cabins; the site farther downstream begins at the pump house and ends 328 feet below it 2,320 feet. The upstream site begins at the stream crossing on Meigs Mountain trail at 2,480 feet.



Data from three large streams in the park are collected in a large stream monitoring study. Since 1986, fish population estimates have been conducted at sampling sites on Cataloochee Creek, Little River, and Abrams Creek. Abrams Creek had 18 species, which was the highest number of all the streams sampled. The Little River had the second highest number of species (12), followed by Cataloochee Creek, which supports several species. Species diversity appears to increase in a downstream direction. Species diversity and composition of the three streams sampled are indicative of coldwater and coolwater ecosystems (Moore and Kulp 1994 in NPS 2006a).

Some of the most common fish species found in the Little River include mottled sculpin (*Cottus bairdii*), longnose dace (*Rhinichthys cataractae*), northern hogsucker (*Hypentelium nigricans*), river chub (*Nocomis micropogon*), stone roller (*Campostom anomalum*), saffron shiner (*Notropis rubricroceus*), and the rainbow trout (*Oncorhynchus mykiss*), a species not native to Tennessee.

In general, fish in the Salmonidae Family (trout, whitefish and salmon) require cold, clean water habitat with pools and riffles. For many visiting the Elkmont District, these fish are an important resource, providing recreational fishing opportunities. Comparing the three streams, mean salmonid biomass was greatest in Cataloochee Creek, 82.2 pounds (lbs)/acre, followed by Little River, 74lbs/acre, and Abrams Creek, 72.4lbs/acre. Mean salmonid density followed the same trend. Of the three large streams sampled, Abrams Creek supported 14 species of nongame fish, the Little River supported ten species, and Cataloochee Creek supported five. Non- game species comprise 50.3 percent of the biomass in the Little River. The major factors influencing these populations are droughts and floods. Major droughts occurred in 1987 through 1989 and 1999 through 2001, whereas a major flood (greater than 1,000 cubic feet per second) occurred in 1994.

In conclusion, the Middle Prong of the Little River is characterized by a high diversity of fish, even higher than the Little River. This is a result of the pristine nature of the watershed of the Middle Prong. Consequently, any disruptive pollutant causing activities in the watershed that affect water quality would have a potential for causing adverse effects to the diversity and abundance of fish in the Middle Prong.

### ***Reptiles***

The northern water snake (*Nerodia sipedon sipedon*) occurs on the site (GSMIT 2007). This is both a carnivorous species and a scavenger that feeds along the edge of rivers and streams on small fish (alive or dead), frogs (adults and tadpoles), large insects, worms, leeches, crayfish, salamanders, young turtles, juvenile snakes, and small birds and small mammals such as white-footed mice. At night, they feed on minnows and other small fish (University of Iowa 2007; University of Michigan 2007).

### ***Amphibians***

The Middle Prong is unusual in that it harbors a large number of different types of salamanders, including the Eastern Hellbender (*Cryptobranchus alleganiensis*). The



Eastern Hellbender is the largest salamander in North America, with some adults measuring over 2 feet long. The excellent water quality and abundance and diversity of food sources for amphibians makes this possible. The best habitat is in the river, not the tributaries (NPS 2007). This species might spend up to two years as an aquatic larva before becoming terrestrial as an adult (NPS 2007e). As part of the ongoing educational program at Tremont, Lee University (Dr. Michael Freake) conducted tagging studies in the Middle Prong at Tremont, but no scientific papers were published. More than 40 animals have been tagged to date and many juvenile hellbenders have been found (NPS 2007f).

The Junaluska salamander (*Eurycea junaluska*) also occurs on the site or in the immediate area. Approximately four to five individuals have been observed on the Tremont site or in the immediate area (NPS 2007f).

### Wastewater Treatment Ponds

Two active, man-made wastewater treatment ponds located on the east side of the Middle Prong (Figures 2 and 3). These ponds also support aquatic life.

The southern pond receives wastewater from the package treatment plant located on the west side of the Middle Prong. This plant was repaired early 2007, and prior to that, a system of vault septic tanks was employed to store waste from the campus. Wastewater from this system is pumped underneath and across the river and into the southern pond. Water levels in the southern pond are relatively constant and vary approximately 1-2 feet during the year (GSMIT 2007c).

Overflow from the southernmost pond flows via a standpipe into the second and smaller pond located immediately to the north. The northern pond serves as a safety retention basin for overflow from the southern pond. Water from the northern pond varies considerably in height during the year and is dependent of the amount of wastewater overflow from the larger southern pond. Because water levels in the southern ponds vary greatly, this pond can go dry during periods of low flow. Water levels in the southern pond are more constant than the northern pond, and typically vary by only 1-2 feet (GSMIT 2007c).

Water in the ponds, when present, infiltrates the soil beneath the site and enters the groundwater, which flows to the north in a downgradient direction. The ponds experience major changes in water levels during the year, related to changes in flow from the treatment plant, as well as natural variation in rainfall.

During a second field trip conducted by the National Park Service in August 2006, the northern pond was dry. Vegetation surrounding the northern pond is primarily upland because of the steep slopes leading into the ponds. The bottoms of the ponds were populated by a mix of arrow-leafed tearthumb (*Polygonum punctatum*) (which occurs rather infrequently in the park), Japanese stilt grass (*Microstegium vimineum*), Camus, a highly invasive nuisance species and various sedges (*Carex sp.*), *Boehmeria sp.*, *Lobelia sp.*, *Sagittaria*, and various rushes. Japanese stilt grass is actually toxic to other plants, and poses a problem on the Tremont site because deer help to spread this species.



The arrow-leaved tearthumb also occurs in the wastewater treatment ponds. This plant occurs infrequently in the park, and provides valuable habitat for other forms of aquatic life (NPS 2009b).

The ponds support large populations of frogs. The wastewater treatment ponds on the eastern side of the Middle Prong support many frogs, including wood frogs (*Rana sylvatica*), green frogs (*Rana clamitans*), American toads (*Bufo americanus*), grey tree frogs (*Hyla versicolor*), and a variety of large turtles, including large snapping turtles (*Chelydra serpentina*) (GSMIT 2007f). In the spring, a major frog migration occurs to the two ponds. The frogs lay eggs in mid winter (January/February) to avoid predation.

## VEGETATION – NATIVE PLANT COMMUNITIES

The National Park Service has mapped the terrestrial plant communities in the park using a variety of methods (NPS 2006a). The plant community present on the Tremont site is classified as the “Appalachian Montaine Alluvial Forest” community (NPS 2006a). This type of vegetation covers the majority of the Tremont site and is absent in the central field and parking area near the basketball court, and all areas occupied by buildings. The following discussion is excerpted and modified from the classification of terrestrial vegetation by the University of Georgia Center for Remote Sensing and Mapping Science publication entitled “*Vegetation Classification System for Mapping Great Smoky Mountains National Park*” (University of Georgia Department of Geography Center for Remote Sensing and Mapping Science 2008).

