3.0 AFFECTED ENVIRONMENT

3.1 Cultural Resources

This section presents a brief overview of the cultural history of the area and a description of the cultural resources within the District. Much of the following text is taken from the 1993 National Register of Historic Places nomination form for Elkmont (Thomason et al. 1993), the 2002 baseline report entitled "Cultural Resources of the Elkmont Historic District, Great Smoky Mountains National Park, Sevier County, Tennessee" (Cleveland et al. 2002), and from follow- up cultural resource investigations conducted in 2003 and 2004 to provide additional baseline information for use in impact analysis (Webb and Benyshek 2004). The cultural resources of the District are of three primary types: prehistoric and historic archeological resources (below ground evidence of human occupation), historic buildings, and other structures and cultural landscape features.

3.1.1 Site Prehistory and History

Environmental Setting

The current environmental setting of the District is described in detail in Section 3.2 of this document. However, to facilitate an understanding of the cultural history, it is important to understand the environmental setting and climate before and during human settlement. The District is located in a mountain valley and on adjacent slopes of the Appalachian Summit region in the Southern Blue Ridge physiographic province. It is characterized by rugged terrain, heavily forested slopes, and rushing streams with waterfalls. Today, its climate is humid and temperate. Temperatures were considerably colder in the southeast during the last glacial period (ca. 23,000—13,000 B.P.) and the landscape was covered with a boreal, northern coniferous forest dominated by pines and spruce. It is estimated that when the first known humans arrived in North America (ca. 18,000- 13,000 B.P.), the climate had warmed, precipitation increased, and the forest overstory at the lower elevations was composed of northern hardwood trees. From 6,000 to 3,000 B.P., another climate change occurred, referred to as the Hypsithermal, which is generally considered a period of continued warming and, possibly, less precipitation. Since that time, the climate has cooled somewhat, allowing for conditions that support different vegetation zones at various elevations.

Currently, a variety of forest types are found in the District and are dominated by species such as white pine, eastern hemlock, oak species, hickory and tulip tree. In addition, some areas include montane alluvial forest, a temporarily flooded cold- deciduous forest found typically on mid- elevation mountainous floodplains. Elkmont represents a higher elevation variant of this forest type. Montane alluvial forest is a relatively rare forest type due to the scarcity of well developed, broad floodplains in mountainous regions. This forest type is also rare because many floodplains in the region have been converted to agricultural areas or developed for other uses. Cove mixed hardwoods and oak hardwoods are often found on the adjacent slopes. The range of flora found in each of these forest types provided diverse habitats and support a variety of wildlife species, including white- tailed deer, black bear, bobcat, gray fox, beaver, otter, several squirrel species, turkey, and fish. Complete descriptions of vegetation communities of the District are provided in Section 3.2.2 of this document.

Table 3- 1: Generalized Cultural Chronology for Elkmont and the Appalachian Summit Region

Period	Phase or Subperiod	Chronology	Comments
Euro- American	Great Smoky Mountains National Park	1930s- present	Development of Elkmont Campground and other facilities
	Resort- Era (Elkmont)	Ca. 1910- 1934	Development of Wonderland Club, the Appalachian Club and resort cabins
	Railroad Logging	Ca. 1908- 1926	Intensive Little River Lumber Company logging of East Prong Little River; beginning of development of Town of Elkmont
	Settlement	1800s- 1830s	Ownby, Trentham, and other occupations along Little Rive and Jakes Creek
	Exploration and Early Settlement	Ca. 1750- 1800	Early exploration; no known occupation of Elkmont area
Historic Cherokee	Late Qualla	Ca . A.D. 1650- 1838	
	Early/Middle Qualla	Ca. A.D. 550- 1650	
Mississippian	Mississippian I (Tennessee)/ Pisgah (North Carolina)	1000- 550 B.P.	
Late Woodland	Undifferentiated	1500- 1000 B.P.	Possible Late Woodland manifestations include Hamilton, Cane Creek, and late Connestee materials
Middle Woodland	Connestee	1800- 1500 B.P.	Continues into Late Woodland period
	Woodland II (Tennessee)/ Pigeon (North Carolina)	2200- 1600 B.P./2500- 1800 B.I	Elkmont Sites 40SV120, 40SV166
Early Woodland	Woodland I (Tennessee)/ Swannanoa (North Carolina)	2900- 2200 B.P./3000- 2500 B.	
Late Archaic	Savannah River	5000- 3000 B.P.	Elkmont Site 40SV125
Middle Archaic	Guilford	6000- 5000 B.P.	
	Morrow Mountain	7500- 6000 B.P.	Elkmont Site 40SV125
	Stanly	8000- 7500 B.P.	
Early Archaic	LeCroy	8900- 8000 B.P.	
	Kirk	10,000- 8900 B.P.	
Paleoindian	Late	10,500- 10,000 B.P.	
	Middle	10,900- 10,500 B.P.	
	Early	11,500- 10,900 B.P.	
Pre- Paleoindian		40,000- 11,500 B.P.	Hypothesized early occupation of Eastern North America

Prehistoric Overview

Human occupation in the Appalachian Summit is divided into seven chronological periods: Pre- Paleoindian (40,000- 11,500 B.P.), Paleoindian Period (11,500- 10,000 B.P.), Archaic (9,500- 3000 B.P.), Woodland Period (3000- 1000 B.P.), Mississippian Period (1000- 550 B.P.), Historic Cherokee (550 B.P. – 1838), and Euro- American (1750 – present). Table 3- 1 illustrates the generalized cultural chronology of Elkmont. Human occupation in this region is evidenced by technology, settlement patterns, subsistence practices, population density, social organization, ideology and other cultural components.

Paleoindian Period

Documented human settlement is known from prior to 12,000 years B.P. elsewhere in the Eastern U.S., but none of these earliest Pre- Paleoindian human occupations have been found in the Appalachian Summit. Research in the Southeast has revealed evidence of human occupation from about 11,500 B.P. While evidence of Paleoindians has been found in Tennessee, there is sparse distribution of their remains in the Appalachian Summit. To date, no evidence of Paleoindian culture has been found within the District.

Archaic Period

The Archaic period in the Appalachian Summit can be divided into three subdivisions: Early (10,000–8000 B.P.), Middle (8000–5000 B.P.) and Late (5000–3000 B.P.). These divisions are largely recognized and based on temporal changes in style of projectile points. Both Middle and Late Archaic site components have been found within the District.

Woodland Period

The Woodland period in the Appalachian Summit is divided into three sub- periods: Early (3000–2500 B.P.), Middle (2500–1500 B.P.) and Late (1500–1000 B.P.). The Woodland period most likely marks a gradual transition in both subsistence and settlement patterns because a deciduous forest environment, similar to that found in the Archaic period, was exploited. Various tools introduced in the Archaic period, such as drills, wedges, hoes, nutting stones, pestles and awls, also appear in the archeological record of the Woodland period. The Woodland period in the Appalachian Summit is also marked by the beginnings of pottery making and the introduction of the bow and arrow. No Early or Late Woodland occupations are known from the District, but evidence of Middle Woodland occupations has been found at two locations.

Mississippian Period

The Mississippian period has been the subject of much research throughout the Southeast. In the eastern part of the Appalachian Summit, this period is marked by the Pisgah phase (1000- 550 B.P.), but it is currently believed that the Pisgah phase did not make a significant cultural impact in the North Carolina or Tennessee mountains west of the Tuckasegee drainage. It has been suggested that an early Qualla (Historic Cherokee or Lamar) phase culture was thriving at about the same time Pisgah influence was being felt in the central part of the Appalachian Summit. Other Mississippian manifestations are also present in the Tennessee and Little Tennessee valleys west and southwest of Elkmont, including the Hiwassee Island and Dallas phases.

Historic Cherokee

The Cherokee Indians occupied the Appalachian Summit region at the time of the earliest European exploration (Hernando de Soto's expedition in 1540) and had likely been resident in the area since at least the mid- fifteenth century. The historic Cherokee occupation is known archeologically as the Qualla phase (ca. A.D. 1450–1838) and can be divided into earlier (ca . A.D. 1450–1650) and later (ca .A.D. 1650–1838) periods. The late Qualla phase (ca. A.D. 1650–1838) is marked by the increasing appearance of European goods at Cherokee sites, as well as shifts from typical Mississippian structure forms to more Euro- American style architecture. The overall settlement pattern for this phase changed during the latter part of the eighteenth century from nucleated towns or villages, to one characterized by loosely grouped houses, usually set in a linear pattern. By the early nineteenth century, most Cherokees were living in Euro- American style log cabins. Late Qualla ceramics are generally similar to those of the early Qualla phase, although there are significant differences in the representation of specific vessel forms and decorative motifs. European- made items like glass trade beads, iron tools and utensils, guns, glass bottles, and copper kettles were introduced into the artifact assemblage.

Historic Overview (Euro- American, 1750–present)

Late- eighteenth- century Euro- American settlements in Sevier County and the rest of East Tennessee generally were located on the flat and accessible lands along the main rivers and larger creeks. Several fortified homesteads, or "stations," were established in the area during this period, primarily along the larger drainages. Sevier County was established in 1785, and in 1795, the county seat was moved to Sevierville. Settlement of the more mountainous interior of the region, including Elkmont, did not begin until well into the nineteenth century. By the 1830s, the Ownby and Trentham families owned and farmed land along Jakes Creek in Elkmont.

Elkmont was important to both the railroad and lumbering operations of the area. The history of logging on the East Prong of the Little River (which includes the District) follows the pattern seen elsewhere in the Smoky Mountains. The earliest logging occurred between about 1880 and 1900, and was characterized by selective cutting in areas most easily reached by the logger. Early logging near Elkmont apparently focused on poplar and ash, but also included some cutting of cherry and basswood. In the early 1900s, ox teams were used to log portions of the Blanket Creek and Jakes Creek drainages. Soon thereafter, the railroad at Elkmont began to take the place of ox teams in transporting harvested lumber from the area.

Large- scale railroad (or mechanical) logging began in the Elkmont area in the early 1900s, when the Little River Lumber Company began to purchase property in the vicinity. The company built a large band mill at Townsend, in Tuckaleechee Cove southwest of Elkmont, and by 1908 had extended a railroad line through the Little River's narrow East Prong gorge to Elkmont. The community of Elkmont soon developed and included a hotel, post office, commissary, church, railway yard, machine shop, coaling dock, and a variety of cabins for management and workers. Most of the buildings were located on and near the broad floodplain of the Little River, primarily within the area of the present- day Elkmont Campground. Establishment of the railroad facilitated the intensive logging period at Elkmont, beginning in 1908 and ending in 1926, overlapping the first two decades of the Elkmont resort era.

The Resort Era at Elkmont (1910–1934)

The following six page description of the resort era at Elkmont is primarily excerpted from the National Register of Historic Places nomination form for Elkmont (Thomason et al. 1993). This description provides an abbreviated history of the period from 1910 to 1934:

> The scenic beauty and moderate climate of the southern Appalachian Mountains have long attracted visitors, particularly in the summer months. However, the difficulty of transportation through the mountains in the nineteenth century limited the type of visitors and the areas able to be developed for summer visitation. Soon after the construction of the Buncombe Turnpike in the 1820s, which connected Greeneville, Tennessee to Greenville, South Carolina, summer colonies of wealthy South Carolinians developed in the North Carolina mountains, south and east of the Great Smoky Mountains. The purported healthy climate of the mountains was a particular lure for visitors during the middle to late nineteenth century.
>
> Various types of health resorts, many located on springs, were established in western North Carolina and East Tennessee. One of the earliest resorts constructed in Sevier County was Henderson Springs, known as a health retreat as early as the 1830s. A two- story frame hotel and 22 cabins were built later in the 19th century, attracting the patronage of prominent Knoxville families.
>
> The construction of railroads vastly enhanced the potential of the Great Smoky Mountains region for recreational purposes, particularly for those with more moderate incomes. Knoxville was accessible by rail prior to the Civil War, but rail lines did not extend into Sevier County until after the turn of the century. While resorts did develop prior to building of the railroad in this area, they were located along more accessible roads or water routes. An advertisement in an 1897 edition of the *Knoxville Journal* for Dupont Springs, located 12 miles west of Sevierville, touted not only its three kinds of water, but also its "cool and invigorating" air and "unequaled" scenery. Visitors were advised to travel by boat or horseback to Sevierville. However, the more remote areas of the Great Smoky Mountains remained out of the reach of most summer visitors until after 1900.
>
> The construction of railroads also allowed the timber resources of the southern Appalachians to be utilized commercially. After 1900, large northern timber companies, facing depletion of the timberlands in the northeast and the Great Lakes, moved into the Great Smoky Mountains and began to develop the infrastructure needed to extract timber. Among the several large timber companies that worked within the Great Smoky Mountains was the Little River Lumber Company. In 1901, under the direction of the General Manager, Colonel W. B. Townsend, the company began to purchase land in East Tennessee. The Little River Lumber Company was especially interested in cutting hardwoods and hemlock at the higher elevations. To enable them to extract this wood, they created the Little River Railroad Company. Chartered in 1901, it operated until it was dissolved in 1940.
>
> The Little River Railroad Company recognized the opportunity to use the railway for multiple purposes. An observation car was added to the lumber train for

passengers who wished to view the scenery along the Little River and by 1909, daily train service was available from Knoxville's Southern Station to Elkmont. The lumber company not only encouraged, but promoted development of land that was logged. In 1910, the Little River Lumber Company deeded the Appalachian Club 50 acres "more or less" along Jakes Creek just upstream from Elkmont. The lumber company retained timber and mineral rights, while the Appalachian Club was granted the right "to construct at its own expense, a club house for the accommodation of members and guests, and the right or privilege, of constructing such cottages, or cabins, by itself, or by its members as may be desired" (Sevier County 1910).

Within the District, the Appalachian Club was a Knoxville- based social club. A 1915 brochure describes the Appalachian Club as "composed principally of Knoxville businessmen, for the purpose of providing a place for recreation and rest for themselves". In 1919, the club was reconstituted and formally incorporated as the New Appalachian Club, with its headquarters in Knoxville and its principal clubhouse at Elkmont (Sevier County 1919). Club members were able to buy lots, and rooms in the original clubhouse were deeded to individuals for personal ownership. Membership in the Appalachian Club and the New Appalachian Club included a banker (J. Wylie Brownlee), a university professor (R.C. Matthews), several attorneys (including Forrest Andrews and James B. Wright) and two members associated with the Little River Lumber Company or the Railroad (General Manager Col. W. B. Townsend and Railroad Superintendent J. P. Murphy). Wright, Townsend, Murphy and Brownlee were all cabin owners by 1919.

While predominantly based in Knoxville, members of the Appalachian Club also came from other places in the South. Testimony by H. E. Wright in 1933 noted that, "we have located at Elkmont now 65 summer homes owned by the very best citizens of Knoxville, some from Memphis, some from Athens, some from Nashville, and some from Kentucky, and other places". However, most of the former cottage owners at the Appalachian Clubs, and at the later Wonderland Club, who became leaseholders within the Park, were from Knoxville. Their Knoxville business affiliations included Richards Loan Company, Bowman Hat Company, Price- Baumann Tire, Swan Brothers Bakery and Galyon Lumber. The Little River Lumber Company maintained a legal affiliation with the club until 1930 when a quit claim was filed, thereby ending all formal connections.

One year after the establishment of the Appalachian Clubhouse, the Little River Lumber Company deeded to C. B. Carter a tract of land immediately downstream from the Town of Elkmont. Carter and his brothers founded the Wonderland Park Company and the next year purchased an adjacent tract of land from the lumber company. Construction of the Wonderland Hotel began in the spring of 1912, and the hotel was ready for business by June 15 of that year.

After construction of the Appalachian Club and Wonderland Hotel, a daily passenger train, the Elkmont Special, ran from Knoxville up the Little River to its final three stops that were just minutes apart at the Wonderland Park Hotel, Elkmont, and the Appalachian Club. The trip took approximately two and one-half hours from Knoxville. The Little River Railroad and the Knoxville and

Augusta Railroad also promoted "Elkmont Country" through brochures. A 1914 brochure assured the reader that besides being noted for its beautiful scenery, Elkmont Country "is becoming more popular each year as a recreation place for people from all over the South, some of whom have built summer cottages so they and their families may spend the summers in one of the most delightful mountain climates in the entire country." In the same brochure, the Appalachian Club was described in the following terms:

> The Appalachian Club . . . has made extensive improvement on its club house and annex since last year, and is now in position to serve its members better than ever before. A complete water and sewerage system has been installed, also a new and up- to- date electric light plan. Here, situated at an elevation of twenty- five hundred feet above sea level and commanding a magnificent view of the Smoky Mountains, some forty or fifty cottages have been built by members of the club. The natural surroundings of the cottages are so beautiful that the possibilities for enhancing the natural beauties are manifold, and this is one of the charms of the place. On the west side of Townsend Avenue flows a tumultuous little mountain stream which furnishes running water in each summer home, and the cottages, rustic and simple, can boast of bath rooms, shower baths and sewer connections together with a natural swimming pool near the club house.

Wonderland Park is described in equally glowing terms in a 1915 brochure:

> One of the most beautiful recreation places in the Elkmont country. Elevation two thousand five hundred feet. Hotel new and modern, situated in the heart of the Great Smoky Mountains. Wonderland Park is noted for its picturesque scenery, with river and mountains in delightful vista. A number of rustic cottages have been built here, which add to the attractiveness of the place. Excellent mountain and rainbow trout fishing in Little River. Horseback riding, bathing and mountain climbing. Accommodations for two hundred guests …

While the Wonderland Park Hotel was fairly typical of the resorts of the day, the owners of the Wonderland Park Company (the Carter brothers from Knoxville) had land speculation in mind. The original plat for Wonderland had more than 650 tracts, and the Wonderland Park Addition had thousands more. The land that cost $5 per acre or less was subdivided into 16 lots per acre. Had it actually been built, Wonderland Park would have had the density of a major city for its time. However, even if the grid of streets had been laid, many of the tracts were too small and located on sites not suitable for building.