Maps for the park are based on the Community Element Global system developed by the Association for Biodiversity Information. This system changed to NatureServe in 2001 and currently maintains databases to support the U.S. National Vegetation Classification System and the plot data upon which it is based. The Community Element Global system assigns a unique identifier code to each vegetation association (community) in the central biodiversity database. The second source of vegetation data is the Center for Remote Sensing and Mapping Science and NatureServe. Aerial photo interpretation and field verification were used to develop maps and a database that describes the vegetation communities in the park.

The resulting map of plant communities is a combination of the Center for Remote Sensing and Mapping Science system and the Vegetation Classification System for Mapping Great Smoky Mountains National Park. The hierarchy in the terrestrial system includes seven levels, five coarser physiognomic levels and two finer floristic levels. Vegetation community types that have common configurations and roughly defined environmental factors are combined in the same formation. Characteristics such as vegetation type (forest, woodland, shrubland), growth habit (annual or perennial), leaf characteristics (needle-leaved, evergreen, deciduous), and whether the vegetation was planted versus naturally occurring are used to distinguish these formations. Each formation consists of “alliances,” which refers to a group of plant “associations.” The association is defined as “a plant community of definite floristic composition, uniform habitat conditions, and uniform physiognomy.” The association for the Appalachian



Montane Alluvial Forest is defined as “*Platanus occidentalis – Liriodendron tulipifera – Betula (alleghaniensis, lenta) / Alnus serrulata – Leucothoe fontanesiana*” (UGA CRSMS 2008).

The Global Conservation Status rank identified for the Appalachian Montane Alluvial Forest is defined as “G2?” based on factors such as current geographic extent, threats, number of distinct occurrences, degree of decline from historic extent and degree or alteration of natural processes affecting the dynamics, composition, or function of the type (Nature Serve 2008). The “G2?” classification is defined as follows:

- G2 = Imperiled = generally six to 20 occurrences and/or fewer remaining acres or very vulnerable to elimination throughout its range due to other factor(s).
- ? = a question mark added to a rank expresses an uncertainty about the rank in the range of 1 either way on the G1 to G5 scale.

The following is a summary of information on this plant community excerpted from the recent Environmental Impact Statement on the Elkmont Historic District (NPS 2006a):

- This association covers alluvial forests of Southern Blue Ridge mountains and nearby portions of the inner Piedmont. In the park, it is associated with narrow, rocky floodplains and islands of medium to large streams, especially sections of streams that are flat or gently sloping. This community is naturally uncommon in the Southern Blue Ridge. Well- developed examples are rare due to past clearing for agriculture and development.
- Floodplain forests in the southern Appalachians are among the most ecologically diverse plant communities in North America. Because of the high fertility and topographic protection of these sites, the tallest trees in eastern North America are found in this community type, with mature trees typically reaching heights of 165 feet or more. The tallest recorded tree in the park and in the State of North Carolina is located in this forest community type and measured 234 feet prior to storm damage in 2004. Earliest historical accounts by European settlers and explorers describe the magnificence of Montane Alluvial Forests.
- Much of the ecological diversity and importance of Appalachian Montane Alluvial Forests extends from the unique structure, biota, and ecosystem processes created by their environment. Because they occur at the bottom of extremely steep, high gradient upland drainages, floodplains serve as a collection point for soil and other material deposited by water flow and gravity. The resulting deep soil is typically rich in nutrients and organic matter and may contain multiple buried soil horizons. In addition, flooding and deposition within the river floodplains results in a diverse patchwork of habitats. Within a mile stretch of montane alluvial forests, one may encounter rich areas of deposited soil and debris teeming with invertebrates and fungi, scoured areas that provide important habitat for rare species, and small depressional pools that are intermittently flooded and provide necessary habitat for breeding amphibians. The biological diversity of montane alluvial forest floodplains has



received little study, but cursory work conducted as part of the Ravensford Land Exchange in North Carolina revealed a rich flora and fauna with dozens of undescribed species.

- Impacts to montane alluvial forests represent a critical, negative impact both within and outside park managed lands. The most recent vegetation mapping identifies 6,590 acres of this plant community type within the park, or approximately one percent of the park's total area. However, the amount of this plant community found within the floodplains of large rivers and streams within the park is a small fraction of this total.
- Steep upland drainages may have many of the same overstory species and may be classified as the same community type, but they typically lack the biological and structural diversity of floodplain forests. Montane alluvial forests are threatened by disturbances that cause changes in hydrology, and many of these sites were the first to be settled due to their flat terrain and access to waterways. Following establishment of the park, floodplains continued to be used for roads, visitor centers, and Civilian Conservation Corps camps [for example, the Tremont]. In addition, a significant number of these floodplain forests (Hazel Creek, Eagle Creek, Abrams Creek, etc.) were lost with the creation of two reservoirs.
- The continuing loss of floodplain forests has led to their classification as “rare” or “imperiled” by many organizations and agencies. For example, biologists from the North Carolina Department of Environment and Natural Resources and the Tennessee Department of Environment and Conservation have described the floodplain forests of the Elkmont District as rare and highly significant. Further, due to the linear nature of floodplain forests, restoration of this and similar sites was described as important to the long- term connectivity of adjacent upland forest communities.
- The National Park Service formally adopted the rating system developed by NatureServe as the definitive rating system for community vulnerability in the National Park Service Interim Guidelines for Assessment of Impairment to Natural Resources. NatureServe, the former science branch of The Nature Conservancy, designated montane alluvial forests as globally imperiled (G2) since they are very vulnerable to elimination throughout their range as a result of human land use, as previously described.
- The recently published Southern Forest Resource Assessment (USFS 2002), a combined effort of the U.S. Department of Agriculture Forest Service, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and The Tennessee Valley Authority, included floodplain forests as one of seven classes of critically endangered communities. This classification included floodplain forests with other biotic communities of documented rarity, including spruce - fir forest, wetlands, long- leaf pine, and prairies. According to the assessment, most floodplains are in private ownership and their future depends on the decisions of



numerous ownerships with varying objectives that typically do not include conservation.

- The Appalachian Montane Alluvial Forest community type represents a late successional forest community. However, as is the case in the Elkmont District, because of perpetual disturbance at the Tremont site for at least the past 100 years, including intensive lumbering operations, this plant community was heavily impacted.

In summary, a portion of the 10-acre Tremont site is occupied by Appalachian Montane Alluvial Forest, classified as globally “imperiled” by the Nature Conservancy. The Tremont site has been disturbed by past logging practices over the last 100 years as well as development associated with the Civilian Conservation Corps buildings and other facilities on the site, including Tremont.

### SPECIAL STATUS SPECIES

Table 13 provides a summary of information provided by Tremont regarding special status species that occur on the project site or in the vicinity (GSMIT 2007). Additional information was also included on the status of each species from other sources.

### ECOLOGICALLY CRITICAL AREAS, WILDERNESS, WILD AND SCENIC RIVERS, OR OTHER UNIQUE NATURAL RESOURCES

Because of its pristine nature, the Middle Prong of the Little River was designated as an “ecoregion reference stream and classified as an outstanding national resource” (TDEC 2006a). The Middle Prong is characterized by high water quality, highly diverse and abundant fish and benthic invertebrate populations, and an almost completely forested watershed located entirely within the park. As such, it would also be defined as an ecologically significant or critical area under the National Environmental Policy Act guidelines of the National Park Service (NPS 2001b).

The Middle Prong has been assigned seven ORVs, as shown below (NPS 2009a):

**Scenery (S):** The landscape elements of landform, vegetation, water, color, and related factors result in notable or exemplary visual features and/or attractions. When analyzing scenic values, additional factors -- such as seasonal variations in vegetation, scale of cultural modifications, and the length of time negative intrusions are viewed -- may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment.

**Recreation (R):** Recreational opportunities are, or have the potential to be, popular enough to attract visitors from throughout or beyond the region of comparison or are unique or rare within the region. Visitors are willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but are not limited to, sightseeing, wildlife observation, camping, photography, hiking, fishing and boating. Interpretive opportunities may be exceptional and attract, or have the potential to attract,



visitors from outside the region of comparison. The river may provide, or have the potential to provide, settings for national or regional usage or competitive events.

**Geology (G):** The river, or the area within the river corridor, contains one or more example of a geologic feature, process or phenomenon that is unique or rare within the region of comparison. The feature(s) may be in an unusually active stage of development, represent a “textbook” example, and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial, or other geologic structures).

**Fish (F):** Fish values may be judged on the relative merits of either fish populations, habitat, or a combination of these river-related conditions.

**Populations:** The river is nationally or regionally an important producer of resident and/or anadromous fish species. Of particular significance is the presence of wild stocks and/or federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of species is an important consideration and could, in itself, lead to a determination of “outstandingly remarkable.”

**Habitat:** The river provides exceptionally high quality habitat for fish species indigenous to the region of comparison. Of particular significance is habitat for wild stocks and/or federal or state-listed (or candidate) threatened, endangered, or sensitive species. Diversity of habitats is an important consideration and could, in itself, lead to a determination of “outstandingly remarkable.”

**Wildlife (W):** Wildlife values may be judged on the relative merits of either terrestrial or aquatic wildlife populations or habitat or a combination of these conditions.

**Populations:** The river, or area within the river corridor, contains nationally or regionally important populations of indigenous wildlife species. Of particular significance are species considered to be unique, and/or populations of federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of species is an important consideration and could, in itself, lead to a determination of “outstandingly remarkable.”

**Habitat:** The river, or area within the river corridor, provides exceptionally high quality habitat for wildlife of national or regional significance, and/or may provide unique habitat or a critical link in habitat conditions for federal or state-listed (or candidate) threatened, endangered, or sensitive species. Contiguous habitat conditions are such that the biological needs of the species are met. Diversity of habitats is an



important consideration and could, in itself, lead to a determination of “outstandingly remarkable.”

**History (H):** The river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare or one-of-a-kind in the region. Many such sites are listed on the National Register of Historic Places. A historic site(s) and/or features(s) is 50 years old or older in most cases.

**Cultural (C):** The river or area within the river corridor contains archaeological sites or areas significant to traditional cultures. Examples might be American Indian burial grounds, petroglyphs, the oldest known human use site in a region, or streams that support traditional agriculture, subsistence fishing, or religious ceremonies.

In addition to the above classifications, the State of Tennessee has designated the Middle Prong of the Little River a Tennessee Outstanding National Resource Water. This is a State of Tennessee designation given to waters in state and national parks or with exceptional recreational or ecological characteristics.

Tremont is also located within the boundaries of the Great Smoky Mountains National Park, which is designated as a biosphere reserve and a world heritage site.

## WILDLIFE

The wildlife resources in the Tremont area include common large mammals (e.g., black bear [*Ursus americanus*] and white-tailed deer [*Odocoileus virginianus*]), medium-sized mammals (e.g., eastern cottontail rabbit [*Syvilagus floridanus*], striped skunk [*Mephitis mephitis*], opossum [*Didelphis virginiana*], woodchuck or groundhog [*Marmota monax*], red fox [*Vulpes vulva*], gray fox [*Urocyon cinereoargenteus*], and raccoon [*Procyon lotor*]), and several species of small mammals (e.g., various species of shrews, mice, and voles).

No surveys for protected wildlife species in the Tremont area have been conducted as part of this project. Previous studies and investigations concerning listed species found in the park have occurred and are presently ongoing. Investigations regarding these species are determined in consultation with National Park Service, U.S. Fish and Wildlife service, and Tennessee Wildlife and Resources Agency. Wildlife species potentially found within the park based on previous survey information include:

- Indiana Bat. The Indiana bat (*Myotis sodalis*) is a federal- and state-listed endangered species that utilizes cave habitats in the cove for winter hibernation. Indiana bats mate in the fall, but female Indiana bats do not actually become pregnant until spring. Indiana bats migrate to tree roost sites in the spring, where they form maternity colonies consisting of 20 to 100 members. The bats roost beneath the shedding bark of live or dead trees, bearing only one young per female. Females may relocate their young to warmer spots on the tree where the



**Table 13 Summary of Information on Special Status Species that Occur on the Tremont Site or in the Vicinity<sup>6</sup>**