The President of the Wonderland Company himself sold land through agents in Orlando, Florida. Aside from the hotel and annex, less than twenty buildings were built at Wonderland. Many of the purchasers of land, in fact, never saw the tracts they had bought. It was not until decades later, after creation of the National Park, that some of the business practices of the Carter brothers became known. After the Carters conveyed this land at Elkmont to the Great Smoky Mountains Conservation Association, the deeds and title papers of all prior lot

owners in this section were canceled, since the Carters had possession of the land and the location of the owners of the tracts were unknown. However, even those who had clear title seldom recouped their purchase price and taxes in the creation of the Park. Many were notified that their tracts were only 25- by- 100 feet and were on the side of a hill or mountain. Generally, they were offered from $2 to $25 for each tract, depending on location.

Due to the legal problems it created, the activities of the Wonderland Park Company were short- lived. By 1913, legal disputes developed between the Carter brothers and the subsequent lawsuit dragged on for a number of years during which time the defendant, T. M. Carter, died. In 1915, the Wonderland Park Hotel and immediately adjacent lands and buildings were sold to a group of Knoxville citizens who formed a private club, similar in nature to the Appalachian Club. Both clubs operated hotels that were available to members but were apparently also rented to paying guests. In 1920, the Wonderland Club built the hotel annex that provided additional rooms for club members. The Appalachian Club Hotel burned down in 1933 and one year later was replaced by another club house that still stands today.

For almost a decade and a half, recreational and industrial use of the East Prong of the Little River existed side by side. The train from Knoxville made day trips to Elkmont possible. Some stayed at the hotels for short periods, while club members often made extended visits. Passengers could debark at the imposing frame hotel on the hill. The next stop was the town of Elkmont. The final passenger stop was the Appalachian Club Station, where visitors would cross the creek on a footbridge to the Clubhouse. Just beyond the Appalachian Club Station, geared engines (also called Shay type locomotives) replaced the piston-driven locomotives and continued up the steep hills to where lumber operations were occurring.

It should be noted that industrial and recreational users of the East Prong of the Little River were not mutually exclusive groups. Several members of the Appalachian Club were at some point connected to the Little River Lumber Company. Furthermore, in 1928, a 65- acre tract of land belonging to the Little River Lumber Company, adjacent to the Appalachian Club holdings, was deeded to Alice U. Morier, who had married the aging Colonel Townsend. Townsend had been listed as a lot owner in 1919. These properties, adjacent to the Appalachian Club along Millionaire's Row, were not part of the original Appalachian Club deed, but were later included in the negotiation of leases with the Park.

By 1923, much of the accessible timber above the East Prong had been removed, and the lumber company began to focus its efforts on its operations on the Middle Prong. The train to Elkmont was discontinued in 1925 and the tracks were dismantled. In 1926, a gravel road was built through the gorge from Townsend to Elkmont, providing an easier route than the steep mountain road from Gatlinburg through Fighting Creek Gap. The development of roads into Elkmont in the mid- 1920s reflects increasing automobile ownership. Many of the cottage owners had been driving as far as Townsend and taking the train from there to Elkmont. Auto- tourism eclipsed the importance of the railroad in the

development of the southern mountains for recreational purposes and was later to be a major contributing factor in the creation of the Park. The road from Townsend to Elkmont and on to Gatlinburg was part of the one- hundred- mile scenic loop that began and ended in Knoxville. This road, which still exists today, passes through Maryville, Walland, Elkmont, Pigeon Forge, and Sevierville, and along a portion of the route of present day I- 40. The section of the roadway from Townsend to Gatlinburg is within the Park.

Tourism grew and some of the buildings within the town of Elkmont were bought and improved to meet the needs of tourists and visitors to the Wonderland and Appalachian Clubs arriving by bus and private car. In 1927, hotel rooms at the Wonderland Park rented for $2.50 per day, but visitors renting for a week at a time paid a daily rate that was even lower. Cabins also were available for rent (Thomason et al. 1993). At the Appalachian Club, residents and visitors stayed in cabins and dined at the clubhouse. Some residents brought their servants along for the summer. Recreation at both locations included hiking, picnicking, horseback riding, outdoor games like horseshoes and badminton, and formal and informal dances. One popular spot during the summer was the swimming hole that formed behind a dammed area of the Little River near the Appalachian Club.

Construction of cabins continued through the 1920s. By 1931, 19 cabins were located at Wonderland. At the Appalachian Club, a number of cabins were also built during the 1920s. Some 75 cabins were present in the two areas just prior to the Depression. A few cabins were built in the 1930s, most notably those built by Mrs. Alice Townsend along the Little River. The Elkmont area in the early 1930s consisted of the cabins, hotel, clubhouse, the small community of Elkmont, and a few mountain farmsteads. When the community of Elkmont was created around 1908, a cemetery was also established. Located north of the Wonderland Hotel, it was the only cemetery in the area. In 1928, a new Elkmont Cemetery was dedicated adjacent to the Appalachian Club. This cemetery was donated by Levi Ownby [correction to original nomination should read Levi Trentham] in memory of his wife.

The enthusiasm that led to the growth of the Appalachian and Wonderland Clubs was one of the forces behind the movement to create either a National Forest or National Park in the Great Smoky Mountains. The movement started in Tennessee and later was embraced by supporters in North Carolina. Knoxville businessmen, along with the Chamber of Commerce and the Knoxville Automobile Club, launched the campaign. In 1923, the Great Smoky Mountains Conservation Association was formed. Initially, its concern was more with building roads than creating a park or forest preserve. In 1926, Congress passed a law authorizing the creation of two National Parks in the Appalachians (Great Smoky Mountains and Shenandoah National Parks) and stipulated that land would be acquired by the states involved. After eight years of land acquisition, the Park was finally established in 1934; it was formally dedicated by President Roosevelt in 1940.

Major players on both sides of the issue of park establishment were associated with Elkmont. Governor Austin Peay, who spearheaded the purchase of the first

large tract of land for the Park, was a member of the Wonderland Club. Mr. and Mrs. Willis P. Davis and Colonel David Chapman were some of the organizers of the Conservation Association, along with J. Wylie Brownlee and attorneys Forrest Andrews and James B. Wright. Wright, who supported the establishment of a National Forest, but not a National Park, resigned from the Conservation Association and became one of the park movement's strongest foes.

Despite the role several members played in the Great Smoky Mountain Conservation Association, many in the Appalachian Club eventually opposed condemnation of land for the Park, possibly when they discovered that their properties would be among those condemned. They retained James Wright to represent their interests. In 1932, faced with political opposition particularly by members of the Appalachian Club, Congress consented to a plan in which landowners could be offered long- term leases. As a result, Appalachian and Wonderland Club properties were acquired from the members for one- half of the appraised value, plus a lifetime lease. Some cabin owners chose to sell their land outright for full value. During the 1930s, some nine or ten cottages at the Wonderland Club were acquired by the NPS and demolished. Leases also were offered to some long- term, full- time residents in the Park area. However, restrictions on use of natural resources, particularly wildlife and timber, and the loss of the rural communities that made life in the mountains viable presented major obstacles for them. Despite these restrictions, some mountain families remained in the Elkmont area until the 1950s and one resident remained into the 1980s.

With the creation of the National Park, commercial development ended at Elkmont. Development of Gatlinburg progressed, although Elkmont retained some commercial activity. Park Superintendent J. Ross Eakin, in a letter to the National Park Service Director in 1934, noted that some of the lessees were subletting their cabins. The letter also stated that the Wonderland and Appalachian Clubs were entertaining paying guests and were, in effect, hotels.

The community of Elkmont was gradually removed during the 1930s and 1940s. Many of the frame buildings were dismantled for their lumber and others were moved. The Elkmont Baptist Church was moved to Wears Valley where it stands today as Valley View Church. A 1943 U.S. Geological Survey map shows only two buildings and the Elkmont School remaining on the site. The last class in the school was held that same year. A Civilian Conservation Corps (CCC) camp was established on the site in the late 1930s. The post office closed in 1950. In 1952, the National Park Service established a campground on the site of the former Elkmont community and the CCC camp, which eliminated almost all of the remaining above ground evidence of both the town and the camp. However, the road system, which followed the same alignment of the Little River Railroad that historically tied the town and the Wonderland and Appalachian Clubs together, remains in use today.

Creation of the National Park resulted in preservation at Elkmont, albeit inadvertently, of a fragment of the architecture that was typical of the recreational use of the mountains in the four decades prior to the Park's dedication in 1940. Restrictions on further commercial development, transfer of

property, and new construction after 1932 have preserved much of the original character of the two club communities at Elkmont. While the majority of the buildings that made up the Appalachian Club and the Wonderland Club in 1940 still remain, above- ground physical evidence of the railroad (except for the road system), the timber industry, and the town of Elkmont has disappeared. Although these above- ground features of the Town of Elkmont no longer exist, below- ground archaeological evidence may still remain. Thus far, few archeological investigations have been conducted in the Elkmont Campground, but of those that have been conducted, little to no evidence has been recovered.

Current Condition of Buildings

The following description of existing structural conditions of extant resources that comprise the District is taken from the baseline report and recent structural reassessments. The initial structural assessment, undertaken as part of the NEPA and Section 106 compliance processes, was conducted as part of the baseline work conducted in 2002, and was updated in the fall of 2003. An overview of this information was presented to the general public at meetings held in March 2004, and to the Consulting Parties the following month. The condition of the buildings is described by area starting with the Wonderland Club, including the Wonderland Hotel and the Annex, and followed by the condition of cabins and other buildings in the Wonderland Club, and then the Appalachian Club. It should be noted that the terms "good", "fair" and "poor" as defined in the 2003 reassessment of buildings are relative assessments of their physical condition.

"Good" indicates that a building component or system needs no more than cleaning or a minimal amount of repair or replacement of existing components. Those buildings rated in good condition need items such as roof repair; replacement of lattice skirting around the crawl space; repair of stone walls under porches; and removal of debris from the interior.

"Fair" indicates that a building or component can be brought back to good condition with a moderate amount of repair or replacement of the existing components. Those in fair condition require more extensive work as compared to those in good condition, including repair of water damage requiring either roof replacement or considerable repairs; repair of water damage to ceiling and floors; repair or replacement of porches; replacement of some foundation posts or other foundation repair; repair of siding boards; and replacement of missing window sashes.

"Poor" indicates that a building component or system requires extensive repair or replacement. Those in poor condition have most of the same types of problems as those in fair condition, but the problems are more extensive. For example, a floor system in poor condition might require framing replacement, considerable structural reinforcement might be necessary to correct excessive sagging, or the flooring and framing might be significantly damaged and require total replacement in one or more rooms.

If any of the buildings are proposed for reuse and are to be occupied for overnight stays, electrical and plumbing systems will have to be brought up to code, sprinkler systems for fire suppression will have to be added, and accessibility will have to be addressed. Any proposed modifications would have to be completed following guidance provided in *The*

Secretary's Treatment Standards (NPS 1995, Revised 2001). These factors are all accounted for in Appendix C, which provides a breakdown of the anticipated costs associated with the recommended treatment of each building for each proposed alternative.

Wonderland Club

The Wonderland Club is composed of the Wonderland Hotel and Annex buildings, and ten cabins. Six of the cabins are considered contributing to the District, as are the hotel and Annex.

Wonderland Hotel

This two- story frame building was built in three stages. The front section facing Little River Road was constructed in 1912, an extension to the east wing was constructed ca. 1928. Additional details of its construction are described in the baseline cultural resources report (Cleveland et al. 2002). This baseline document was amended by an addendum prepared in 2003, which updated the baseline report's condition assessment of the hotel (Cleveland 2003). Other reassessment information is also available on the web site.

Despite stabilization measures undertaken by the Park pursuant to a plan developed by the NPS Historic Preservation Training Center, the hotel cannot be restored due to its current condition. The hotel collapsed in August 2005 due to advanced deterioration and the failed structural system. As a result, the only option available for the Wonderland Hotel would be reconstruction.

Wonderland Hotel Annex

The Annex was built in 1920 to provide additional guest accommodations and a social area. While it was classified as being in good to fair condition overall in 2002, the Annex contained areas of spot deterioration that were allowing water to penetrate the building. These entry points had likely been in place for some time, but the damage they were causing was obscured during previous visits by ceiling and wall coverings. The true condition of the building became evident during the 2003 reevaluation when significant water damage from a leaking roof at two rear inside corners was discovered. Damage was also noted around the social room fireplace where the roof flashing at the chimney had failed.

Originally, there were two porches on either side of the social room. One porch was open and the other was screened. The open porch, located on the side of the building facing the Hotel, had collapsed prior to the initial assessment in 2002.

Other Wonderland Club Buildings

Ten cabins remain standing in the Wonderland Club, six of which are considered contributing resources. Four noncontributing cabins and a woodshed comprise the remaining buildings in the Wonderland Club. These buildings are noncontributing because they have had alterations and modifications that are not in character with the period of significance, and/or have lost their structural integrity. The condition of all cabins in the Wonderland Club is provided in Table 3- 2.

Appalachian Club

As noted previously, the Appalachian Club is composed of the Appalachian Clubhouse and the areas of Daisy Town, Society Hill, and Millionaire's Row. Each of these elements is discussed below.

Appalachian Clubhouse

The Appalachian Clubhouse served more as a social center for the cabin residents than as a tourist destination, as was the Wonderland Hotel. The original building burned in 1933, was reconstructed in 1934, and is considered to be in comparably good condition. Designed by Knoxville architect Alfred Baumann, Jr., it has a large porch on the front with cobblestone chimneys and fireplaces at each end of the large social room.

The Appalachian Clubhouse has been stabilized by the Park pursuant to an October 1998 NPS Historic Preservation Training Center assessment and recommendations (McGrath 1998). The Park cleared out trash and debris, secured the doors and windows, installed window vents/ louvers, installed brick and stone caps on the two chimneys, and installed several support posts beneath the main floor. If the Appalachian Clubhouse were to be utilized as a day use facility, it would require restoration of the porch, refinishing of its interior finishes and creation of ADA accessible entrances, as well as ADA compliant restroom facilities. The crawlspace lattice work also requires repair and wallboards and windows in the basement rooms below the Clubhouse show signs of extensive rotting. Also, the steps to the building must be replaced. The sagging porch floor should be jacked up and reinforced, and the footings and foundation posts may require repair or replacement.

A condition reassessment of the Appalachian Clubhouse was conducted in the fall of 2003. This reassessment noted evidence of minor water damage from roof leaks, settling of the floor in places, and rot or deterioration of building components such as foundation posts, window sashes, window screens and siding. The existing fixtures are outdated or unusable. Most other building components assessed were determined to be in relatively stable condition. Overall, the condition of the building appeared similar to that observed in 2002.

Daisy Town Buildings

Daisy Town is the area adjacent to and south of the Appalachian Clubhouse that lies between the Clubhouse and the road to Jakes Creek cemetery. There are 20 buildings still standing in Daisy Town and 15 of these are considered contributing. The noncontributing buildings in Daisy Town (using the names as they appear on the National Register of Historic Places) are Swan (#4) built in ca. 1910; and four buildings rebuilt in 1974 after a fire destroyed the original cabins [Sneed (#12), Jamerson (#14), Burdette (#16), and Bagley (#17)]. The Swan cabin had major alterations and the four 1974 cabins are modern, non- historic buildings. The Swan cabin would require exterior restoration in order to be considered contributing if it is retained under any of the proposed alternatives. An additional building (Gaylon [#9]) has an associated noncontributing rear room which also would be removed if this building is retained.

Society Hill Buildings
Lying south (upstream on Jakes Creek) of Daisy Town, most of the cabins in Society Hill are located between Jakes Creek Road and Jakes Creek. Of the 25 cabins in this portion of the Appalachian Club, 16 are considered contributing.

All of the noncontributing buildings have major conspicuous alterations or partial or complete loss of structural integrity. The more extensive repairs required are noted in Table 3- 2, and these are dependent upon the potential reuse as described in each alternative.

Millionaire's Row Buildings
This area was the last to be constructed and consists primarily of larger buildings. There are eight remaining cabins, six of which are contributing to the District. The two noncontributing buildings (as listed on the National Register of Historic Places) are the Parrott cabin (#44) built ca. 1928 and the Young cabin (#48) built ca. 1930. Both of these display major conspicuous alterations.

Cabins and other remaining buildings such as garages were assessed throughout all areas of the District. The condition of these buildings is provided in Table 3- 2. Common repairs or treatments required include roof repair or replacement; repair of water damage; installation of porch and floor supports as well as foundation repair; and exterior restoration. Depending on the proposed use, repair and rehabilitation of the interior and upgrading of the plumbing and electrical systems may also be necessary.

Some trees that could fall on buildings in the District may require removal. Mowing, trimming vegetation, and pruning are routinely performed by the Park across landscapes surrounding historic buildings. A Servicewide Programmatic Agreement between the NPS and the Advisory Council on Historic Preservation (ACHP 1995) contains provisions for the Park to manage historic resources while providing for visitor safety. The landscapes surrounding the historic buildings at Elkmont are subject to the same management practices implemented in other areas of the Park and the management prescription for such landscapes in the District is guided by assessing risks to public health, historic resources, and property on a recurring basis (recognizing landscapes as dynamic systems). The scale of hazardous tree removal and vegetation management required in the District will be determined by the number of buildings to remain, intended use and the condition of the landscape at any given time. Environmental consequences of vegetation management are discussed further in Chapter 4 for each project alternative.