Common Name (Scientific Name)	Federal Status <sup>1</sup>	State Status <sup>2</sup>	Global Rank <sup>3</sup>	State Rank <sup>4</sup>	Summary <sup>5</sup>
Southern Allegheny Woodrat ( <i>Neotoma magister</i> )	federal species of concern	D	G3/G4	S3	Occurs in dryish rock outcrops where it builds large stick nests. This species is known as the “packrat” of the park. There is a record for the Tremont site, and it does occur sometimes in buildings, but the valley bottom area is probably not significant habitat. It prefers rock outcrops that occur in the vicinity.
Eastern Hellbender ( <i>Cryptobranchus allegheniensis</i> )	federal species of concern	D	G3/G4	S3	This giant, aquatic salamander is believed to be declining range-wide. This species is found in a dozen or so of the larger park streams, but is adversely affected by siltation. It requires clean water and prefers flat rocks on the stream bottom, where it preys principally on crayfish. The Little River, of which the Middle prong at Tremont is a major tributary has the only significant population in the park. With the help of students at Tremont, Lee University (Unpublished) has tagged approximately 40 hellbenders in the Middle Prong of the Little River.
Junaluska salamander ( <i>Eurycea junaluska</i> ):	federal species of concern	D	G3	S2	This salamander has been found in the Little River where it might spend up to two years as an aquatic larva before becoming terrestrial as an adult. Little is known about this species, which has a world range of just several counties in Tennessee and North Carolina, in the vicinity of the west end of the park. Disturbance of stream banks and small eddy backwaters in streams, siltation and obstructions to terrestrial movements would be risk factors for this species.
Butternut ( <i>Juglans cinerea</i> )	federal species of concern	T	G4	S3	Butternuts occur in very small numbers in many of the watersheds of the Smokey Mountains. However they are not generally reproducing in the park or range-wide due to an introduced fungal disease and loss of habitat. Only a handful of populations larger than 20 trees occur in the park. A significant population occurs upstream of Tremont.



**Table 13 Summary of Information on Special Status Species that Occur on the Tremont Site or in the Vicinity<sup>6</sup>**

Common Name (Scientific Name)	Federal Status <sup>1</sup>	State Status <sup>2</sup>	Global Rank <sup>3</sup>	State Rank <sup>4</sup>	Summary <sup>5</sup>
					While the “footprint” of the project may not affect this declining tree species, Tremont does occupy its optimal habitat.
Diana fritillary ( <i>Speyeria diana</i> )	federal species of concern		G3/G4	S3	Tremont has conducted moth surveys for over 6 years. Since invertebrates are generally not as well known as vertebrate animals and vascular plants, state and federal rankings are not as well developed. However the Diana fritillary is a federal species of concern and is found in the Tremont area. It requires violets as host plants for its larvae, but little is known beyond that. Current research in the park may bring other habitat requirements to light.
Indiana bat ( <i>Myotis sodalis</i> )	LE	E	GS	S1	This bat appears to be declining range-wide. It both hibernates and has maternity colonies in the park. The Tremont project site is within a 5 mile radius of the principal hibernacula in the park, which carries U.S. Fish and Wildlife Service restrictions regarding land disturbing and tree removal activities. Maternity colonies also forage along roads, and creeks. Therefore, prior to construction associated with the proposed project, a site specific survey for this species would be required. This species would be sensitive to loss of maternity roost trees (if felled in summer), and artificial attraction of insects at night lighting.



**Table 13. Summary of information on special status species that occur on the Tremont site or in the vicinity<sup>6</sup>.**

Common Name (Scientific Name)	Federal Status <sup>1</sup>	State Status <sup>2</sup>	Global Rank <sup>3</sup>	State Rank <sup>4</sup>	Summary <sup>5</sup>
Climbing fumitory ( <i>Adlumia fungosa</i> )		T	G4	S2	This is a biennial vine. Its principal occurrence in the park is within a kilometer upstream of Tremont. Sometimes seedlings get established for a period of time downstream in rocky areas with some sunlight. This species does not occur within the footprint of the proposed project area. Should development create a rocky, moist, sunny micro-site, this species could be considered for seeding, which would be a positive factor for this rare species.
Peter's Filmy fern ( <i>Trichomanes petersii</i> )		T	G4/G5	S2	This is one of the smallest ferns in North America. It occurs in moist outcrops near the valley floor around the Townsend "Y" and up toward Tremont. This species does not occur within the footprint of the proposed project, but could occur immediately to the south of the main site in rocky outcrops along the Middle Prong.
Rare invertebrates (Various Species, including <i>Pachypolia atricornus</i> )			Globally unknown		Rare invertebrates include the widespread, but very rare moth <i>Pachypolia atricornus</i> , a specimen of which has been captured at Tremont. Its status is listed by NatureServe as "globally unknown" since its occurrences are so enigmatic. There are other uncommon species of moths at Tremont as well.

**Footnotes:**

<sup>1</sup>Federal status:

Species of Concern: A species under consideration for listing, for which there is insufficient information to support listing at this time. These species may or may not be listed in the future, and many of these species were formerly recognized as "C2" candidate species

LE: Listed Endangered - Taxon is threatened by extinction throughout all or a significant portion of its range

<sup>2</sup> State status



D: deemed in need of special management - Any species or subspecies of nongame wildlife that the executive director of the TWRA believes should be investigated to develop information relating to populations, distribution, habitat needs, limiting factors, and other biological and ecological data to determine management measures necessary for their continued ability to sustain themselves successfully. This category is analogous to "Special Concern."

S: Special Concern - Any species or subspecies of plant uncommon in Tennessee, or with a unique or highly specific habitat requirements or scientific value and therefore requires careful monitoring of its status.

T: Threatened - Any species or subspecies likely to become an endangered species within the foreseeable future.

E: Endangered - Any species or subspecies whose prospects of survival or recruitment within the state are in jeopardy or are likely to become so within the foreseeable future

<sup>3</sup>Global Rank

G3: vulnerable - Rare and uncommon in its range or found locally in a restricted range, generally from 21-100 occurrences.

G4: apparently secure - Widespread, abundant, and apparently secure globally, but with cause for long-term concern.

G5: Demonstrably widespread and secure globally

<sup>4</sup>State Rank

S1: Extremely rare and critically imperiled in the state with five or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extinction

S2: very rare and imperiled in the State; from 6 to 20 occurrences, or few remaining individuals, or because some other factor(s) making it vulnerable to extinction"

S3: rare and uncommon in the State; from 21-100 occurrences known")

<sup>5</sup>GSMIT (2008)

<sup>6</sup> Status and rank definitions obtained from TN DEC 2009a (<http://www.state.tn.us/environment/na/pdf/Status&Ranks.pdf>); Status and ranks obtained from Tennessee List of Rare Species by County Tennessee Division of Natural Areas ([www.state.tn.us/environment/na/](http://www.state.tn.us/environment/na/))(June 2009b).



tree is exposed to sunlight, as temperature affects the length of time required for the young to mature (Britzke, et al. 2003 and 2006; USFWS 2007; Humphrey, et al. 1977). According to Dr. Susan Loeb, project leader of the USDA Forest Service Southern Research Station, Threatened and Endangered Species Unit, it is common for Indiana bats to move from roost to roost, carrying their young with them (Loeb 2002; USFWS 2007).