Table 3- 2: 2003 Condition of Cabins and Other Buildings

Building*	2003 Condition	Comments
Appalachian Club – Daisy Town		
Appalachian Clubhouse	Good	Built ca. 1934. Roof and flashing between roof and chimney needs repair, minor water damage from roof leaks, settling of the floor, rot or deterioration of lattice skirting around crawlspace, foundation posts, wallboards, main staircase, porch floor, railings and support posts, window washes, window screens and siding.
Sneed (1) (C)	Good	Built ca. 1910. This log building was stabilized in 1999 and again in 2004. As of 2003, the building was still in good condition.
Smith (2) (C)	Fair	Built ca. 1910. The 2003 reassessment found the exterior remaining in fair condition.
Higdon (3) (C)	Poor	Built ca. 1910. The 2003 reassessment revealed damage evident at the south side roof valley where the rear wing and main section meet. The rear chimney bricks are failing and the rear wing is leaning and rotting in places.
Swan (4) (NC)	Fair to Poor	Built ca. 1910. Front porch flooring rotted; water damage at ceiling; main room floor sloped; north central room has water damaged ceiling; rear hallway floor slopes; kitchen ceiling failing due to water penetration; enclosed rear porch has a major roof leak; addition has water penetration through hole in roof, causing some of ceiling to collapse and most of floor to collapse; wood steps on north side are gone, landing floorboards soft; north end roof valley has lost metal and asphalt covering; some rear siding is split and/or rotted.
Addicks (5) (C)	Fair to Poor	Built ca. 1910, a "set off" house. The 2003 reassessment revealed that the front porch was in fair to poor condition and was stabilized in 2004.
"Adamless Eden" (5A) (C)	Fair to Poor	A playhouse built ca. 1921 of unhewn logs. The 2003 reassessment found conditions somewhat fair to poor and the playhouse was repaired and stabilized in 2004.
Creekmore (6) (C)	Fair to Poor	Built ca. 1910. The condition was fair to poor and by 2004, the rear, modern deck had failed.
Mayo (7) (C)	Good	Built ca. 1910, a "set off" house. The 2003 reassessment indicated that the building was still in good condition.
Levi Trentham Log (7A) (C)	Good	Built ca. 1830 and moved to the lot in 1932. This building was in good condition in 2002 and the overall appearance in 2003 was similar.
Mayo Servants' Qtrs. (7B) (C)	Good to Fair	Built ca. 1920. The 2003 reassessment indicated that the building was I good to fair condition. This building was cleaned and stabilized in 2004.
Cain (8) (C)	Fair	Built ca. 1915. The 2003 reassessment indicated that the building was in fair condition.
Galyon (9) (C)	Poor	Built ca. 1910; one room addition is noncontributing and is no longer connected to the main building. The 2003 reassessment revealed exterior conditions had worsened. Some front porch foundation posts are rotted; middle addition on north side sags due to a fallen foundation post; eave damage at the rear additions on north side; gutter has fallen off rear addition on the south side; rear siding shows moisture damage; rear sill of main block is rotted in places; and bottom edge of siding is rotted on the south side and on the southwest corner.

*(C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

Table 3- 2: Continued

Building*	2003 Condition	Comments
Appalachian Club – Daisy Town (continued)		
Galyon rear 1- rm. (NC)	Good to Fair	Exterior at entry has rotted area and missing fabric. The siding displays rot and water damage.
Baumann (10) (C)	Fair	Built ca. 1910; some front porch foundation posts are rotted; middle addition on north side sags due to a fallen foundation post; eave damage on rear addition (north side); gutter has fallen off rear addition (south side); rear siding shows moisture damage; rear sill of the main block is rotted in places; and bottom edge of siding is rotted at south side and southwest corner.
Scruggs- Brisco (11) (C)	Poor	Built ca. 1915, fair to poor condition at rear. The 2003 reassessment revealed stones missing from the front porch foundation; rising dampness visible on south side; deterioration of the roof on the south side entry porch; sagging of the southeast corner of cabin; rotting of the siding at the southeast corner; and the north side entry steps are rotted/missing.
Sneed (12) (NC)	Poor	Rebuilt in 1974 after a fire destroyed the original building. Building sinking at middle; water damage in downstairs bathroom and possible bat infestation noted in several places on second floor; exterior plywood siding is warped at bottom on north side; rear porch steps and rails are rotted/missing; and dry rot evident exists at rear porch sill.
Cook (13) (C)	Fair to Poor	Built ca. 1912; the 2003 assessment revealed that the exterior has these problems: the front porch displays rot in floorboards and at the railing; the siding is rotted on the south side, especially in the area of the meter box; portions of the foundation lattice are rotted on the north side; some perimeter foundation posts are rotted; and foundation piers of the rear additions are leaning.
Jamerson (14) (NC)	Good	Rebuilt in 1974 after a fire destroyed the original building. Exterior rear deck sags; piece of rear deck railing is broken; and concrete block pier supporting northwest corner addition is leaning.
Hale (15) (C)	Poor	Built ca.1914; the 2003 reassessment revealed these problems with the exterior: a rusted gutter at the entry steps; the front porch sags; boards covering the foundation at the southeast corner and east side are rotted; the roof is damaged at the rear high section, possibly from limbs falling off a dead tree; the roof is damaged at the northeast corner of the room; the roof, eaves, and siding are damaged in the middle of the north side of the building.
Burdette (16) (NC)	Fair	Rebuilt in 1974 after a fire destroyed the original building. Building has water damage throughout. The exterior has mildew and mold on creek side; water damage at south side; gutter above southeast corner shed rusted and roof of shed caved in; north side steps rotted and fallen; and west side windows are broken.
Bagley (17) (NC)	Fair	Rebuilt in 1974 after a fire destroyed the original building. Building displays moisture damage and mold; and uneven/buckled linoleum floor. The exterior has broken windows on south side; rising damp at sump room addition; and broken sliding glass doors at rear.

* (C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

Table 3- 2: Continued

Building*	2003 Condition	Comments
Appalachian Club - Society Hill		
Gilliand (18) (C)	Fair to Poor	Built ca. 1916. The 2003 reassessment revealed these exterior issues: rotting siding on the east side of the south side addition; rotting of the second- story window hood on the south side of the main block; a rusted gutter at the entry; a sag in the front room of the first story; and the rear steps are soft and rotting.
Thomas (19) (C)	Poor	Built ca. 1910. Structural defects noted in 2003 include: front porch floor sags and is rotted in places; foundation lattice on east side is rotted; north end porch room sags and leans; foundation lattice bows at the north side; mid- rear room on north side leans to east; mildew on support timbers near the creek; sill and siding at southwest corner of rear wing are damaged; rear foundation lattice is broken; south chimney is cracked and adjacent floor sags.
F. Andrews (20) (NC)	Fair	Built in ca. 1910. Southeast room (addition) floor slopes to south; southwest kitchen has water damage at ceiling, floor, and walls; the west center room has water stains at ceiling and floors that slope south; the northeast room has uneven floor and the stone chimney leans to west; northwest room floor slopes to east; basement bathroom has mold and mildew; and basement southwest area wood floor rotted at entry. Exterior has rotted sill at entry to hot water heater room on south side, rotted siding at rear basement room, soft eaves at first- story rear, mildew at front timbers and needs extensive porch repairs.
Andrews- Sherling (21) (C)	Poor	Built ca. 1912. Structural defects and exterior condition issues noted in 2003 included: recent graffiti is inscribed in the concrete next to the west chimney; rotted sill at the entry to the hot water heater room on the south side; rotted siding on the rear basement room; eaves at the rear of the first- story are soft; and there is mildew on the front support timbers.
Congleton- Brownlow (22) (C)	Poor	Built ca. 1915. The 2003 reassessment found these exterior issues: rotted fascia at south side; moss growing on the roof; rotted front porch roof and damaged siding at each end of porch; porch roof truss sags; fascia is missing at the north side; siding is rotted at the northwest corner; and the overhanging eave at the rear screened porch has rotted and is collapsing.
McDonald (23) (C)	Poor	Built ca. 1910. In 2003, structural issues with the following exterior conditions were noted: the roof of the second- story room sags; the steps to the second- story room are rotted and missing; the bottom edge of the siding is rotted on the south and east sides; and the crawl space door on the north side is rotted.

* (C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

Table 3- 2: Continued

Building*	2003 Condition	Comments
Appalachian Club - Society Hill (continued)		
W. Arnett (24) (NC)	Fair	Build in ca. 1912. East inset porch has floor rotted and water- damaged ceiling; main room buckling floorboards, water damage at chimney; windows broken in front bow window; hallway to rear floor buckled and slopes to north; north center room floor buckled; bathroom floor uneven; northwest room floor slopes to rear and has mildew; rear screened porch floor slopes and has hole in floor at door to rear deck; south room fireplace leans and crumbling; water damage at chimney and adjacent wall surfaces; floor and walls slope away from chimney on each side and floor is buckled; rear bathroom floor slopes toward creek; and rear pantry and kitchen have extensive water damage at ceiling, walls, and floor, and floor slopes toward creek. Exterior stone foundation wall at rear has numerous cracks and is missing stones; bottom of siding rotted at west and north sides; rotted steps and landing at rear; eave damage at northwest and northeast corners; and some perimeter foundation posts rotted at north side.
Franklin (25) (NC)	Fair	Build in ca. 1913. Front porch north section has rotted railing, east section has rotted railing and floor is rotted near railing, and there is ceiling and floor damage at entry; rear porch room has water- damaged to the ceiling, walls, and floor in southeast corner; and the front fireplace room has water stains at chimney. Floors slope in the main, rear porch, southwest, and fireplace room. The exterior basement-level landing on north side is soft, bottom edge of siding at northwest corner room is deteriorated, rear deck is soft, moss on roof, roof deteriorated at chimney, and siding in front gable is rotted.
Hutchins (26) (NC)	Fair	Build in ca. 1912. The front porch has some rotted rafter ends, water stains at ceiling, and rotted siding at north end; main room ceiling and beams sagging, and water stains at ceiling; rear dining room floor slopes to rear; northwest room floor uneven; northeast room floor uneven and hole in ceiling, water damage to ceiling, floor and east wall; and the basement storage room has a collapsed wood floor. The exterior has soft rear steps, moss, mildew, and rising damp evident on rear siding, and the chimney has vertical cracks and is leaning away from building.
Gaines (27) (NC)	Fair to Poor	Build in ca. 1912. Front porch floor rotted at front edge; main room has hole in ceiling at chimney, uneven floor, and water stains at ceiling; southeast bathroom/washroom floor slopes to front, and there is mildew and water stains at ceiling and walls; south- southeast room floor uneven; south- southwest room and bedroom have uneven floor and some water damage at ceiling and floor; rear porch south section floor has rot and slopes toward cabin, and the north section floor has rot, large holes, and slopes toward cabin; northwest room floor sloped and has water stains; northeast room floor slopes to the middle; and northwest corner porch at basement level floor rotted and sloped toward cabin, and rear wall is pulling away from ceiling. The exterior chimney missing stones at rounded cap; rear north wall bows out; rear porch sill rotted; rear porch posts rotted at bottoms; some rear siding rotted; and there is termite damage.

* (C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

Table 3- 2: Continued

Building*	2003 Condition	Comments
Appalachian Club - Society Hill (continued)		
Spengler- Schmid (28) (NC)	Fair	Build in ca. 1912. Front porch south end displays rot; main room floor slopes to rear, moisture damage; leak at chimney and adjacent wall damage; adjacent bathroom floor sloped; northwest room floor sloped; interior room has uneven floor; rear screened porch slopes toward creek at south end; kitchen has water damage at ceiling; storage room roof, ceiling, and floor damaged by water infiltration; the addition has water damage to ceiling and walls and the adjacent bathroom badly water- damaged. The exterior has rot and damage at south side of addition, window sills on addition rotted, chimney has lost mortar, gutter rusted at front porch entry, cracks and holes in front porch foundation, damaged foundation lattice at north and west sides, and eave damage at southwest corner and west side.
F. Arnett (29) (C)	Poor	Built ca. 1910. The 2003 reassessment revealed these issues in regard to the exterior: rotted logs at southwest corner, gutter rusted through; warped wooden shakes at the southwest and northwest corners; leaking gutter at the northwest corner has caused deterioration of siding, window frame, and sheathing; warped shingles in the main gables; a roof gap at the chimney and damage to the eave and siding; and the log ends on the bathroom addition are rotted.
Wright (30) (C)	Poor	Built ca. 1921. The exterior per the 2003 reassessment noted these issues: eave damage at the ridge on the north side; gap in the roofing at the chimney (north side); water- damaged siding on the north side; damaged rear porch; fascia damage at the rear of the main block; and the shed on the rear of the cabin sags.
Matthews (31) (C)	Poor	Built ca. 1910 as a log building. The reassessment in 2003 revealed the following problems: front porch rails have rotted, two south end posts are rotted at the bases, and two floorboards have buckled in the side screened porch; south main room wood floor slopes away from the chimney on each side, the chimney leans toward the rear, and walls are built from logs; kitchen floor slopes to rear, and there is water damage at ceiling along north side and in northwest corner; north room has some water damage at ceiling; and the south room has some water damage at ceiling. The exterior has holes in front porch stone foundation wall, roof gap at chimney, cracks in stone foundation at southwest and northwest corners and along west side, rear walled space has rotted siding and stone doorway/flat arch about to fail, and foundation lattice at north side rotted.
"Little Cottage" (31A) (C)	Fair	Built ca. 1925. The 2003 reassessment revealed some rot in handrails on the front entry stoop/porch and the steps are soft; the main room floor slopes in the southeast corner and has a small hole; and the rear screened porch floor slopes to the east and the wood screen door has fallen on floor.

* (C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

Table 3- 2: Continued

Building*	2003 Condition	Comments
Appalachian Club - Society Hill (continued)		
Allen (32) (C)	Poor	Built ca. 1910. In 2003, exterior was found to have these issues: eave and gutter damage west of the chimney on the north side; rotted and missing boards at the basement storage room on the north side; the gutter is off at the south side porch; and the south side porch leans.
Jeffords (33) (NC)	Fair	Build in ca. 1920. Main room floor slopes away from chimney and slopes to south- southeast overall; adjacent north end space floor slopes to north and to stove platform at center; northwest room floor rotted, wallboard walls and ceiling heavily water- damaged; kitchen floor, bedroom off kitchen, bathroom, southeast room floor slope; water- damage to ceiling; exterior has rot at bottom edge of siding on east side, roof sags at ridge, north side shed addition sags at sill, split siding at north side of rear addition, siding of southwest corner room displays rot, foundation posts of southwest corner room rotted and leaning, south side siding is split and rotted, and sill on south side sags.
McAmis (34) (C)	Fair to Poor	Built ca. 1920. The 2003 reassessment noted exterior issues as follows: rotted fascia above the porch roof; rising dampness evident on the front siding; north side eave is rotted on both sides of the chimney; rotted support posts, eaves, and siding at the basement room.
Culver (35) (C)	Fair to Poor	Built ca. 1922. The 2003 reassessment noted that the exterior exhibited these problems: rot at the bottom edge of the front siding; missing and rotted siding at the north side; eave damage at the rear; rear siding is rotted and missing where the deck and steps have collapsed.
Knaffl (36) (C)	Failed 2005	Built ca. 1922. In 2003, the following exterior issues were revealed: the metal roofing is off or coming off; stones at top of chimney are missing; the ridge/eaves are split at south side; the siding is coming off at the southeast corner; the bottom edge of the siding is rotted along the rear side; the basement wall is bowing in on the north side; and the wood shingles on the front and northeast corner are warped.
Johnston (37) (NC)	Fair	Build in ca. 1920. Main room floor slopes off center to each side, and hole in ceiling at chimney; screened porch and deck have hole in roof/ceiling near wood screen door to outside and at southeast corner; hall to north bedroom floor slopes to north; and north bedroom floor sloped and uneven and there are water stains at ceiling. The exterior bottom edges of siding shows rot; screened porch sags, and sill rotted on east side of chimney.
Byers (or Chapman) (38) (C)	Poor	Built ca. 1912. The 2003 condition assessment noted the following exterior issues: the siding is cracked in several places; several foundation slats are missing; the sill at north side of the sleeping porch is rotted; fascia is rotted at the northeast corner; and there is water damage and missing support posts at the southwest corner. This building was stabilized in 2004.

* (C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

Table 3- 2: Continued

Building*	2003 Condition	Comments
Appalachian Club - Society Hill (continued)		
Dudley (39) (C)	Fair to Poor	Built ca. 1923. The reassessment in 2003 revealed that the chimney is in need of repair as well as the following problems with the condition of the exterior: the front gutter and fascia is pulling away from the porch roof; several porch foundation slats are rotted; there is mildew/mold at the rear north side, the west side, and the rear south side; the wood steps to the rear deck are rotted.
Kuhlman (40) (C)	Fair	Built ca. 1925. The reassessment in 2003 noted the following problems with the exterior: gutter is rusted and the eave is rotted at the northeast corner, at the north side of front porch, and at the front porch entry (south side); the entry porch stair rail is soft; the fascia board is rotted at the rear of the south side; and the gutter is partially rusted at the east side.
Kuhlman garage (40A) (C)	Good to Fair	Built ca. 1926. The 2003 assessment revealed that the gutters were the primary problem on the exterior.
Kuhlman woodshed (C)	Fair to Poor	Built ca. 1926. The 2003 assessment indicated that the asphalt roofing had deteriorated and was missing and there is a sag in the roof.
McNabb (41) (NC)	Fair	Build in ca. 1923. Main room floor slopes away from chimney on each side and section of fallen ceiling exist; kitchen floor slopes to east; bathroom floor slopes to east; south middle room floor slopes to south slightly; and southwest room has water damage at south wall and ceiling below skylights. The exterior siding is missing at northeast corner, rusted gutter at south side, and eave damage and rot at southeast corner.
McNabb privy (NC)	Fair	Build in ca. 1923. In 2003, the bottom edge of the privy siding was rotted where it touches ground.
Appalachian Club - Millionaire's Row		
Spence (42) (C)	Fair	Built ca. 1928. The 2003 reassessment found these exterior items that require attention: the west end wing (south side) has cracked and loose foundation stones; the crawlspace opening leans to the east, and the sill has a noticeable sag; the west gable end is damaged at the ridge (possibly from fallen tree); the log over the main entry has rot; the rear patio has stones missing and displaced; the wood steps at the small rear screened stoop/porch lean away from cabin; the siding, lattice, and door of the basement rooms have extensive rot.
Brandau (43) (C)	Fair to Poor	Built ca. 1928.The 2003 reassessment revealed structural damage and the exterior condition was described as follows: one front window hood is rotted, and the other front window hood is rotted and has fallen; siding at the east side of the chimney is rotted; the roof damage at the southeast corner; moss is growing on the roof; and the roof framing is damaged at the northwest corner of the rear porch.