- Northern Carolina Flying Squirrel. Although the federal- and state-listed endangered northern Carolina flying squirrel (*Glaucomys sabrinus coloratus*) is listed as potentially being located in the Cades Cove USGS quadrangle, Thunderhead Mountain USGS quadrangle, as cited by National Park Service personnel, Upper Abrams Creek watershed, and Middle Prong Little River watershed, no known sightings of this species have been recorded in the cove or Laurel Creek Road corridor. The northern Carolina flying squirrel is known from five isolated localities: three in the western mountains of North Carolina (Yancey County, Haywood County, and in the vicinity of Mount Mitchell), and two localities in the eastern mountains of Tennessee (Carter and Sevier counties). Within the park, northern flying squirrels have been found in Swain and Haywood Counties, North Carolina, and Sevier County, Tennessee. This species is a high-elevation species not likely to be found in the Tremont area.

The park is a premier place for birds. From the high, exposed peaks, to the warmer, sheltered lowlands, some 240 species of birds have been found in the park. Sixty species are year-round residents. Nearly 120 species of birds breed in the park, including 52 species from the neo-tropics. Many other species use the park as an important stopover and foraging area during their semiannual migration. More birds will be heard than seen in the park's dense, tall forests, where more than 100 species of birds a day can be found during peak migration (late April and early May).

Migratory and resident bird species are well-documented in the park. Some common species sighted include juncos, mourning doves, chimney swifts, eastern phoebes, barn swallows, blue jays, indigo buntings, cardinals, towhees, sparrows, eastern bluebirds, eastern meadowlarks, field sparrows, red-winged blackbirds, crows, chickadees, wild turkeys, and warblers. Golden eagles have been sighted flying over the cove in autumn. The pileated woodpecker requires stands of dead and dying pines for its habitat, and has been found nesting in some portions of the cove where pines are prevalent. Open fields in the park provide habitat for red-tailed hawks, American kestrels, northern bobwhite quail, wild turkeys, killdeer, eastern bluebirds, field sparrows, and eastern meadowlarks. In the summer, areas nearby are visited by barn swallows, downy woodpeckers, ruby-throated hummingbirds, common yellowthroat, blue grosbeak, Acadian flycatchers, eastern wood pewees, blue-gray gnatcatchers, eastern kingbirds, barn swallows, yellow warblers, indigo buntings, and orchard orioles.



## SOCIOECONOMICS

Tremont is located in Blount County, Tennessee. The 2005 population of Blount County was 115,535, which represents a greater than nine percent increase in population since 2000 (U.S. Census Bureau 2006a). The growth in population appears to be slowing slightly in the county as the population grew over 23 percent between 1990 and 2000. However, the population in Blount County is projected to continue to grow to over 124,000 persons by 2020 (Knoxville Regional Transportation Planning Organization 2006b). There are six incorporated cities in Blount County: Alcoa, Friendsville, Louisville, Maryville, Rockford, and Townsend. The cities range in population (2003) from 247 persons to 25,062 persons. Maryville is the largest city in Blount County and is also the county seat. Townsend is the smallest city in Blount County and is the gateway to the northeastern portion of the Great Smoky Mountains National Park. Townsend is also the nearest city to Tremont.

In 2005, the median age of a resident of Blount County was 40.2 years of age (U.S. Census Bureau 2006a). This is nearly three years older than the median age for a Tennessee resident and nearly four years older than the median age for a U.S. resident. In 2000, the median age for a resident of Townsend was 55.7 years. This indicates that Blount County, and particularly Townsend, has a mature age composition. In 2005, approximately 95 percent of the population of Blount County was Caucasian, as compared to 81 percent of the State of Tennessee and 80 percent of the U.S. population (U.S. Census Bureau 2006a). Black residents comprised nearly 3 percent of Blount County's population and nearly 17 percent of the State of Tennessee's population in 2005. In addition, Hispanic residents comprised slightly more than 1 percent of Blount County's population and nearly 3 percent of the State of Tennessee's population in 2005.

The 2005 per capita income in Blount County is approximately \$300 higher than the Tennessee per capita income of \$22,090 (U.S. Census Bureau 2006a). The Tennessee per capita income is approximately \$3,000 lower than the U.S. per capita income. However, the 2005 median household income in Blount County is \$42,551 and the Tennessee median household income is \$38,874. A comparison of these figures indicates that the average Blount County household contains more wage earners than the average Tennessee household. The median household income in the United States is approximately 19 percent higher than the Tennessee figure. Only 10.3 percent of Blount County residents were living in poverty in 2003, compared to 13.5 percent of all Tennessee residents and 12.5 percent of all U.S. residents.

In 2004, approximately 39,863 persons were employed within Blount County. Manufacturing was the industry sector with the highest Blount County employment, with 18.7 percent of the total employment, and retail trade was second highest, with 15.1 percent of the total employment (U.S. Census Bureau, 2006b). In Blount County, health care/social assistance was third highest with 12.5 percent of the total employment, followed by construction with 12.2 percent of the total employment. Within the State of Tennessee, manufacturing was also the industry sector with the highest employment, with 16.7 percent of the total employment. However, health care/social assistance was



second highest, with 13.8 percent of the total employment, followed by retail trade, with 13.7 percent and accommodation/food service, with 9.2 percent of the total employment.

A study performed by Michigan State University in 2002 found that the spending of park visitors in the six-county area surrounding the park contributed \$446 million in increased sales to the area economy in 1997, which resulted in more than 11,700 jobs and value added of \$262 million (Stynes 2002). Value added is the sum of personal income, rents, profits, and indirect business taxes. It is the most commonly used measure of the contribution of a region or sector to gross state or national product.

When secondary effects of this spending are included, the overall beneficial economic impact of the park is over \$581 million in sales. In addition, the park has acted as a catalyst to attract additional tourist related industry to the area, such as the Dollywood theme park in Pigeon Forge. Tourists visiting the park may spend additional time in the area to enjoy these other attractions, which further increases the benefits to the area economy. The study did not isolate economic benefits for each county in the area, but did note that Sevier County received the greatest economic benefit from tourism. Sevier County, while representing only a fourth of the six-county region's population, accounts for 71 percent of the lodging sales, 77 percent of amusements, and 59 percent of restaurant sales and a third of retail trade. Sevier County is considered the primary gateway to the park and contains the communities of Gatlinburg, Sevierville, and Pigeon Forge. There are no studies to determine the economic benefits of Tremont to the community (NPS 2007c).