* (C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

Table 3- 2: Continued

Building*	2003 Condition	Comments
Appalachian Club - Millionaire's Row (continued)		
Parrott (44) (NC)	Poor	Built ca. 1928. Southeast corner porch/stoop some soft floorboards and support post rotted at bottom; main room roof leaks resulting in damaged flooring at those locations; chimney leaning to east and is sinking; loft floor slopes off center, and there is damage to the roof and floor at west wall; east room addition has damaged ceiling at east wall and northeast corner (flooring rotted, too); west room has leaking ceiling and resulting floor damage at southeast corner; west room bathroom has holes and partially collapsed/rotted areas in ceiling and floor; small room off kitchen floor slopes to north; kitchen rear space floor slopes off center on both sides; exterior roof is sagging and roofing rotted at front corner porch and room addition, rot and mildew at north side of room addition, extensive rot and damage at west bathroom addition, roof and eave damage at southwest corner and window east of chimney slanted.
Murphy (45) (C)	Fair to Poor	Built ca. 1928. In 2003, structural damage was noted regarding the following exterior conditions: clerestory is sagging near the chimney; a recent roof patch sags at the eaves; the wall below the roof patch is rotted; the foundation and wall bow out at the northeast corner; the siding is rotted at the northeast entry; the northeast window hood shows rot and is pulling away from wall; some eave damage is apparent at the north side; northwest corner has some water damage; the west wall bows out; and there is mildew on south side.
Murphy garage (45A) (NC)	Failed	The 2003 reassessment noted that the front garage roof has collapsed and the vertical board siding is removed in several places. The rear garage room (likely servant's room) has floor and ceiling water damage.
Murphy gazebo (NC)	Fair	The Murphy gazebo is a noncontributing outbuilding since it was rebuilt from the original design or has loss of structural integrity.
Miller (46) (C)	Fair to Poor	Built ca. 1928, was originally built as a cantilever barn and remodeled in 1950 as a cabin. In 2003, structural damage was noted as well as these exterior conditions: mildewed siding and some missing siding at the west end; balcony front gates are not attached; south side cantilevered second floor sags; south side foundation blocks are washed out at ground; some siding is warped on south side second floor; roof cupola has deteriorated; some roof sag is apparent at the ridge; ground- level south end railing is warped and support post is slanted at east end of the cabin; main fascia of the east end is infested with carpenter bees; second floor porch sags at northeast corner; second floor siding at the north side of the cabin has rot and water damage; several stones have fallen out of the stone walls.

* (C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

Table 3- 2: Continued

Building*	2003 Condition	Comments
Appalachian Club - Millionaire's Row (continued)		
Faust (47) (C)	Fair- Poor	Built ca. 1928. The 2003 reassessment noted structural damage with the following exterior conditions: fallen stones at the yard wall; rotted sill, siding, and framing at the rear screened porch entry (east side); rot at the rear screened porch sill on the south side; rotted siding on the rear room/bathroom on the east side; damaged eaves at the rear room/bathroom and at the west side of the main roof; rotted and missing siding and missing foundation stones on the west side of the main block; rotted eave on the north side where the main roof joins the east porch roof; and rotted and split siding at the base of the north side.
Faust garage (C)	Poor	Built ca. 1928. The 2003 assessment found that the garage is not salvageable in its current condition and would require reconstruction if it was proposed to be retained in an alternative.
Young (48) (NC)	Poor	Built ca. 1930. The front deck has soft floorboards, water- damaged railing, and rot at wood screen door and threshold leading to screened porch; screened porch floor rotted near entry screen door; main room floor slopes to northwest; rear wing den floor sinks off joists, floor low near rear chimney, and there is mildew at ceiling; rear wing kitchen floor slopes to north; and the bedroom addition floor slopes to rear and has mildew and water stains at ceiling. The exterior stone steps at deck are cracked, stone foundation at west wall of main block bowing out, roof and wall rotted at hyphen, gutter off and roofing coming up at screened porch; rear part of screened porch on east side slopes and water- damaged siding at east side of rear wing.
Cambier (49) (C)	Fair to Poor	Built ca. 1940. The last cabin constructed at Elkmont. The 2003 reassessment noted that the exterior has the following issues: the gutter, which is off at the front, requires repairs and the fascia boards are rotted as a result of water damage originating from the detached gutter; the west wall bows slightly; the rear steps and landing are rotted; and there is rising dampness on the east porch/room.
Wonderland Club		
Wonderland Hotel	Failed	Front section built in 1912. east side extension added at unknown date, rear wing constructed ca. 1928. The 2003 assessment noted the following problems: both ends of front porch have collapsed, the dormer over the front entrance has collapsed, extensive damage has occurred where the two sections of the "L" shaped building meet; post bases of many of the footings are rotting; many sections of the sill beams need replacement; the main stair has extensive damage; the roof and many elements of the floor structure are sagging; the roof has deteriorated and the gutters need to be replaced; and Gypsum and composition wallboard need to be replaced.
Wonderland Hotel Annex	Fair to Good	Built ca 1920. The following problems were noted during the 2003 assessment: spot deterioration has allowed water to penetrate the building, water damage has occurred at the two rear inside corners and to the social room fireplace where the roof flashing at the chimney has failed; the open porch has collapsed.

* (C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

Table 3- 2: Continued

Building*	2003 Condition	Comments
Wonderland Club (continued)		
Wonderland Servants' Quarters (Riordan) (58) (C)	Poor	Built ca. 1930. The 2003 reassessment revealed rising exterior dampness; west entry and portico on south side are leaning east; crack in concrete walk/stoop at the east entryway on the south side; insect damage has occurred to some foundation posts; a portion of the cabin south of the chimney is leaning south/southeast; the eaves are soft at several locations; and the siding at the west side entry portico has sustained water damage.
May or Moore (58- 1A) (C)	Poor	Built ca. 1917. Structural problems were evident during the 2003 reassessment. Exterior problems noted include: a missing section of eave at the front of the main roof; the east end of the front façade bows outward; a section of the eave at the west side of the chimney is rotted; a hole has developed in the siding at the chimney; and the steps and deck to the northeast corner entryway are rotted.
Paine (58- 2B) (C)	Poor	Built ca. 1928. Structural problems were evident during the 2003 reassessment. Exterior problems noted include: siding is rotted at the bottom edge; a falling tree apparently ripped the gutter off of the north side of the addition; the gutter at the south side of the addition has fallen off; the siding in the east gable of the main block shows rot and mildew; the west side of the main block is mildewed; and the wooden steps and landing at the rear screened porch are rotted and have collapsed.
Preston (58- 3C) (C)	Fair	Built ca. 1922. The 2003 reassessment revealed the following exterior problems: the shingles at ground level are rotted and mildewed; the higher shingles are warped and brittle, with some missing; the roof is covered with plant debris and vegetation is growing on it.
Bowman or Brown (58- 4D) (NC)	Poor	Built in ca. 1913. Multiple holes in roof resulting in damage to ceiling walls and floor in dining room, southeast room off dining room, kitchen, hallway off kitchen, east and west bathrooms, interior chimney room, and vestibule. Enclosed dogtrot/hallway to rear screened porch has holes in wallboard ceiling and the wood floor sloped; interior room (contains rear side of later stone chimney) wallboard ceiling falling and wood floor rotted at south side; west end den wallboard ceiling falling, rotted wood flooring and water damage all around, especially at edges; rear screened porch has two holes in roof/ceiling at east half; and one hole in roof/ceiling at west end of west half (resulting in rotted siding and flooring); sink room at bottom of stairs has water damage; rear corner porch has rotted wood railing; north side bedroom wood floor slopes to west and is rotted in places, some water damage at wallboard ceiling and moldy sheet paneling at walls; and the west end bedroom has water- damaged wallboard ceiling and wood floor and moldy sheet paneling at walls. Exterior shingles and plywood are saturated with water; some shingles warped and brittle, large tree limb on roof, roof sags at ridge, toward chimney, and to rear, soft eaves, collapsed roof at front entry stoop, stoop materials rotted and soft, rear porch roof partially gone at west end, middle rear porch roof collapsed, vertical boards at foundation rotted and perimeter foundation posts rotted, split, or leaning.
Hicks (58- 5E) (C)	Fair	Built ca. 1918. The 2003 reassessment found evidence of the following exterior problems: eave damage has occurred on the east shed addition; there is some siding rot at ground level; and the front screened porch crawlspace door has fallen off its hinges.

* (C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

Table 3- 2: Continued

Building*	2003 Condition	Comments
Wonderland Club (continued)		
McMillan/Keith (58- 6F) (NC)	Poor	Built in ca. 1922. The 2003 reassessment revealed that the front screened porch has several holes and rotted places in deck and holes in roof/ceiling; main room has uneven floor, water stains at ceiling, and ceiling is falling in places; southeast room floor rotted and uneven, ceiling caving in and closet is damaged; kitchen roof/ceiling collapsed; 2- panel door with one light to collapsed rear porch; southwest room floor soft and slopes to north and ceiling is down in southeast corner; northwest room floor slopes to west; tree damage to roof on east side; rear porch roof and walls collapsed; former landing at rear of east side rotted away, T1- 11 siding on east side rotted in places; soft eave on west side; and southwest corner of cabin coming off concrete block supports
Vandergriff (58- 7G) (NC)	Poor	Built in ca. 1925. Structural problems revealed by the 2003 reassessment included: east side porch roof sagging; water damage on roof; concrete and stone deck cracked; south end of wood deck rotted; main room floor and wall lean east at chimney; north end addition leans west; ceiling is water- stained near chimney; and rear bedroom floor slopes off center on both sides. Exterior siding panels mildewed; tree lying on main roof; southwest corner ramp and landing leaning slightly; and south end window and frame bowing out and wall warped.
Tate, Beaman & Tucker (58- 8H) (C)	Fair to Poor	Built ca. 1926. Structural problems were evident during the 2003 reassessment as well as exterior issues: stone retaining wall at the road is cracking and spalling; foundation siding is rotted at northeast corner; gutter is down on east side near front; siding is rotted at ground on east and west sides near rear; holes in the roof/eave at northwest and southwest corners; and vertical boards at south side of the foundation are missing or rotted.
Richards or Brandau (58- 9I) (NC)	Poor	Built in ca. 1920. Structural problems revealed by the 2003 reassessment included: east side porch slopes to south/southeast and the floorboards are rotted; kitchen floor slopes to southwest and there is water- damaged ceiling and floor at southeast corner; rear screened porch has water damage at southwest corner; floor at east end slopes north; hole in roof/ceiling and falling wallboard; west closet and bathroom addition pulling away from cabin; main room chimney leans to north; hole in roof/ceiling at north end and hole in floor below; northeast bedroom room leans to south/southeast; water- damage to ceiling; east middle bedroom room leans to south and floor slopes off center on both sides; east room in basement has missing or rotted floorboards and some support posts leaning; west room of basement has fallen portions of wallboard ceiling; exterior roof near south end was crushed by large tree limb; siding rotted at ground on east side near rear; tree lying on concrete deck of north end porch, northwest eave, corner of roof, and upper siding knocked off by tree, gutters off and eaves soft at west side, roof and eave damage and rotted siding at southwest corner.
Richards or Brandau woodshed (NC)	Poor	Built in ca. 1940. In 2003, the reassessment revealed that the roof had failed and the siding was missing or lying on the ground at the south side of the building.

* (C) = Contributing; (NC) = Noncontributing; (1) = Resource Number

3.1.1.2 Cultural Landscape

As part of its research, the Park is charged with inventorying its cultural resources, including buildings and structures, archeological resources and cultural landscapes. Cultural landscapes are defined in the NPS *Cultural Resource Management Guideline* as "settings we have created in the natural world" that "reveal fundamental ties between people and the land—ties based on our need to grow food, give form to our settlements, meet requirements for recreation, and find suitable places to bury our dead. Landscapes are intertwined patterns of things both natural and constructed: plants and fences, watercourses and buildings. They range from formal gardens to cattle ranches, from cemeteries and pilgrimage routes to village squares and are special places: expressions of human manipulation and adaptation of the land" (NPS 1997).

The NPS management guideline for cultural landscapes directs that a Cultural Landscape Inventory (CLI) be undertaken for the purpose of providing information on "location, historical development, character- defining features, and management" to "assist park managers in planning, programming, and recording treatment and management decisions" (NPS 1977). Great Smoky Mountain National Park began this effort for Elkmont by completing draft CLI forms and producing draft site plan drawings in 2001, which were used as part of the baseline cultural resource study (Cleveland et al. 2002). Most of these draft drawings were focused on the individual buildings and their immediate surroundings.

The cultural resources baseline work and report included information on the cultural landscapes around each building, as well as those District- wide cultural landscape elements and features that were considered contributing to the District (Cleveland et al. 2002). Additional work on the history of the development of the cultural landscape at Elkmont was undertaken and is included as Appendix B. The focus of this additional work was to develop a historical chronology of the cultural landscape development at Elkmont immediately before, during and shortly after the period of significance, as listed in the National Register (1908- 1940), in order to determine if it was appropriate to classify Elkmont's cultural landscape into management zones as part of the EIS process. As part of this study, plan maps from five identified historic periods were developed:

- Pre- National Register of Historic Places (NRHP) Listed Period of Significance: 1880s–1907
- NRHP Listed Period of Significance 1908–1940: Sub- period 1908–1913
- NRHP Listed Period of Significance 1908–1940: Sub- period 1914–1924
- NRHP Listed Period of Significance 1908–1940: Sub- period 1925–1932
- NRHP Listed Period of Significance 1908–1940: Sub- period 1933–1942

Emphasis was placed on how Euro- American settlement and occupation patterns affected land use, spatial organization and use of the natural environment. For each historic period, historic maps, photographs, drawings and texts were reviewed that identified the topography, natural and cultural vegetation, circulation, natural systems and features, views and vistas, buildings, structures and small- scale features present in the District. Understanding the landscape over time allowed for informed analysis of what remains of the cultural landscape, as well as what does not remain or is no longer apparent. These maps are presented in the Cultural Landscape Assessment (Appendix B). Although the official period of significance for the District as defined in the National Register ends in 1940, the listed period of significance was extended to 1942 in the

Cultural Landscape Assessment. This additional period was included to capture the cultural landscape components that were installed during the final period in which the Civilian Conservation Corps was still active in the Park.

While not all characteristics and features from each period have survived, a sufficient number are still present in their original location. Because the surviving characteristics and features are located within a National Register of Historic Places- listed historic district and their integrity has been retained, they are recommended as contributing to the District. Those features directly associated with a particular building are recommended contributing to that building, as well as to the District as a whole. Larger, District- wide elements and features not directly tied to a particular building, but meet necessary criteria are also recommended as contributing to the District.

Researchers found that, in terms of cultural landscape management zones, the cultural landscape characteristics and features are evenly distributed throughout the District to the point that the definition of zones would not be of management value—in essence, the District is a cultural landscape management zone in and of itself and is viewed as a whole unit for management purposes and impact assessment. Table 3- 3 provides representative examples, by type of feature, of the remaining significant cultural landscape elements within the District.

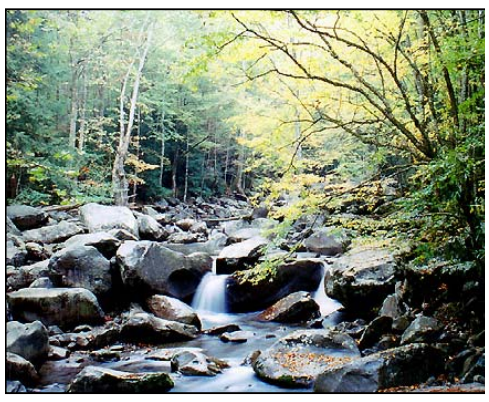
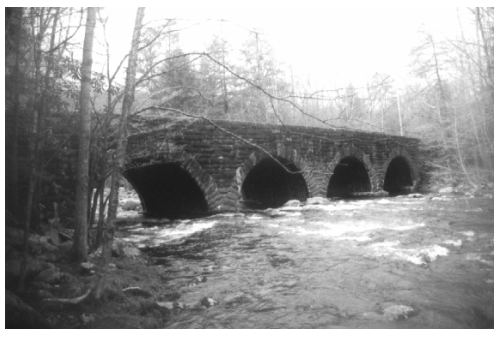
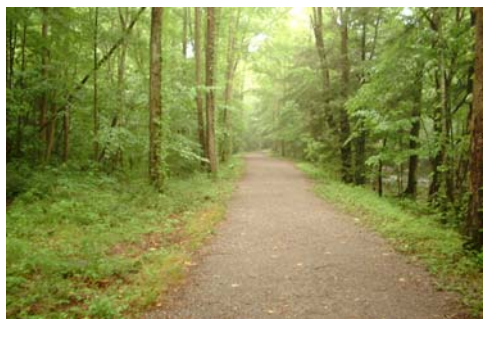
3.1.2 Archeology

Archeological baseline investigations were conducted in a series of four survey level studies over a two- year time period. The studies were phased for several reasons: to gather baseline information on the archeological resources of the District in a way that builds upon the small amount of information known about the District; to explore potentially sensitive areas based on geomorphological analysis to gain knowledge on the resources potentially present; and to gather sufficient information to compare potential management alternatives in terms of the type and amount of archeological work that would be necessary to implement a selected alternative. A complete (100%) survey of the entire District has not been conducted; however, sufficient information has been gathered in order to inform the archeological impact analysis and alternative selection process. The research methodology for each examination and the scientific reports resulting from these studies were reviewed by the Park and the SHPO Tennessee Historical Commission through the Tennessee Division of Archeology under the Section 106 consultation process. All work was conducted under Archeological Resources Protection Act (ARPA) permit GRSM 02- 002.

The earliest known archeological investigations at Elkmont occurred in 1936, when George MacPherson, a Park employee who conducted archeological reconnaissance in both Tennessee and North Carolina, discovered artifacts in a field near Little River and Elkmont Road. The site was apparently revisited by Quentin Bass in the 1970s, who noted that the site produced a “pitted cobble” but provided no other information (Bass 1975).