## TRANSPORTATION

The Great Smoky Mountains National Park and Tremont are located relatively close to large population centers. The park is less than a one-day drive for approximately half of the population of the United States. Approximately 78 percent of park visitors travel from areas east of the Mississippi with 40 percent originating in east north central states (Wisconsin, Illinois, Indiana, Michigan and Ohio), 24 percent from the south Atlantic states (from Maryland and West Virginia to Florida), and 14 percent from east south central states (Kentucky, Tennessee, Mississippi and Alabama) (NPS 2006a; 2006c; 2006d). Interstate Highway 75 provides access to the area from the north and south and Interstate Highway 81 provides access to the area from the northeast (see Figure 1). Interstate Highway 40 provides access to the area from the east and west. The Blue Ridge Parkway provides access to the area from the mid Atlantic coast states. Interstate Highway 26 provides access to the Asheville, North Carolina area located to the east of the park from the southeastern Atlantic coast states.

Access to the park from the Interstate Highway system is provided by U.S. 441 through Gatlinburg – Pigeon Forge, Tennessee and Cherokee, North Carolina. Access to the northeastern portion of the park, including Tremont, is provided by U.S. 321/Tennessee Route 73, also known as the Lamar Alexander Parkway from Townsend to Maryville. U.S. 321 connects the Tremont area of the park with Maryville and Sevierville,



Tennessee. This facility is a four-lane and five-lane roadway, with an approximate 3-mile section of two-lane roadway located south of the Foothills Parkway. In Townsend, this facility includes a bicycle path and a sidewalk. Year 2005 average annual daily traffic volume along this segment of the Lamar Alexander Parkway was 9,031 vehicles per day near Briar Branch Road (Knoxville Regional Transportation Planning Organization, 2006c). This facility generally operated at level of service “C” operating conditions on the 2 lane portion and level of service “B” operating conditions on the 4 lane segments in 2005. Level of service is a measure of the relative congestion on a roadway facility along a continuum ranging from free flow operating conditions (level of service “A”) to bumper to bumper congestion (level of service “F”). From Townsend, U.S. 321 travels to the east to provide access to Pigeon Forge and Gatlinburg. This section of U.S. 321 is also called Wears Valley Road. Year 2005 average annual daily traffic volume along this two-lane roadway was 5,638 vehicles per day. This facility generally operated at level of service “B” operating conditions in 2005.

Tennessee Route 73 enters the park to the south of Townsend and ties into the Laurel Creek Road/ Little River Road intersection. This three-lane roadway includes a 3-foot shoulder and bicycle/pedestrian facilities. Near the park, the roadway narrows to two lanes. The only signalized intersection in Townsend is at the intersection of U.S. Highway 321/State Route 73. Year 2005 average annual daily traffic volume along this segment of Tennessee Route 73 was 4,221 vehicles per day. This facility generally operated at level of service “C” operating conditions in 2005.

Laurel Creek Road continues to the west from Tennessee Route 73 to provide access to the Cades Cove area, a distance of approximately 7.5 miles. This roadway includes 2 to 10-foot lanes with no paved shoulder. The roadway is in very good condition, but includes no bicycle or pedestrian facilities. The speed limit along this road is generally 30 miles per hour, but is reduced to 25 miles per hour in congested areas. Year 2005 average annual daily traffic volume along Laurel Creek Road was 4,471 vehicles per day. This facility generally operated at level of service “C” operating conditions in 2005. This roadway experienced 13 traffic accidents in 2006, 6 traffic accidents in 2005, and 11 traffic accidents in 2004 (NPS 2007a).

Little River Road continues to the east from Tennessee Route 73 to provide access to the Sugarlands Visitor Center and to Cherokee and Gatlinburg via Newfound Gap Road (U.S. 441). It is approximately 17.5 miles from Tennessee Route 73 to U.S. 441. Little River Road includes 2 to 10-foot lanes with no paved shoulder. The roadway is in very good condition, but includes no bicycle or pedestrian facilities. The speed limit along this road is generally 30 miles per hour, but is reduced to 25 miles per hour in congested areas. Year 2005 average annual daily traffic volume along Little River Road was 3,364 vehicles per day. This facility generally operated at level of service “C” operating conditions in 2005. This roadway experienced 40 traffic accidents in 2006, 27 traffic accidents in 2005, and 26 traffic accidents in 2004 (NPS 2007a).

Tremont Road is a north-south roadway facility that provides access from Laurel Creek Road to the Tremont area. Tremont Road intersects the south side of Laurel Creek



Road just to the west of the intersection of Laurel Creek Road/Little River Road/Tennessee Route 73. Tremont Road parallels the Middle Prong of the Little River on the west bank for a distance of 5.1 miles. This roadway includes two 10-foot paved lanes with no paved shoulder from Laurel Creek Road to Tremont, a distance of approximately 2 miles. The grass shoulder adjacent to the roadway is narrow. The roadway is in very good condition, but includes no bicycle or pedestrian facilities. To the south of Tremont, Tremont Road is a 16-foot wide unpaved roadway to its terminus at the Middle Prong trail head, a distance of approximately 3 miles from Tremont. There are two single lane (11-foot wide) bridges along the unpaved portion of Tremont Road. There are numerous low radius, right angle curves along Tremont Road. The speed limit along this road is generally 25 miles per hour, but lowers to 15 miles per hour near Tremont. There are also approximately 15 pull-off areas along Tremont Road for short term parking. Traffic counts were not available for Tremont Road. Tremont estimates the traffic volumes that utilize Tremont Road to access the Tremont as follows (GSMIT 2006b):

- Two to four school buses or charter buses per week, each making several trips to and from Tremont.
- Three to four tractor trailers for food delivery each week.
- Two large cargo trucks with warehouse deliveries from the Great Smoky Mountains Association each week.
- Three garbage trucks per week.
- One to six delivery trucks per week.
- 10,000 visitors use the Tremont visitor center each year, primarily transported by automobile or light truck.
- 20,000 visitors park use Tremont to access the trailheads each year, primarily transported by automobile or light truck.

Therefore, on an average day, there could be 1.5 buses, one tractor-trailer, two medium delivery trucks, and 41 autos/light trucks accessing Tremont (assuming the visitors average two persons per vehicle). Therefore, average daily traffic volumes on Tremont Road would be less than 100 vehicles per day, not including vehicles that bypass Tremont to drive farther south to the Middle Prong trail head.

Large trucks are unable to negotiate some of the curves on Tremont Road without crossing the centerline. However, due to the low truck and auto traffic volumes, traffic accidents along Tremont Road are rare. This roadway experienced one traffic accident in 2006, zero traffic accidents in 2005, and one traffic accident in 2004 (NPS 2007a).

Although the average daily traffic conditions in the vicinity of Tremont are fairly uncongested, traffic levels increase at the park during certain times of the year. By observing the monthly variations in traffic recorded on Newfound Gap Road, it was determined that two peak traffic periods of interest occur during the year. These include



weekdays during the month of July and Saturdays during October (NPS 2006a). Traffic conditions similar to the peak weekday in July are expected to occur several times throughout the year. The peak Saturday traffic condition in October occurs only a limited number of times on especially “high visitation” days to the park.