There is no record of additional archeological investigations at Elkmont from the 1930s to the 1990s, although former residents have indicated that prehistoric sites were known to be present in at least the Appalachian Club and Society Hill areas. Further, no archeological investigations were conducted at Elkmont in association with cultural

Table 3- 3: Significant Surviving Landscape Characteristics and Features within Elkmont Historic District

Type and Description of Characteristic or Feature	Representative Photo of Examples Found in Elkmont Historic District	Type and Description of Characteristic or Feature	Representative Photo of Examples Found in Elkmont Historic District
Spatial organization Pattern of watercourses, landforms, circulation routes, topography, vegetation, nodes of development, buildings and structures, and smaller features *Photo Descriptions*: View of Little River adjacent to Elkmont Road between the Wonderland Club and the Appalachian Club		**Small- scale features** Wonderland Hotel steps, fountain, and side paths; remnants of Camp Le Conte dam and power plant; Bearwallow Branch footbridge; CCC culverts and erosion control walls; remnants of CCC walkway at swimming hole; stone fireplace or possible still between Cabins 46 & 47 *Photo Descriptions*: Remnants of stone wall in the Wonderland Club	
Natural systems and features Little River, Jakes Creek, numerous branches (including redirected Bearwallow Branch), and loss of "island" when stone arch bridge cut off branch of Little River through Elkmont Town (current campground) *Photo Description*: The Little River		**Water features** Spring head at Bearwallow Branch; power plant base at Jakes Creek; Camp Le Conte lakebed, dam remnants, and base of power plant; Appalachian Club swimming hole; underground cistern near Elkmont Town (current campground) *Photo Description:* View of Little River "swimming hole".	
Land use Cemeteries, recreation (swimming hole and campground), and transportation (roads) *Photo Description*: Elkmont Campground		**Buildings and structures** Wonderland Club area (hotel, annex, and cabins), Appalachian Club area (clubhouse and cabins in Daisy Town, Society Hill, and Millionaire's Row), and infrastructure (water tanks, utility lines, etc.) *Photo Description*: "Adamless Eden" playhouse in Daisy Town	
Circulation Old road to Gatlinburg via Fighting Creek Gap, roads into and throughout the District following removal of railroad tracks, and CCC stone bridge over Little River *Photo Description*: Little River stone bridge; view of east side		**Views and vistas** Axial views along watercourses and roads; partial panoramic views at Wonderland Hotel, at Cabins 58- 4d to 58- 9i, and near Cabin 40. *Photo Description*: View northwest from the Wonderland Hotel	
Topography and vegetation Flat land adjacent to watercourses, sloped areas and ridges, native trees and plants (successional forest), and non- native species planted by club residents *Photo Description:* Hemlock forest at Elkmont		*Photo Description:* Axial view along Little River Trail; view facing east from Millionaire's Row. Trail follows former bed of the Little River Railroad.	

resource studies (Thomason et al. 1993) that led to designation of the Elkmont Historic District, and archeological resources are not included in the Areas of Significance on the National Register of Historic Places nomination form. In a comment on a draft of the 1993 report and the nomination, the NPS explicitly stated its doubts about the potential for significant logging- era archeological resources at Elkmont:

> Because there is no indication of archeological testing to determine the presence of sub- surface resources, it is hard to accept that the area that was the Elkmont Lumber Camp is likely to yield information about the camp. It also seems unlikely that there would be surviving archeological resources because when the Town of Elkmont was moved and the railroad taken up, little was left behind. The road, trail, and other construction projects by the CCC and the construction of the present Elkmont Campground by the National Park Service in the 1950s would have destroyed archeological remains. For this reason, we do not believe that Criterion D should even be considered or mentioned in the National Register nomination (Brown 1993).

In keeping with the period of significance established for the District (1908–1940), the National Register of Historic Places nomination and accompanying cultural resource study (Thomason et al. 1993) do not mention the potential for prehistoric archeological materials within the District. There was also no mention of the potential for archeological remains associated with the non- logging- era historic occupations, including the pre- 1908 settlement period and the resort- era occupations associated with the Wonderland and Appalachian clubs.

In 1997, a NPS Southeast Archeological Center (SEAC) field crew conducted limited surveys of two small locations (the Elkmont Firing Range Privy Toilet and the Elkmont Campground maintenance shed) within the District. Both locations were found to be disturbed, and no additional work was recommended for those projects (Birdsong 1997). The first substantial NPS archeological work at Elkmont included surface reconnaissance and was conducted in 2001 by the Park Archeologist as a part of the initial baseline studies for the present project. Selected areas where visibility and terrain permitted were examined, with no subsurface examination and no collection of artifacts noted on the surface. Six areas were identified as having moderate to high probability for cultural materials One previously recorded site (40BT23) was located and seven other apparent site locations were identified, as well as a possible railroad grade and a well-preserved portion of an early historic period road. Due to the limited nature of the study, the sites were not registered with the state of Tennessee. It was concluded that a more intensive archeological investigation would be required prior to any ground disturbing activities at Elkmont.

The initial archeological reconnaissance for the project took place in April 2002, in conjunction with the geomorphological investigation. This work consisted of limited shovel testing of representative landforms and attempts to relocate the sites found by the Park Archeologist in 2001. Following this initial work, additional site testing was conducted later that year as part of the Park's "Experience Your Smokies" program (Webb 2002). Separate from the current planning process, Park staff conducted a limited survey in June 2003 in advance of the rehabilitation of two comfort stations in the Elkmont Campground. Finally, in November 2003 and March 2004, additional

archeological survey of selected parts of the District was conducted to determine the likely effect of the proposed management alternatives upon the District's archeological resources. The 2003 and 2004 work represents the most intensive archeological investigations carried out at Elkmont to date. The synthesis of the archeological findings is presented below and is based on the technical report of *Archeological Investigations in the Elkmont Historic District, Great Smoky Mountains National Park, Sevier County, Tennessee* prepared as part of the Section 106 compliance process (Webb and Benyshek 2004).

The combined investigations at Elkmont included limited surface collection and excavation of 467 shovel tests and one 1 x 1 m unit. A total of 108 (23.1 percent) of the shovel tests produced prehistoric artifacts, including three ceramic fragments and 485 chipped stone tools or debitage fragments (pieces of chipping debris that are the byproducts of stone tool production). Although few diagnostic artifacts were identified, the documented components appear to date primarily to the Archaic period. Woodland materials were identified in only three locations, and no Mississippian or Historic Cherokee materials were recovered. Historic period artifacts were recovered from 141 (30.2 percent) of the shovel tests. The 1146 historic artifacts consist primarily of bottle glass fragments and wire nails, but a variety of ceramic fragments and other materials were also found. Most of these materials are associated with the twentieth- century resort- era occupations of the Wonderland and Appalachian Clubs, although at least two appear to represent earlier home sites. The survey did not extend into the core of the former logging town of Elkmont (located in the current campground), and few, if any, artifacts associated with that occupation were recovered (Webb and Benyshek 2004).

Like most Southeastern tracts that are 350- acres or larger, the District contains evidence of numerous overlapping prehistoric and historic period occupations. This situation is exacerbated at Elkmont, which contains historic period artifacts or structural remains associated with over 100 former or standing buildings (including scattered nineteenth and early twentieth century buildings, a former town, several clusters of resort buildings and a Civilian Conservation Corps camp), as well as an abundance of prehistoric American Indian artifacts. Although the distribution of some of these remains appears to be limited by natural or cultural features, other distributions appear as continuous, or nearly continuous, scatters of artifacts that stretch across multiple landforms or around multiple buildings. The situation is further complicated by the presence of both prehistoric and historic materials at many locations, and in some cases distinct prehistoric artifact distributions are linked by a continuous historic artifact scatter. A final complicating factor is that the survey was limited in nature, and varied widely in intensity and scope across various parts of the District since it concentrated primarily on the areas with the most potential to be disturbed by the proposed alternatives. This parameter, and the lack of full delineation of essentially all identified artifact distributions, makes it even more difficult to define site boundaries.

In an attempt to identify workable site boundaries and facilitate management of the archeological resources in light of these conditions, the District has been divided into eight archeological sites (40SV120, 40SV121, 40SV122, 40SV123, 40SV124, 40SV125, 40SV165 and 40SV166) that together cover the entire 378- acre District. These sites are separated by topographic or drainage features, and in some cases also represent major historic subdivisions of the District. Each site contains both surveyed and unsurveyed

areas, as well as one or more concentrations or scatters of prehistoric and/or historic artifacts, each of which is designated a separate locus. Although the presently known resources are not continuous within some of the sites, it is reasonable to expect that continuous distributions would be identified if additional work was conducted. Tennessee State site forms have been completed for all sites in the District, and NPS Archeological Sites Management Information System site record forms will be completed for these sites at the conclusion of the project.

Since only part of the District has been surveyed, and the site boundaries are relatively artificial, it is also difficult to derive formal National Register of Historic Places-eligibility recommendations for the identified sites (although at least one site [40SV120] clearly contains significant deposits). Consequently, to facilitate project planning individual recommendations have been prepared concerning the potential need for additional work at each recognized locus and elsewhere at each site. These recommendations call for avoidance or additional work in all or parts of 12 of the 21 loci that may be affected by project activities, although impacts to the significant deposits at many, if not all, of those loci may be avoidable through project redesign or implementation of additional mitigation measures. In addition, supplemental survey will be required in the unsurveyed parts of the District if those areas are to be affected by project implementation or other land disturbing activities.

The eligibility of these resources has been evaluated according to the National Register of Historic Places Eligibility Criteria, as outlined in 36 CFR 60.4. The criteria state that "The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and that:

> a) are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> b) are associated with the lives of persons significant in our past; or
>
> c) embody the distinctive characteristics of a type, period, or method of construction; or that represent the work of a master, or that possess high artistic values; or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> d) have yielded, or may be likely to yield, information important in prehistory or history.

The regulations (36 CFR 60.4) also outline several additional criteria that affect National Register of Historic Places eligibility for certain types of properties:

> Ordinarily cemeteries, birthplaces, or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the

National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

- a religious property deriving primary significance from architectural or artistic distinction or historical importance; or
- a building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or
- a birthplace or grave of a historical figure of outstanding importance if there is no other appropriate site or building directly associated with his productive life; or
- a cemetery that derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or
- a reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; or
- a property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own historical significance; or
- a property achieving significance within the past 50 years if it is of exceptional significance.

In the absence of a formal redefinition of the District to include archeological resources and to extend the period of significance before 1908, these sites and loci are considered here as individual resources rather than as potential contributing resources to the District. It is recommended that such a redefinition take place, but those revisions are beyond the scope of the present work.

The eight identified archeological sites are described in detail (including mapped locations and other technical data) in the Section 106 report (Webb and Benyshek 2004). Due to the sensitivity of these resources and the need to protect them, however, location information about each site is presented here in only general terms.

Site 40SV120

Site 40SV120 is a multi- component prehistoric American Indian and twentieth century historic period site found on the terrace and alluvial/colluvial hill slopes on the east side of Jakes Creek in the southern part of the District. This site includes the Daisy Town and Society Hill areas of the former Appalachian Club resort, and contains 48 standing buildings, 33 of which are considered contributing resources to the District (Cleveland et al. 2002). Work at this site included excavation of 186 shovel tests, including 164 on the terrace along Jakes Creek and 22 on the hill slope deposits east of the creek. Fifty- four (28.9 percent) of the tests produced prehistoric artifacts, while 63 tests (33.7 percent) produced historic period artifacts. The positive shovel tests have been grouped into four loci.

Locus A. Locus A at 40SV120 contains prehistoric and historic period artifacts and deposits. Thirty- four (50.0 percent) of the 68 shovel tests in Locus A produced a total of 210 prehistoric lithic artifacts. Although no temporally diagnostic artifacts

were recovered, the predominance of quartz and quartzite and absence of ceramics suggest that most if not all of these artifacts date to the Archaic period. Many of the shovel tests encountered disturbed soils, but other shovel tests show some degree of stratigraphic integrity. Despite the obvious historic period modifications to this area, the data suggest that prehistoric deposits may maintain some degree of stratigraphic integrity in parts of this area. Based on these results, it is recommended that additional investigations be conducted to gather a larger sample of artifacts and further evaluate the prehistoric deposits in this area prior to any disturbance that might extend beneath A horizon soils, which are typically about 20 cm thick across the area.

Thirty- three (48.5 percent) of the 68 tests in Locus A produced a total of 205 historic period artifacts, all of which appear to date to the twentieth century occupation. Most of these materials are distributed as a generalized sheet midden, but artifact concentrations were found in three areas. It is recommended that two of those three areas be avoided or further evaluated prior to ground-disturbing activities.

Locus B. No prehistoric artifacts were recovered from the 14 shovel tests excavated in Locus B, but four (28.6 percent) of the tests produced a total of 25 historic period artifacts. This deposit appears to be a generalized sheet midden, representing the entire period of historic occupation in this area, and there are no indications of significant artifact concentrations or deposits. Consequently, no additional investigations of those deposits are recommended and no further work is recommended for this part of the site.

Locus C
Eleven (17.8 percent) of 62 shovel tests in Locus C produced a total of 24 prehistoric artifacts. Although no diagnostic artifacts were recovered most, if not all, of those artifacts presumably date to the Archaic period. Most of the shovel tests encountered disturbed profiles. This fact, along with the low artifact density and clear evidence of extensive historic period modifications, suggest that most, if not all, prehistoric deposits in this area have been extensively disturbed by historic period activities. Consequently, the prehistoric materials in this area are not considered to be of substantial research value.

Twenty- one (33.9 percent) of the 62 shovel tests in Locus C produced a total of 397 historic artifacts. Of those, 273 (68.8 percent) were recovered from a single shovel test, which encountered an intact pit feature that probably represents a pit or privy that was filled in the 1920s or 1930s. As a discrete refuse deposit associated with the early years of the Elkmont occupation, this feature has the potential to provide a variety of data concerning the material culture and lifestyles of the Elkmont inhabitants. Consequently, it should be protected from any ground- disturbing activities in this area.

Locus D
Nine (40.9 percent) of 22 shovel tests in Locus D produced a total of 101 prehistoric artifacts, primarily quartz or quartzite debitage fragments. Most shovel tests in this area encountered apparently undisturbed fine- grained

sediments extending to at least 70 cm below surface (cmbs). Additional information on the archeological potential of this area is provided by a test unit, which encountered an apparent Middle to Late Woodland period pit feature at the base of the plow zone (A horizon). Based on these data, it appears that Locus D contains prehistoric deposits that can provide information relevant to a variety of research questions. Although investigations in this area were limited, the entire site should be considered high- potential for archeological deposits except for a few eroded or otherwise obviously disturbed areas.

Only five (22.7 percent) of the 22 shovel tests in Locus D produced historic period artifacts. None are believed to represent significant deposits, although it is possible that more substantial deposits might exist elsewhere in that area.

In summary, Site 40SV120 contains a variety of prehistoric and historic period deposits, some of which appear to have appropriate integrity, clarity and contents to provide information relevant to substantial research questions. Consequently, the site is recommended eligible for the National Register of Historic Places and should be considered a contributing element to the District. If further investigation is not undertaken at these areas, the areas should be protected from future ground- disturbing activities associated with the proposed project or for other, unrelated projects. Other parts of the site do not appear to contain significant deposits, and no further archeological work is recommended in those areas.

Site 40SV121

Site 40SV121 is a multi- component prehistoric American Indian and nineteenth to twentieth century historic period site on the west side of Jakes Creek in the southern part of the District. The site is located on terrace, alluvial/colluvial hill slopes, and upland landforms. The combined survey at 40SV121 included excavation of 13 shovel tests. Seven of the tests were excavated in the southern part of the site during the 2002 investigations; the other five tests were excavated in the northern area in 2004. Five (38.5 percent) of the tests produced prehistoric artifacts, while a single test (7.7 percent) produced historic period artifacts. The positive shovel tests have been grouped into two loci.

Locus A

Locus A is situated in the southern part of 40SV121, and includes a standing stone chimney mortared and a stacked stone wall. A number of stone piles are also present nearby and are probably related to the historic period occupation as well. Prehistoric and historic artifacts were recovered from one (14.3 percent) of seven shovel tests excavated in this part of the site. The investigations in Locus A were extremely limited, and did not define the boundaries of either the prehistoric or historic period components in the area. Additional work will be necessary to complete identification and evaluation of those resources should impacts be planned as part of the current project or any future work.

Locus B

Locus B is in the northern part of 40SV121, on hill slope deposits. Four (80 percent) of five shovel tests excavated there recovered a total of 13 quartz debitage fragments. Artifacts were found in both the topsoil (A horizon) and the

underlying B horizon. The work at Locus B was extremely limited, and did not define the boundaries or nature of the prehistoric component in this area.

The survey at 40SV121 was extremely limited, and was not sufficient to characterize the resources in this area or to support a recommendation concerning the site's research potential or eligibility for the National Register. In the event that impacts are proposed outside previously disturbed areas of this site, additional work is recommended to complete identification and evaluation of this resource.

Site 40SV122

This site is a multi- component prehistoric American Indian and twentieth century historic period site located in the southeastern portion of the District. The combined survey at 40SV122 included the excavation of 79 shovel tests. Fifteen (19.0 percent) of the tests produced prehistoric artifacts, while 35 tests (44.3 percent) produced historic period artifacts. The positive shovel tests have been grouped into four loci.

Locus A

Locus A at 40SV122 is situated in the western part of the site, and includes both prehistoric and historic artifact distributions. Thirteen (43.3 percent) of 30 shovel tests in Locus A produced a total of 29 prehistoric artifacts, including a small ceramic sherd that probably dates to the Early to Middle Woodland period. The data indicate that low to moderate density intact prehistoric deposits are present in at least part of Locus A. The significance and research potential of those deposits cannot be determined based on the available data. Consequently, additional work will be needed to further evaluate those deposits prior to any ground- disturbing activities in that area.