An unknown portion of visitors to Tremont also visit the loop road at nearby Cades Cove, located approximately 6 miles from Tremont. The Cades Cove loop road can be very congested during these periods. As a result, a traffic study was initiated by the park for Cades Cove to determine needed transportation improvements or policy modifications.

An air quality non-attainment area must demonstrate actions that will bring it into conformity with air quality goals. There are links between transportation conformity and continued Federal Highway Administration and Federal Transit Administration funding of transportation plans, programs and projects. A non-attainment area may find it difficult to fund expanded or new facilities for single occupant vehicles and may be required to consider transportation alternatives. Examples of alternative transportation solutions include bus service, park-and-ride lots, intermodal facilities, bikeways, and bike parking facilities.

While transit service is currently not available in the Townsend or Tremont area, there is the potential for transit service in the future depending on the final alternative selected for the Cades Cove transportation improvement.

While transportation improvements are planned for other areas of the Knoxville urban area, the Foothills Parkway is the only improvement planned in the vicinity of southern Blount County (Knoxville Regional Transportation Planning Organization 2006a). The Foothills Parkway was originally authorized in 1944. Construction of the National Park Service - -owned scenic parkway began in 1960. The overall limits of the parkway are from U.S. 129 near Chilowhee Lake to I-40 in Cocke County, a distance of 72 miles. The road is intended to parallel the northern boundary of the Great Smoky Mountains National Park and will be totally contained within the State of Tennessee. The sections between U.S. 129 and U.S. 321 at Walland and between Cosby and I-40 are currently constructed and open to traffic. The section of the Foothills Parkway between U.S. 321 at Walland in Blount County and U.S. 321 at Wears Valley in Sevier County was under construction, but the fill used for road construction through depressions ultimately failed. This section is now proposed to be constructed in 2020 and was re-engineered to utilize bridges.

Farther to the north, a loop road around the southern perimeter of Maryville is planned for construction in the year 2030. Also, the extension of the Pellissippi Parkway (Interstate Highway 140/Tennessee Route 162) from Tennessee Route 33 to U.S. Highway 321 in Maryville is planned to be constructed in the future pending resolution of litigation regarding the adequacy of environmental documentation regarding the project. The Pellissippi Parkway currently connects Interstate Highway 40 west of Knoxville with Tennessee Route 33 near Alcoa. This facility would provide an extension



of I-140 to U.S. Highway 321 to the east of Maryville, essentially providing a limited access highway terminus within 8 miles of Townsend.

As indicated previously, Blount County and the Townsend area have a several high quality bicycling trails. The 8.4 mile Little River Run begins in Maryville and follows the Little River along the Lamar Alexander Parkway, terminating at the Tuckalaheechee Caverns (Smoky Mountain Convention and Visitors Bureau, undated). The Maryville–Alcoa Greenway is a 9-mile trail connecting Sandy Springs Park in Maryville to Springbrook Park in Alcoa. This trail is separated from major roadways and connects several schools and parks in the Maryville–Alcoa area. The Townsend Bicycle Trail is a bike path paralleling U.S. 321 through Townsend. The loop trail is approximately 9 miles long and provides access to numerous restaurants, shops, and hotels. Cades Cove in the park contains an 11-mile one way loop road that offers mild grades, awesome scenery, and historic structures. From Memorial Day through Labor Day, the road is closed to motor vehicle traffic on Wednesdays and Saturdays from sunrise to 10:00 A.M. and many bicyclists take advantage of this closing to ride around the loop road.

While most visitors to Tremont travel to the area by motor vehicle, there are alternative forms of transportation available. The airport in Blount County is an alternative transportation mode. The McGhee Tyson Airport is the primary commercial airport in the Knoxville urban area and offers many non-stop flights to cities in the eastern United States. It is located approximately 15 miles from downtown Knoxville, 20 miles from Townsend, and 26 miles from Tremont. With parallel 9,000-foot runways, the facility can accommodate any type of modern aircraft and handles approximately 858,000 annual enplanements (Knoxville Regional Transportation Planning Organization 2006b). There is no interstate passenger rail service available in the area, but Greyhound Bus Lines provides connecting service from Knoxville to 2,200 destinations throughout the United States (Knoxville Regional Transportation Planning Organization 2006c).

Within Tremont, a single access road provides service for guests, visitors, and service vehicles. The wide, single lane, unstriped roadway intersects the east side of Tremont Road and bridges the Middle Prong of the Little River. To the east of the river, the roadway accesses a 21-space parking facility for the administration building / maintenance building / bookstore on the north side of the road and a four-space auxiliary parking lot on the south side of the road. The access road curves to the south beyond the auxiliary parking lot and travels past the outdoor recreation area on the west side of the roadway. Farther south, a large (12,500 square feet) general purpose unstriped parking area/basketball court is located on the west side of the access road. This parking facility could accommodate 30 to 40 cars. The dormitory and dining hall / multipurpose building is located on the east side of the access road in this area and children often are required to cross the access road to get to their destination. A nine-space parking facility is located on the south side of the multipurpose building. Also, parking spaces for 12 vehicles and two small buses or large trucks are located along the



access road near the multipurpose building. Farther to the south, the access road passes the employee housing area with four apartment units and the executive Director's home. Six parking spaces are provided for the apartment units.

## **VISITOR USE AND EXPERIENCE AND VISUAL QUALITY/VIEWSHED**

### **Visitor Use and Experience**

Great Smoky Mountains National Park is the most visited national park in the nation. Situated within a day's drive of over half of the population of the United States, the park provides for public benefit and enjoyment of its resources by over 9 million visitors each year. The park encompasses more than 521,000 acres and contains 346 miles of roads, over 800 miles of maintained trails, more than 1,000 front-country campsites in 10 locations, 83 backcountry campsites, 18 backcountry shelters, three visitor centers, nine picnic grounds, and numerous scenic overlooks.

The highest recorded annual visitation occurred in 1999 with 10.3 million visitors. During 2005, the park entertained 9.2 million visitors. July recorded the most visitors at the park in 2005, with 14.5 percent of the annual visitation. The summer months of June to August experienced nearly 38 percent of the 2005 visitation. Approximately 37 percent of the visitors accessed the park through Gatlinburg and 15.5 percent accessed the park through Townsend (NPS 2006a). A survey conducted in 1996 found that approximately 21 percent of respondents entered the park at Townsend and approximately 19 percent exited the park at Townsend (University of Idaho 1997).