Seventeen (56.7 percent) of the 30 shovel tests in Locus A produced historic artifacts. All appear to date from the early to mid twentieth century, although none are highly diagnostic. Artifact density ranged from one to 16 artifacts per positive shovel test, with no clear pattern in the distribution of the materials. Nine of the 13 shovel tests that produced prehistoric artifacts also produced historic materials. The historic period artifacts at Locus A appear to represent a variable- density secondary refuse deposit. Due to the redeposited nature of these materials and the inability to link them with specific cabins or activities, this artifact distribution is not believed to be of substantial research value. Consequently, no additional investigations (other than monitoring during any construction activities) are recommended in association with the historic component of this locus, as it is currently defined.

Locus B

Locus B at 40SV122 is in the northern part of the site. Two (18.2 percent) of 11 shovel tests in Locus B produced single quartz debitage fragments; both were recovered from the A horizon. This low- density artifact distribution likely dates to the Archaic period, and is not considered to be of substantial research value or merit further consideration.

Four (36.3 percent) of the 11 shovel tests in Locus B produced a total of 15 historic period artifacts, all of which appear to date from the early to late- twentieth

century. The historic period deposits appear to represent a variable- density sheet midden. Although these materials probably derive from activities in specific cabins, the deposits do not appear to have the potential to provide data relevant to substantive research questions, and are not considered to be of research value. Consequently, no additional investigations (other than monitoring during construction) are recommended in association with the historic component of this locus, as it is currently defined.

Locus C

Locus C at 40SV122 is situated in the eastern part of the site. No prehistoric materials were discovered in this area, but a moderate density historic period artifact distribution was identified. Twelve (52.2 percent) of 23 shovel tests in Locus C produced a total of 46 historic period artifacts, all of which appear to date to the early to- mid twentieth century. The historic period deposits in this locus are clearly secondary in nature, but are of unknown origin. It is possible that some or all of these artifacts were included in fill that was deposited to raise the level of a roadway at some point during the resort- era occupation. Due to their redeposited nature and uncertain origin, these deposits do not appear to have the potential to provide data relevant to substantive research questions, and are not considered to be of research value. Consequently, no additional investigations are recommended in association with the historic component of this locus, as it is currently defined.

Locus D

Locus D at 40SV122 is in the northern part of the site. No prehistoric materials were discovered in this area, but two of five shovel tests produced historic artifacts. These artifacts are not considered to represent a significant deposit, and no additional investigations are recommended in association with this component as it is currently defined.

Most of 40SV122 remains unsurveyed. In addition to potential prehistoric resources, the site could contain historic period resources associated with four pre- Little River Lumber Company buildings or other logging or resort- era occupations.

40SV123

Site 40SV123 is a multi- component prehistoric American Indian and twentieth century historic period site located in the northeastern portion of the District. This site lies outside the areas of dense development associated with the logging- and resort- era activities at Elkmont. The combined survey at 40SV123 included the excavation of 10 shovel tests, all but one on hill slope deposits near a cabin. Five (50.0 percent) of the tests produced prehistoric artifacts, and the remaining five (50.0 percent) produced historic period artifacts.

Locus A

Locus A includes an area where prehistoric lithic debitage fragments were recovered from the surface during the 2002 reconnaissance. Due to the current land use, no shovel tests were conducted in part of the area. A single shovel test excavated on the ridge top to the west recovered no artifacts.

The work in Locus A was extremely limited, and did not define the boundaries of the prehistoric artifact distribution. Although the prehistoric deposits in one area are clearly highly disturbed, it is possible that intact deposits are present in the surrounding area. Additional work will be necessary to complete identification and evaluation of resources in that area should impacts be planned as part of the current project or any future work.

Locus B

Locus B at 40SV123 is located near a cabin, and produced both prehistoric and historic period materials. Five (55.5 percent) of nine shovel tests in Locus B produced a total of seven quartz and five chert debitage fragments. No diagnostic artifacts were recovered, but the relatively high percentage (41.7 percent) of chert may indicate the presence of a Woodland component. Although some of the tests encountered a thin layer of historic fill, debitage fragments were recovered from what appeared to be intact strata.

The work in this area was limited, and did not define the boundaries of the prehistoric artifact distribution or adequately assess its integrity. Although the area has been somewhat disturbed by the historic period occupation associated with a cabin, it is possible that intact deposits are present. If ground- disturbing activities are proposed in this location as part of the current project or any future work, additional work will be necessary to complete identification and evaluation of this component.

The historic period deposits near the cabin appear to represent a low- density sheet midden similar to that found around other cabins at Elkmont. Although these materials probably derive from activities in this specific cabin, the deposits do not appear to have potential to provide data relevant to substantive research questions, and are not considered to be of research value. Consequently, no additional investigations are recommended in association with the historic component of Locus B as it is currently defined.

In summary, Site 40SV123 contains prehistoric components in at least two locations. The prehistoric deposits at both Locus A and Locus B are poorly defined, and require additional evaluation. For this reason, both areas should be protected from future ground- disturbing activities, either related or unrelated to the present project. In addition, further investigations will be required should potential ground- disturbing activities be planned in other parts of the site.

40SV124

Site 40SV124 is a prehistoric American Indian and twentieth century historic period site in the northwestern part of the District The combined survey at 40SV124 included the excavation of 24 shovel tests. Six (25.0 percent) of the tests produced prehistoric artifacts, and two (16.7 percent) produced historic period artifacts. Two artifact distributions have been identified.

Locus A

A total of seven quartz debitage fragments were recovered from two shovel tests in Locus A in 2002. No diagnostic artifacts were found, but the predominance of

quartz suggests an Archaic occupation. The work in this area was limited, and did not define the boundaries of the prehistoric artifact distribution or adequately assess its integrity. Although part of the area has obviously been disturbed by construction, it is possible that intact deposits are present. Additional survey and site evaluation is recommended prior to performing any ground- disturbing activities.

The historic component of Locus A represents the remains of the former Elkmont sewage system, and consists of an earthen embankment with an associated array of concrete piers holding up an iron pipe running across the former pond area. In addition, a small number of ceramic artifacts were recovered from the surrounding area. The limited work conducted in this area did not adequately document the former sewer system and the associated deposits, and additional work is recommended prior to any ground- disturbing activities.

Locus B
Four (19.0 percent) of 21 shovel tests excavated in this area produced a total of four debitage fragments. No diagnostic artifacts were recovered. The intensive shovel testing has adequately assessed the prehistoric deposits in this area, which appear to lack research value. Consequently, no additional work is recommended.

Like the other sites, most of 40SV124 remains unsurveyed. In addition, the prehistoric and historic period deposits at Locus A are poorly defined and require additional evaluation. That locus should be protected from future ground- disturbing activities, either related or unrelated to the present project, although no additional work is recommended as part of the potential construction in Locus B. Finally, further investigations will be required should potential ground- disturbing activities be planned in other parts of the site.

40SV125
Site 40SV125 is a prehistoric American Indian and nineteenth to twentieth century historic period site in the western part of the District. This site lies across Little River from the former area of dense development associated with the Little River Logging Company logging town of Elkmont, and never witnessed the same degree of development seen in that area. At least three buildings were located on the site prior to 1907 and the advent of the lumber company.

The combined survey at 40SV125 included the excavation of 48 shovel tests. Seven (14.6 percent) of the tests produced prehistoric artifacts and seven (14.6 percent) produced historic period artifacts. Artifacts were also collected from the surface in two areas. Artifacts were found in six locations, designated Loci A- F.

Locus A
A total of seven artifacts were recovered from two shovel tests in Locus A, including a chert Morrow Mountain projectile point (Middle Archaic period) and six debitage fragments. The work in this area was limited, and did not define the boundaries of the prehistoric artifact distribution or adequately assess its

integrity. Additional survey and site evaluation is recommended prior to any ground- disturbing activities.

Locus B
Locus B is located on a wooded rise on the terrace, and contains to early twentieth century house site. Two (33.3 percent) of six shovel tests excavated on this rise a total of 10 artifacts, including an apparent Late Archaic projectile point. Artifacts were recovered from the A horizon only. Work in this area was limited and although the boundaries of the artifact distribution appear to be defined by the landform, the investigations were not sufficient to assess the component's integrity or research potential. Additional survey and site evaluation is recommended prior to performing any ground- disturbing activities.

The historic component at this locus includes a square stone chimney base as well as an associated low- density artifact scatter. Historic period artifacts totaling 65 items were found in five (83.3 percent) of six shovel tests. As with the prehistoric component, the work in this locus was not sufficient to assess the component's integrity or research potential. Additional survey and site evaluation is recommended prior to any ground- disturbing activities.

Locus C
Locus C is situated north of Locus B, and contains low- density prehistoric and historic period artifact scatters. One (20.0 percent) of five shovel tests excavated in this area produced a single quartz debitage fragment from an apparent disturbed context. Although no attempt was made to delineate the boundaries of this locus, it does not appear to represent a significant resource as currently defined, and no additional investigations are recommended. However, additional survey would be necessary if impacts would potentially extend outside that corridor.

Two (40.0 percent) of the five shovel tests excavated in this area produced a total of 14 historic period artifacts. No attempt was made to delineate the boundaries of this locus, and it is possible that it represents a pre- campground occupation. Consequently, additional survey and site evaluation is recommended prior to any ground- disturbing activities in this area.

Locus D
Most of the prehistoric artifacts from this locus were found on the surface of a distinct rise. No shovel tests were excavated on the landform, as it was outside the area potentially impacted by construction. In addition to those artifacts, two quartz debitage fragments were found in one (25.0 percent) of four shovel tests excavated nearby. Those artifacts came from apparent fill. No attempt was made to systematically investigate or define the boundaries of the artifact distribution on the rise, and additional survey and evaluation would be necessary if it was to be impacted by ground- disturbing activities. However, the artifacts found adjacent to the road came from apparent fill deposits, and no additional work is recommended in that area.

Fifteen historic artifacts were also found on the rise. The limited artifact collection is clearly biased towards easily visible, potentially diagnostic items, but appears to represent a late nineteenth to early twentieth century occupation. No attempt was made to systematically investigate or delineate the boundaries of this locus. Consequently, additional survey and site evaluation is recommended prior to any ground- disturbing activities in this area.

Locus E
Locus E is situated at the southern end of the site, where a debitage fragment was recovered from the single shovel test. Although this artifact came from an apparently intact context, it does not appear to represent the presence of a significant deposit within the survey corridor. No further work is recommended in that area, but additional survey and site evaluation is recommended if ground-disturbing activities extend to the north.

Locus F
Locus F is situated in an open area at the northern end of the site, where a single wire nail fragment was recovered from one of five shovel tests in this area. This artifact does not appear to represent a significant component and no further work is recommended in that area.

In summary, Site 40SV125 contains five known prehistoric components and four known historic components, many of which require additional evaluation. A large part of the site remains unsurveyed, and additional prehistoric and historic components could also be present.

40SV165
This site is located on floodplain, terrace and hill slope landforms in the eastern part of the District. Most of the area is lightly wooded. The limited survey at 40SV165 included the excavation of 11 shovel tests. One (9.1 percent) of the tests produced prehistoric artifacts. No historic period artifacts were recovered.

Locus A
Only one of five shovel tests excavated in this area produced artifacts, all of which were found in fill deposits. The origin of these artifacts is unknown, but they clearly do not represent an in situ resource. Consequently, no additional work is recommended along the utility corridor in this area.

Like the other sites, most of this new site remains unsurveyed. In addition to potential prehistoric resources, the site almost certainly contains a variety of subsurface remains associated with the Little River Lumber Company town of Elkmont.

40SV166
Located on terrace, alluvial/colluvial hill slopes and uplands, 40SV166 is a newly identified prehistoric American Indian and twentieth century historic period site in the northeastern part of the District. Most of the area is wooded, although there are some grassy and cleared areas adjacent to the buildings. The combined survey at 40SV166 included excavation of 82 shovel tests. Fifteen (18.3 percent) of the tests produced

prehistoric artifacts, and 27 (32.9 percent) produced historic period artifacts. The recovered materials have been grouped into four loci.

Locus A

Locus A at 40SV166 is situated primarily on the upland ridge and the adjacent hill slopes leading down to the terrace. Seven (15.9 percent) of 44 shovel tests in this locus produced prehistoric artifacts, consisting of a total of 16 quartz debitage fragments. Based on the predominance of quartz, the component presumably dates primarily to the Archaic period. The shovel test with the highest density of artifacts was one of two tests located on a distinct bench partway down the hill slope, where there is some potential for intact artifact distributions and perhaps features. Consequently, additional survey and site evaluation is recommended if ground- disturbing activities extend into that area. None of the other shovel tests excavated elsewhere on the ridge produced more than two prehistoric artifacts, and most encountered disturbed and/or eroded soils. Evidently, the intense historic period activities have disturbed any deposits that may have been present in this part of the component. For this reason, no additional investigations are recommended in that area.

Seventeen (38.6 percent) of the 44 shovel tests produced historic period artifacts, which appear to represent a dispersed artifact scatter or sheet midden that extends across the entire area. All of the materials were found in the surface or A horizon, and there was no evidence of significant artifact concentrations or unmixed deposits. Based on this pattern, no additional work is recommended in the investigated part of this area, subject to the constraints and recommendations provided below.

Locus B

Locus B at 40SV166 is situated on a narrow terrace located at the base of a ridge. Four (66.6 percent) of six shovel tests excavated in this area produced a total of 10 prehistoric artifacts, including two ceramic sherds dating to the Woodland period. Artifact density ranged from one to six artifacts per positive shovel test, and the artifacts were recovered from depths of up to at least 100 cmbs.
The prehistoric cultural deposits at this site appear undisturbed, and there is potential for intact Woodland period artifact distributions and perhaps features on this landform. Consequently, additional survey and site evaluation is recommended prior to any ground disturbing activities in this area.

Two of the six shovel tests produced historic period artifacts. These artifacts were recovered from the upper strata, above the strata that produced the prehistoric artifacts. These materials appear to represent intermittent refuse disposal in this area, and are not considered to warrant additional interpretation.

Locus C

Locus C at 40SV166 is situated on a terrace and parts of this area are maintained as lawn, while other parts are wooded. Four (11.1 percent) of 39 shovel tests excavated in this area produced a total of nine prehistoric artifacts. Essentially all of the shovel tests in this area encountered disturbed soils, and there is considerable surface evidence of ground disturbance and erosion across parts of

this area. Based on the low artifact density and evidence of disturbance, no additional investigations of this component are recommended.

Five (12.8 percent) of the 39 tests produced a total of 15 historic period artifacts. Artifact density ranged from one to eight artifacts per positive shovel test. These materials derive from one or more of the documented twentieth century uses of this area, and there are no indications that they represent an intact deposit. Consequently, no additional investigations of this component are recommended.

Locus D
Locus D at 40SV166 is situated in an area that was reportedly used as a septic drain field and as a refuse dump during the mid- twentieth century. Large numbers of historic period artifacts were observed eroding out of the riverbank at the west edge of this area, and three of seven shovel tests excavated above the riverbank also encountered historic period artifacts. No similar artifact deposits were encountered in Locus C, indicating that this deposit is limited to the Locus D area.

This deposit appears to represent a secondary refuse deposit that can be associated with the twentieth- century use of nearby resort facilities. As such, it has the potential to provide data concerning activities that took place at the site, and additional survey and evaluation are recommended if ground- disturbing activities extend into this area.

In summary, 40SV166 contains three known prehistoric components and four known historic components, many of which require additional evaluation. Like the other sites, much of 40SV166 remains unsurveyed. In addition to potential prehistoric resources, it is possible that unsurveyed parts of this site contain additional intact remains associated with the Wonderland Club development.

Summary of Results and Recommendations for Archeology
The archeological work conducted at Elkmont, despite its limitations, has provided pertinent data concerning the archeological remains present, and has established a framework for recording and, to some extent, evaluating, additional materials that are likely to be found in the future. The eight identified sites at Elkmont include a variety of prehistoric and historic period materials. The most extensive prehistoric materials consist of quartz debitage, which constitutes a nearly ubiquitous scatter across most surveyed parts of the terraces and alluvial/colluvial hill slopes; chert is a relatively minor constituent compared to most of the quartz distributions. Although only two diagnostic artifacts were found (a chert Morrow Mountain point and a quartz Late Archaic stemmed point), most of this debitage are considered likely to date to the Middle and Late Archaic period. There are indications of intact subsurface remains associated with these components in a few areas (such at 40SV120 Locus A and 40SV121 Locus B), and it is likely that significant Archaic period deposits are present in several areas of the District.

Woodland period remains have been documented at three locations: on the hill slope deposits at 40SV120 Locus D, on the terrace at 40SV122 Locus A and at 40SV166 Locus B. The materials at 40SV120 Locus D are known to date to the Middle to Late Woodland

periods, and occur in association with a pit feature. This locus clearly has the potential to provide significant data concerning the Woodland occupations of the Little River valley. Less information is available concerning the other two components, although the component at 40SV166 appears to have the potential to contain significant deposits.

No Mississippian or Historic Cherokee materials were recovered. Although it is possible (and perhaps likely) that some such deposits are present in unsurveyed parts of the District, this pattern likely represents a lessened intensity of occupation of this upland valley during these periods.

As expected, most of the historic period remains from Elkmont date to the twentieth century, a period that witnessed an explosion in use of the valley associated with the Little River Lumber Company logging town of Elkmont, the resort- era occupations at the Wonderland and Appalachian clubs, and the establishment of successive Boy Scout, private, Civilian Conservation Corps and NPS campgrounds. Since the survey was concentrated in the Wonderland and Appalachian club areas, most of the recovered historic artifacts are associated with those occupations. Most of those artifacts were recovered from diffuse sheet middens that are present in most occupation areas. Those deposits contain mixed materials, from up to 80 years of occupation, and are generally considered to have little research potential. However, discrete deposits with research potential were identified in association with three buildings. It is likely that similar deposits are present in the vicinity of other buildings, but occur as discrete features that are not easily identified in shovel testing.

The survey work recorded structural remains associated with two of the pre- Little River Lumber Company buildings at Elkmont. Although the investigations at each locus were limited, the remains at those and similar home sites certainly have research potential. Very little work was conducted at the former Elkmont town site, and essentially no artifacts were recovered that can conclusively be associated with that occupation. Although the former town site is believed to have considerable research potential, this remains to be demonstrated through additional research or compliance-oriented work.