The Smoky Mountains Convention and Visitors Bureau is the official organization representing Townsend and Blount County, Tennessee. Also known as the "Peaceful Side of the Smokies," Blount County is a gateway community to the Great Smoky Mountains National Park. The community of Townsend in Blount County is located at the park boundary and is only 7 miles from Cades Cove, the most popular destination in the park. While the Townsend area does not have the tourist attractions available in the Gatlinburg – Pigeon Forge area, the area does attract visitors with arts and crafts, hiking, biking, tubing, horseback riding, live music, and a number of unique festivals. The Townsend area festivals for 2006 included:

- Early April – Spring Arts and Crafts Show
- Early May – Annual Spring Festival and Old Timers Day
- Early June – Trout Fest
- Early June – Pioneer Days (Maryville)
- Early July – Freedom Fest
- Early September – Country Fair
- Late September – Annual Heritage Festival and Old Timers Day
- Mid October – Foothills Fall Festival
- Early December – Christmas Parade



The Townsend area is also known as the “back porch of Cades Cove.” The Cades Cove Loop Road was the most visited site in the park. Approximately 54 percent of summer park visitors and 61 percent of fall park visitors drove on Cades Cove Loop Road (NPS 2006d).

Sightseeing was the most predominant activity enjoyed by the respondents of the 1996 visitor survey (University of Idaho 1997). Approximately 96 percent of the visitors enjoyed sightseeing at the park, followed by wildlife or wildflower viewing (73%), photography (56%), visiting historic sites (56%), and day hikes and walks (44%).

Three visitor centers are located within the park: Cades Cove, Oconaluftee, and Sugarlands. Ranger-led programs are conducted seasonally from each of these visitor centers. Other popular places to visit within the park include Roaring Fork Motor Trail, Cable Mill Complex (water-powered grist mill), Mingus Mill (turbine-powered grist mill), Newfound Gap, Clingmans Dome, Chimney Tops, Laurel Falls, Mountain Farm Museum, and Cataloochee.

While resource education and interpretation is one of many recreational user experiences within the park, it is perhaps one of the most important and is key to the overall objectives of the park. Over time, the general understanding and expectations of education has changed. In the 1970s, the National Park Service decided that providing residential environmental education facilities in parks was a good way to help achieve its education mission. The park originally partnered with Maryville College to provide this service at Tremont. In the mid 1980s, the Great Smoky Mountains Natural History Association took over this challenging responsibility. In 2000, Tremont began providing this educational service. The National Park Service and Tremont believes that long term, repeated exposure to nature and environmental education principles, such as that provided by centers like Tremont, are a core component to the park’s overall environmental education responsibility.

The Tremont program is dedicated to creating “environmentally literate” students who want to help preserve and protect places like the Great Smoky Mountains National Park for the future. Groups of all ages visit Tremont to live and learn, using the national park as an outdoor classroom. The students are challenged to grow in their understanding and care of the earth and its cargo of life. Courses are experiential, stressing “hands-on” participation in learning. The Tremont focus is on discovery and discussion, using important concepts as building blocks toward critical thinking skills. Year-round offerings include elder hostels, teacher training weeks, backpacking courses, summer youth camps, and weekend to week-long adult workshops on topics from wildflowers to local culture and history.

During 2005, 5,031 students of all ages attended classes at Tremont. Approximately 70 percent of these students were youth and the remaining 30 percent were adults (GSMIT 2006a). Since 2001, the annual number of students attending Tremont has ranged from a low of 4,739 in 2003 to a high of 5,496 in 2002. Students reside at Tremont an average of 3.8 days for their educational program. In 2005, a total of 82 school groups



attended Tremont from 14 states (GSMIT 2006a). When adult sessions were added, classes were attended by groups from a total of 30 states in 2005.

### Visual Quality/Viewshed

Sightseeing is the most popular activity at the park. There are numerous vantage points where spectacular vistas can be enjoyed. Clingman's Dome, the highest point in the park and in Tennessee, and the second highest point east of the Mississippi, is a favored vantage point for park visitors. Clingman's Dome is 6,643 feet above sea level and is accessed via Newfound Gap Road. A 54-foot observation tower was constructed at Clingman's Dome to allow visitors to see the viewshed above the trees. However, as mentioned in the Air Quality section of this design concept plan / environmental assessment, annual average visibility has been reduced to 25 miles due to air pollution, much less than the estimate of natural visibility conditions (113 miles) (NPS 2005). Local and state agencies are working to reduce this air pollution and to restore the spectacular vistas of years ago. For more information, see the Air Quality section of this document.

Tremont is surrounded by trees and has a limited viewshed. There is a clearing in the center of the site that provides a limited viewpoint to the south. The view to the south includes up-mountain views of the Smoky Mountains range.

### PUBLIC HEALTH AND SAFETY

As part of the Master Planning process for Tremont, the condition of the facilities was assessed in 2002 (Barge Waggoner, Sumner and Cannon 2003). Certain of the buildings were found to have problems that would relate to health or safety. A summary of these problems follows:

- River House –Needs repairs.
- Information/Gift Shop/Office/Shop – the entrance, office, and restroom areas do not meet Americans with Disability Act requirements.
- Gaylor Lodge Dormitory – the restroom/shower areas do not meet Americans with Disability Act requirements. The floors do not slope properly to the drains, causing water drainage problems. The building interior is damp and musty due to these water problems and the inability of the heating/ventilation/air conditioning system to remove moisture from the building. This has led to mold problems.
- Dining Hall/Activity Center/Classrooms – The first floor received a new fire alarm system in 2003, but the second floor, where classrooms are located, did not receive a new system. The restrooms do not comply with Americans with Disability Act requirements. The second floor classrooms are inaccessible to disabled persons. The activity center area smells damp and musty due to poor drainage on the exterior and the inability of the heating/ventilation/air conditioning system to remove moisture from the building. The service entrance to this building is located between the dormitory and the activities building.



## SOUNDSCAPE

Noise is basically defined as unwanted sounds. Things commonly considered noise producers at Tremont include airplanes, electric motors, pumps, and vehicles. However, whether something produces noise or a pleasant sound can also depend on perception of the receptor. For instance, certain people may define children playing or an accelerating motorcycle as noise and some people may define one or the other of these sounds as pleasant. The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

- The amount and nature of the intruding noise.
- The relationship between the background noise and the intruding noise.
- The type of activity occurring where the intruding noise is heard.

Sound currently heard within the Tremont site consists of natural sounds such as those generated by the river, the wind, rainfall, insects, birds, and other animals; human-produced sounds, such as those produced by people talking and children playing; and sounds made by mechanical equipment, such as those produced by vehicles carrying visitors or delivering supplies to the site, electric motors and compressors on heating, ventilation, and air conditioning equipment and maintenance equipment. The dominance of each of these sounds in the Tremont soundscape varies in accordance with the time of day and the season of the year. The land uses surrounding Tremont are heavily forested with hiking and fishing being the primary activities.