3.1.3 Area of Potential Effects

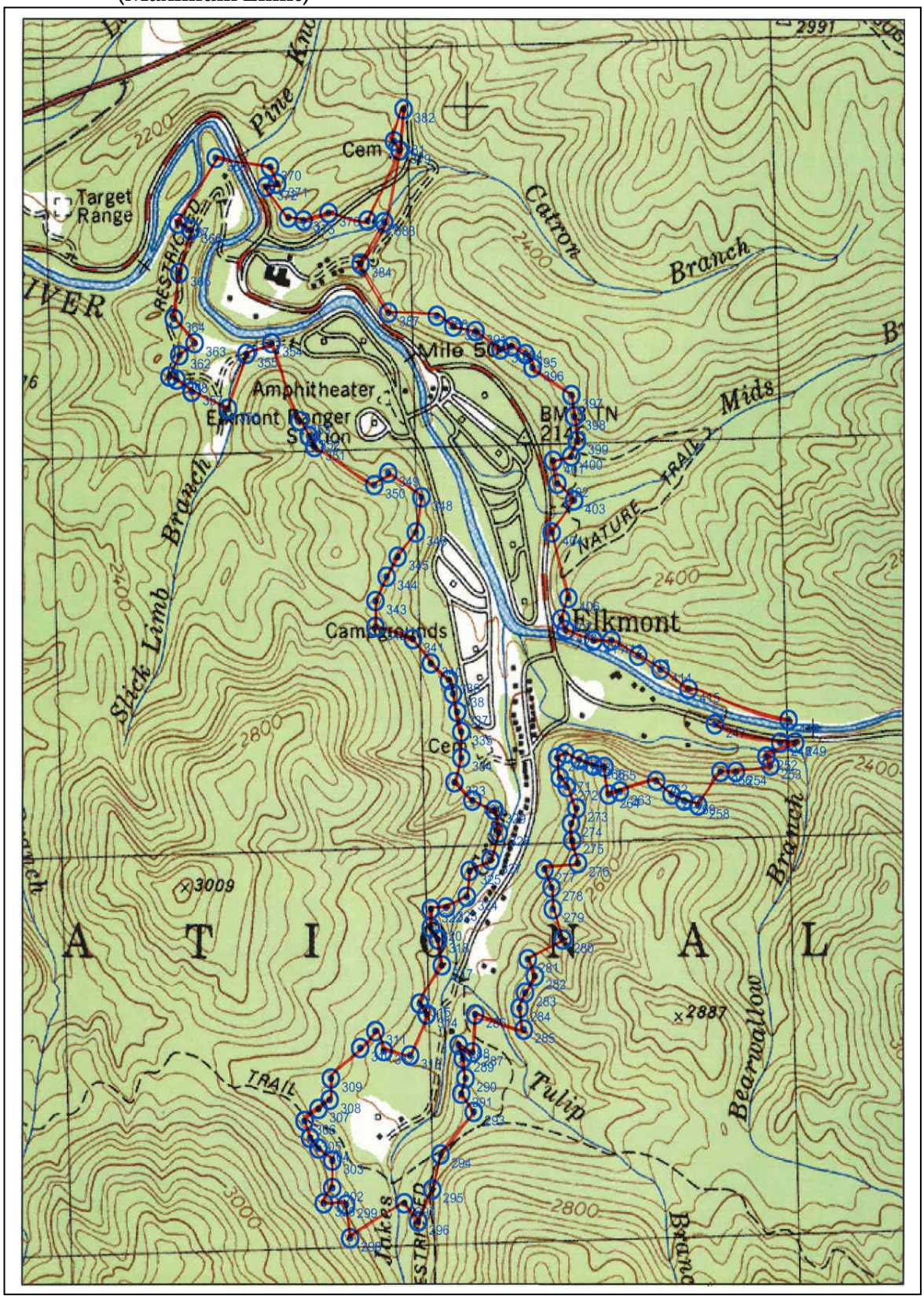
The Area of Potential Effects (APE) is a cultural resources concept that is specific to Section 106 of the National Historic Preservation Act mandate to identify a project's potential impact area (36 CFR 800.4[a][1] and 800.16[d]). Most simply put, it is that area that includes all the direct effects (for example, removal of the buildings that are considered contributing to the District) and all the indirect effects (for example, an increase in visitation to the District) that could result from implementation of any of the proposed alternatives. The visual limit into the District is defined by a string of points encircling the District from which one can look into and no longer observe anything manmade. This visual limit constitutes the maximum APE for the Elkmont project and encompasses the maximum area of potential change. The location of the boundary defining the APE may constrict or expand dependent upon the alternative selected for implementation; however, no boundary will go beyond the maximum APE/visual limit line.

The maximum APE was delineated in the winter (2003) when the leaves are off the trees and the cultural landscape of the District is most visible. Figure 3- 1 illustrates the maximum APE. The small circles on the figure indicate where map coordinate readings were made, and the boundary was drawn by connecting these points of observation. These points are at the elevation from which one cannot see the buildings, structures, and roads at Elkmont. For the most part, the maximum APE for the management alternatives proposed for the District is within or borders the physical boundary of the District as described in its nomination. It extends outside the District nomination boundary at its most southern end (near the area of the NPS horse barn) due to the flatter topography in this part of the District.

Chapter 2 of this document provides a detailed description of each alternative. The proposed management alternatives for the District that have the largest APE are the "No Action Alternative" (implementation of the current General Management Plan) and Alternative A. The "No Action Alternative" would remove all historic buildings within the District and leave only remnants of cultural landscape features such as stone walls that would not pose a safety hazard. Alternative A would do the same, except all foundations would be removed to ground level as would many of the cultural landscape features. These two alternatives would have the largest APE because they would cause the most visible change within the Elkmont Historic District.

In addition to determining the APE for cultural resources, a visual quality assessment was performed within and adjacent to the District as part of this planning process. The visual quality assessment was performed because the overall visual quality of the District not only considers cultural resources, but relates to and considers all other resources as well. In determining the environmental consequences that could result from implementation of any of the proposed alternatives, potential impacts to all resources are described. In this analysis, the area of potential effects for other resources does not necessarily coincide with that of cultural resources. Environmental consequences are described in terms of the potential for direct, indirect and cumulative effects and must consider each resource in its own context. As such, analysis of environmental consequences may extend well beyond the cultural resource APE, especially if a resource that may potentially be affected by project implementation is rare within the region, the Park, or globally. Therefore, the APE was defined to comply with Section 106 of the National Historic Preservation Act, whereas the viewshed analysis was performed to gather existing information for the NEPA process. This process is described in detail in Section 3.5.1 of this document.

Figure 3- 1: Area of Potential Effects for Elkmont Historic District Cultural Resources (Maximum Limit)



3.2 Natural Resources

3.2.1 Physical Geology

The rocks that underlie the Park and vicinity are part of the western Blue Ridge Geologic Province in the southern Appalachians. Most bedrock in the Park consists of a thick mass of variably metamorphosed sedimentary rocks of late Precambrian age. The dominant units underlying the Little River watershed are the Elkmont and Thunderhead Sandstones, which are massive, thick- bedded, feldspathic sandstones, composed of detrital quartz, potassium feldspar, and plagioclase and metamorphic biotite, muscovite and chlorite. Bedrock in many areas of the basin is overlaid by deposits of alluvium, colluvium and saprolite that are locally up to 30 meters (m) [98.4 feet (ft)] thick (Mast and Turk 1999). The bedrock underlying the portion of the watershed which contains the District is composed of less metamorphosed rock (slates, sandstones and metasiltstones) of the Thunderhead formation. The sedimentary bedrock is late Precambrian, about 500 million to 1 billion years old.

Processes of erosion and deposition formed the landscape within the District. Rocks and sediments moved from higher elevations through landslides; in addition, water also left sediment deposits. The contemporary landscape probably formed during periods of colder and/or wetter climate thousands of years ago. Movement of rock and sedimentary material probably occurred during the late Pleistocene through middle Holocene period. There is no evidence to suggest the exact mode of placement of landscape material, although data from the Ravensford Tract in the Oconaluftee drainage indicates that debris flows sufficient to move boulders could have been fairly common during the early and middle Holocene period. Some of the mass- wasted sediment was likely deposited during the last glacial maximum under periglacial climatic conditions. Volume estimates are not possible, as the entire basin would have to be studied in order to estimate sediment yield given the small areal focus of the District. The elevation of boulders in the low terrace indicates that the streambed was slightly higher than it is now (1- 2 m), and that it was carved out to its present elevation during the latter half of the Holocene period. However, absolute dating techniques would be necessary to confirm this hypothesis (Webb 2002).

3.2.1.1 Geomorphology

A geomorphic reconnaissance within the District boundaries was conducted to identify the major landforms present. Five principal landforms were identified, including: (1) the floodplain; (2) a low terrace; (3) high terrace remnants; (4) alluvial/colluvial hill slope deposits; and (5) rocky upland slopes. Each landform type is discussed below in terms of its sedimentation history.

<u>Floodplain</u>

The floodplain is the alluvial land surface that is being constructed by the modern regime of the Little River and its tributaries. It is the first distinct alluvial surface above the river and stream channels. The highest elevation of this surface ranges from about 0.5 to 2.0 m (1.6 to 6.5 ft) above the base flow water level of the river and its tributaries. The floodplain tends to be a narrow corridor of land, which indicates that the river and streams have not been graded to this elevation for a very long period of time. The floodplain probably receives new sediment (historical in age) during relatively frequent overbank flood events (every 0.5- 5.0 years). The youngest parts of this surface consist of

imbricated boulders and cobbles, whereas the older parts have a layer of sand and silt over the cobbles that are typically less than 50 cm (19.7 in) thick. No auger holes were drilled into the floodplain deposits, but observations were made from cut banks along the active channel.

Low Terrace

The low terrace is the first widespread alluvial surface with increasing elevation above the floodplain. The average top elevation is at about 1.5 to 3.0 m (4.9 to 9.8 ft) above the baseflow water level, but it can be as high as 4.0 m (13 ft). There is considerable topographic relief on this surface since boulder bars and intervening swales are common. This is the most extensive alluvial surface in the valley at Elkmont, and makes up most of the area where the Elkmont Campground and buildings are situated. Some relatively low swales on this surface are probably the only portions of this landform that have received overbank flood sediment over time. This surface exhibits many very large boulders [some in excess of 2.0 m (6.5 ft) in diameter], indicating that debris flows were an important sediment source for the alluvium and flooding on a much larger scale than what is presently experienced were likely responsible for sedimentation of this surface.

Five auger holes were drilled into the low terrace. Each hole exhibited a silty to sandy layer of sediment less than 1.0 m thick that overlies cobbles and boulders. Locations of those auger tests are mapped in the 2002 baseline report (Webb 2002). In some places, cobbles and boulders are at the surface and completely lack a fine- grained stratum. The soil traits indicate that the low terrace is probably from the Holocene period. This surface exhibits characteristics that correlate closely to those of the first terrace at the confluence of Raven Fork and the Oconaluftee Rivers on the east side of the Park, which has been dated to 3,000 to 8,000 calendar years old (Webb 2002).

High Terrace Remnants

Small remnants of high terraces occur sporadically throughout the District. The largest remnant occurs in the amphitheater area, but it appears to be covered with a layer of hill slope sediment at that location. Other patches of high terrace remnants were too small to map at the scale investigated. The available outcrops exposing this unit indicated a much greater degree of soil weathering than was seen in the low terrace. These high terrace remnants represent a much higher elevation of the stream base level in the past. All available evidence (profile weathering and stratigraphic relation to the low terrace) suggests that this surface is Pleistocene in age.

Alluvial/Colluvial Hill Slope Deposits

Alluvial/colluvial hill slope deposits are aprons of colluvium and alluvium along the sides of the valleys. They have been transported from the uplands and redeposited in the lower back slope, foot slope, and toe slope positions. Many of the hill slope deposits occur as lobes of sediment that emerge from small first and second- order tributaries upon entry to the main valley of the Little River and Jakes Creek. The thickness of the hillslope deposits is not well known. Since cobbles and boulders were always encountered in auger holes, the depth of analysis within this unit was restricted.

Seven auger holes were drilled into hill slope deposits. These hill slope deposits are essentially identical to the Holocene hill slope sediments that were radiocarbon dated as part of the geomorphic investigations of the Ravensford Tract in the Oconaluftee

drainage (Webb 2002). Unlike the valley at Ravensford, an older phase (Pleistocene) of hill slope deposition was not identified at Elkmont, and it appeared that the majority of these deposits are from the Holocene period. A buried A horizon was found in one auger hole, indicating that the youngest of these deposits is historical in age. It is also apparent that some of the older Holocene hill slope sediments have been somewhat dissected and appear as low spurs of foot slope deposits protruding into the valley in some localities.

It is possible that the hill slope deposits could contain artifacts associated with Paleoindian populations (circa 12,000 years old) or later time periods. In addition, unoxidized sediments that could be present within or sealed beneath such deposits could potentially contain intact plant subfossils that could provide information on past environments in the Elkmont vicinity.

Rocky Upland Slopes

The rocky upland slopes are the hill slopes that consist of bedrock and saprolite with a thin veneer of colluvium. Much of this sediment is rather coarse, consisting of angular cobbles and gravel.

3.2.1.2 Soil Characteristics

Most soils in the watershed are classified as Inceptisols that are fairly deep, well- drained soils developed in residuum weathered from the underlying bedrock (NPS 2002b). Chemically, these soils tend to be acidic (pH 4.1 to 5.8), with low organic content and low cation- exchange capacities (NPS 2002b). The exchange complex is almost entirely derived from the organic matter and is generally dominated by aluminum.

The U.S. Department of Agriculture- Natural Resources Conservation Service (NRCS) is mapping soils in the Park. Soil mapping for Sevier County, including the District, has not yet been published, but is available in draft form (Figure 3- 2). A description of the soils found in the District follows (Khiel 2002 and Khiel Pers. comm. 2004):

- The floodplain, low terrace, and alluvial/colluvial landforms are composed of Spivey- Santeetlah- Nowhere complex. This complex is found in the Daisy Town, Millionaire's Row, Society Hill and Campground areas within the District. Slopes vary from 2 to 8 percent, 8 to 15 percent, and 15 to 30 percent. The Spivey soil series consists of very deep, well drained, cobbly soils in long narrow areas in valleys, and coves in mountainous areas. Formed in colluvium from metasedimentary rock (mostly sandstone of the Thunderhead formation), they are classified as loamy- skeletal, mixed mesic Humic Dystrudepts. The Santeetlah series consists of very deep, well- drained, moderately rapidly permeable soils on benches, fans, and foot slopes in coves in mountainous areas. They formed in colluvium from metasedimentary rock (phyllite, slate, and sandstone). They are classified as coarse- loamy, mixed, mesic Humic Dystrudepts. Spivey and Santeetlah soils have thick, dark surface layers, and are very deep. Spivey soils also have more than 35 percent rock fragments in the subsoil and make up about 20 percent of the map unit.

- The high terrace landform is composed of Lonan loam, with 8 to 15 percent slope and 15 to 30 percent slope. This soil unit is found in the area west of Daisy Town near Jakes Creek Cemetery and in the Wonderland Hotel area. This map unit

consists of deep to very deep Lonon soils on sloping colluvial benches and fans. These soils are well drained. Mapped areas are remnants of once larger colluvial deposits from the surrounding mountains. Permeability is moderate and there is very little runoff in forested areas where leaf litter has not been fully or partially disturbed. Runoff is rapid in non- forested area. The water table is more than 6 feet below the surface.

- The rocky upland slopes are composed of Soco- Stecoah complex, with 30 to 95 percent slopes. Within Elkmont Historic District, this complex is found in the northeast part of the District south of the Catron Branch and east of the Little River Road. This soil type consists of moderately deep Soco soils and deep Stecoah soils on very steep south- to- west facing side slopes in the intermediate mountains. Both soils are well drained. Mapped areas are irregularly shaped and range from 2 to 20 ha (5 to 50 acres). These soils are too intricately mixed and small in size to separate them in mapping. Permeability is moderately rapid. Surface runoff is slow where forest litter has not been disturbed and is rapid where litter has been removed.

  Other than Lonan loam (15 to 30 percent slopes) described above, most of the Wonderland Hotel area consists of the Junaluska- Brasstown complex (15 to 30 percent slopes). Soils in this map unit include moderately deep Junaluska soils and deep Brasstown soils. Both soils are found on moderately steep south to west facing hill slopes and are well drained. Areas with these soil types are long and narrow, covering areas from 2.0 to 20.2 hectares (5 to 50 acres). Junaluska soils usually comprise 35 to 45 percent of this soil unit, while the Brasstown soils portion is 35 to 45 percent. The two soils occur together with areas of each too small to accurately separate them for mapping. These soils are moderately permeable. Areas where there has been significant ground disturbance exhibit rapid runoff of precipitation, while runoff in areas that remain covered by leaf litter is slow.

  Small areas of Santeetlah, Spivey, and Tsali soils are also included in this soil unit. Santeetlah and Spivey soils are found along drainageways and have dark surface layers. The subsoil layer of Spivey soils is comprised of more than 35 percent rock fragments. In addition, Santeetlah and Spivey soils are very deep to weathered bedrock. Tsali soils are on highly divided areas and are shallow to weathered bedrock. Approximately 20 percent of the soils in this map unit are comprised of these soil types.

  Soils similar to Junaluska and Brasstown soils are also included in this map unit and may have a rockier surface layer or subsoil layers that are browner.

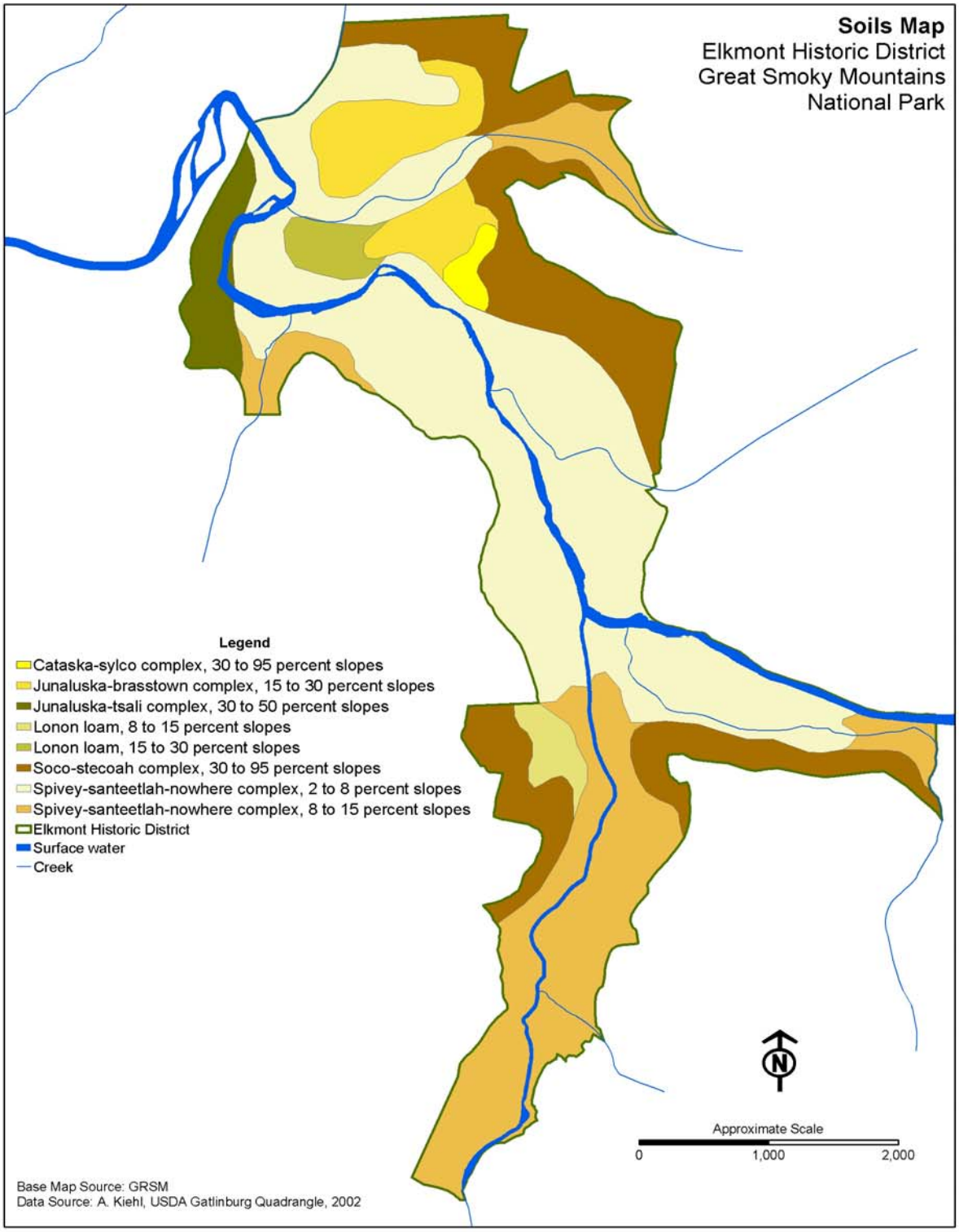
- A small portion of the Wonderland Hotel area consists of the Cataska- Sylco soil complex (CcF). This complex is in very rocky areas with steep slopes (50 to 95 percent slopes). This map unit is very steep and consists of shallow Cataska soils and moderately deep Sylco soils. They are generally found on steep slopes in low and intermediate mountains. Sylco soils are well drained and Cataska soils are excessively drained. These areas generally range from 4 to 32 hectares (10 to 80 acres) in size. Typically, this unit contains 40 to 50 percent Cataska soils, and 30

to 40 percent Sylco soils. These soils are too intricately mixed and small in size to separate them in mapping.

These soils have moderately rapid permeability, with slow runoff where the leaf litter has not been significantly disturbed and rapid runoff in areas lacking leaf litter. Weathered bedrock is found at 25 to 51 cmbs (10 to 20 inches) in Cataska soils and 51 to 102 cmbs (20 to 40 inches) in Sylco soils. Sylco soils have a wide range of organic matter content in the surface layer (low to high), while Cataska soils range from low to moderate organic matter content. These soils are underlain by sulfuric rock that may be exposed by road building and produce acidic runoff and seepage when exposed to precipitation. This acidic fluid may eventually flow into streams nearby and result in water quality degradation. The rock is also susceptible to landslides during periods of rain.

Small areas of Junaluska, Soco, and Spivey soils are also included in this complex. Less than 35 percent of the subsoil in Junaluska and Soco soils is comprised of rock fragments. The subsoils of Junaluska soils also have a higher component of clay. The surface layer of Spivey soils is thicker and darker. Junaluska and Soco soils are found at the base of slopes, while Spivey soils are found along drainageways. Approximately 20 percent of the map unit is comprised of these soil inclusions. Soils similar to Cataska and Sylco soils are also included in this unit and have a composition with fewer rock fragments and or subsoils that are more reddish.

Figure 3- 2: Draft Soil Map of the Elkmont Vicinity (USDA–NRCS)



3.2.2 Biotic Communities of Elkmont Historic District

Great Smoky Mountains National Park is a richly diverse landscape, hosting approximately 1,600 species of flowering plants, over 50 native mammals, 200 species of birds, and a large variety of reptiles, amphibians, salamanders, invertebrates, insects and other biological organisms. Approximately 20% of the forest within the Park has old growth characteristics. Many other areas have been previously disturbed and are in a variety of stages of succession following disturbance from logging and agricultural practices that occurred prior to the Park's establishment (UNESCO 2003).

Vegetation communities differ with changes in elevation, slope and slope aspect. The combination of variable topography, presence of the Little River and tributaries, and past land uses have all contributed to development of a variety of vegetation communities throughout the District. These communities, in turn, provide habitat for a diverse population of aquatic and terrestrial organisms. Biotic communities of the District are discussed in detail below.

3.2.2.1 Aquatic Communities

Streams and other aquatic environments in the Park provide essential habitat for numerous species of invertebrates, reptiles and amphibians. 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 a great diversity of amphibians, including 31 species of salamander and 13 species of frogs and toads (Nichols Pers. comm. 2004). Fish and invertebrate species occurrences more specific to the Little River watershed are provided below.

Benthic Surveys

Tennessee contains six rivers classified as "Outstanding National Resource Waters". In addition, a portion of one river (Obed River) is classified as a Tier III provisional water. 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. Benthic community research supports water quality data (See Section 3.2.4), 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 three 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 the most sensitive to pollution and the lowest is given to species that are 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 3- 4).

Table 3- 4: Little River Invertebrate Data

Year	Number of Species	Biotic Index Score
2000	63	Good
1999	64	Excellent
1998	52	Good
1997	72	Good
1996	No Data	N/A
1995	76	Excellent
1994	82	Excellent
1993	No Data	N/A

Source: NPS 2002b

Fish Surveys

The ongoing fishery management program at the Park was initiated in the mid- 1980s by the 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 montane 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 angler 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 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 US 73 at elevation 603.5 m (1,980 ft); the other site is located upstream near the Little River truck road turnaround [elevation 701 m (2,300 ft)]. The two sites on Jakes Creek are located upstream from the cabins; the site further downstream begins at the pump house and ends 100 m (328 ft) below it [elevation 707.1 m (2,320 ft)]. The upstream site begins at the stream crossing on Meigs Mountain trail [elevation 755.9 m (2,480 ft)].

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 seven 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).

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 (*Campostoma anomalum*), saffron shiner (*Notropis rubricroceus*), and the rainbow trout (*Oncorhynchus mykiss*), a species that is 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 District, these fish are an important resource, providing recreational fishing opportunities. Comparing the three

streams, mean salmonid biomass was greatest in Cataloochee Creek [37.29 kilogram (kg)/ha] [82.2 pounds (lbs)/acre] followed by Little River (33.60 kg/ha) [74lbs/acre] and Abrams Creek (32.85 kg/ha) [72.4lbs/acre]. Mean salmonid density followed the same trend. Of the three large streams sampled, Abrams Creek supported 14 species of non-game 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 [>1,000 cubic feet per second (cfs)] [>28.3 cubic meters per second (cms)] occurred in 1994.

3.2.2.2 Terrestrial Communities

The region that separates the Great Valley of Tennessee from North Carolina is the Unaka mountains, which lie on the western edge of the Blue Ridge physiographic province (Wofford 2002; Isely 1990). The majority of the province is located in Tennessee, with the remainder in North Carolina. This region includes the group of mountains called the Smoky Mountains that encompasses the District. Many plant species in this region tend to show a strong affinity to specific physiographic and are found less frequently in other provinces.

Descriptions of the vegetation communities within the District are based on several data sources. One source is the Community Element Global (CEGL) system developed by the Association for Biodiversity Information (ABI). ABI became NatureServe in 2001 and currently maintains databases to support the United States National Vegetation Classification System (USNVCS) and the plot data upon which it is based. The CEGL 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 (CRMS) 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 classification system is outlined in the draft report, *Vegetation Classification System for Mapping Great Smoky Mountains National Park* (CRMS and NatureServe 2003).

The resulting map of plant communities in the District is a combination of the CEGL 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 a common configuration 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 areas delineated on Figure 3- 3 represent the floristic levels of association. Table 3- 5 lists the plant communities (common name) along with the name of the association.

The Global Conservation Status rank identified for each plant community listed in Table 3- 5 is based on factors such as current geographic extent, threats, number of distinct

Figure 3- 3: Plant Communities of the Elkmont Historic District

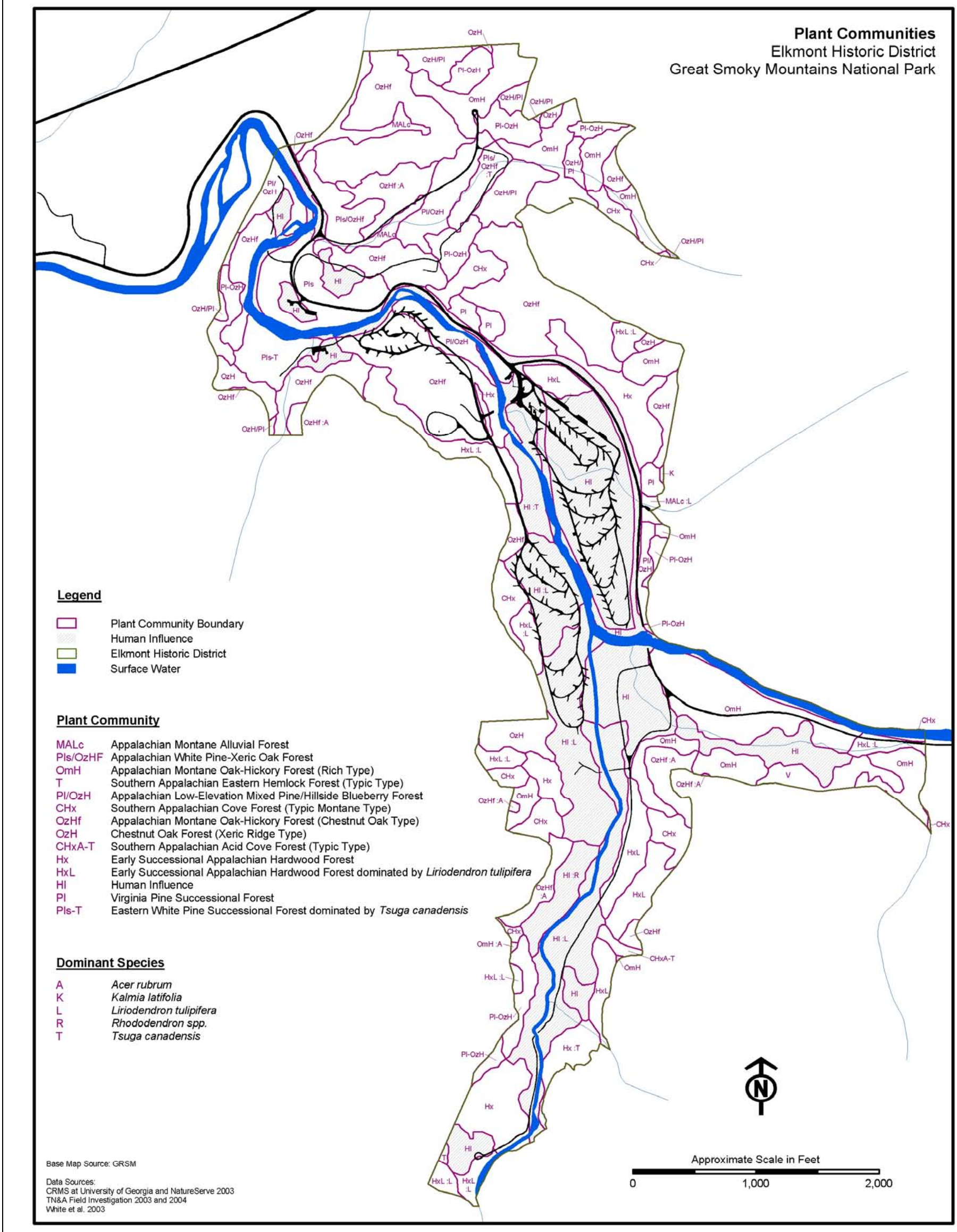


Table 3- 5: Vegetation Associations of the Elkmont Historic District

Map Key	Association	Community Name	Global Conservation Status Rank
MALc	*Platanus occidentalis – Liriodendron tulipifera – Betula (alleghaniensis, lenta) / Alnus serrulata – Leucothoe fontanesiana* Forest	Appalachian Montane Alluvial Forest	G2?
PIs/OzHf	*Pinus strobus – Quercus (coccinea, prinus) / (Gaylussacia ursina, Vaccinium stamineum)* Forest	Appalachian White Pine – Xeric Oak Forest	G3
OmH	*Quercus alba – Quercus rubra – Quercus prinus / Collinsonia canadensis – Podophyllum peltatum – Amphicarpaea bracteata* Forest	Appalachian Montane Oak- Hickory Forest (Rich Type)	G3
T	*Tsuga canadensis / Rhododendron maximum – (Clethra acuminata, Leucothoe fontanesiana)* Forest	Southern Appalachian Eastern Hemlock Forest (Typic Type)	G3 G4
PI/OzH	*Pinus virginiana – Pinus (rigida, echinata) – (Quercus prinus) / Vaccinium pallidum* Forest	Appalachian Low- Elevation Mixed Pine / Hillside Blueberry Forest	G4?
CHx	*Liriodendron tulipifera – Aesculus flava – (Fraxinus americana, Tilia americana var. heterophylla) / Cimicifuga racemosa –Laportea canadensis* Forest	Southern Appalachian Cove Forest (Typic Montane Type)	G4
OzHf	*Quercus prinus – (Quercus rubra) – Carya spp. / Oxydendrum arboreum – Cornus florida* Forest	Appalachian Montane Oak- Hickory Forest (Chestnut Oak Type)	G4 G5
OzH	*Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest	Chestnut Oak Forest (Xeric Ridge Type)	G5
CHxA- T	*Liriodendron tulipifera – Betula lenta – Tsuga canadensis / Rhododendron maximum* Forest	Southern Appalachian Acid Cove Forest (Typic Type)	G5
Hx	*Liriodendron tulipifera – Acer rubrum- Robinia pseudoacacia* Forest	Early Successional Appalachian Hardwood Forest	GD
HxL	*Liriodendron tulipifera – Acer rubrum- Robinia pseudoacacia* Forest dominated by *Liriodendron tulipifera*	Early Successional Appalachian Hardwood Forest dominated by Tulip poplar	GD
HI	Human Influence	Areas disturbed by human activities	N / A
PI	*Pinus virginiana* Successional Forest	Virginia Pine Successional Forest	GD
PIs- T	*Pinus strobus* Successional Forest dominated by *Tsuga canadensis*	Eastern White Pine Successional Forest dominated by Eastern hemlock	GD

Source: White et al. 2003.

G2=Imperiled: generally 6 to 20 occurrences and/or fewer remaining acres or very vulnerable to elimination throughout its range due to other factor(s)

G3=Vulnerable: generally 21- 100 occurrences. Either very rare and local throughout its range or found locally, even abundantly, within a restricted range or vulnerable to elimination throughout its range due to other factor(s)

G4= Apparently Secure: uncommon, but not rare (although it may be quite rare in parts of its range, especially at the periphery). Apparently not vulnerable in most of its range.

G5= Secure; common, widespread, and abundant (though it may be quite rare in parts of its range, especially at the periphery). Not vulnerable in most of its range.

GD= Ruderal: vegetation resulting from succession following anthropogenic disturbance of an area. Generally characterized by unnatural combinations of species (primarily native species, although often containing slight to substantial numbers and amounts of alien species as well).

? = 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.

G# G# = Greater uncertainty about a rank is expressed by indicating the full range of ranks which may be appropriate. For example, a G1 G3 rank indicates that the rank could be a G1, G2 or a G3.

occurrences, degree of decline from historic extent and degree or alteration of natural processes affecting the dynamics, composition, or function of the type (White et al. 2003). Characteristics of the District's plant communities are described below as provided in the *Vegetation Classification of Great Smoky Mountains National Park* (White et al. 2003). A description of the distribution of plant communities throughout each planning area of the District (Millionaire's Row, Wonderland Club, Daisy Town, Society Hill and the Elkmont Campground) is provided following the plant community descriptions. The distribution of these communities is shown on Figure 3- 3.

Globally Imperiled Associations (G2)

Appalachian Montane Alluvial Forest (MALc)

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 ft 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 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 soils are 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 teaming 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 2,667 ha (6,590 acres) of this plant community type within the Park, approximately 1% 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 which 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. In addition, a significant number of these floodplain forests (Hazel Creek, Eagle Creek, Abrams Creek, etc.) were lost with the creation of two reservoirs. In the District, the floodplain of the Little River was utilized as a site for the Elkmont Campground. Most of the structures in the Appalachian Club area are located on alluvial / colluvial flats and benches at the confluence of Little River and Jakes Creek.

Even more severe losses have occurred outside the Park where floodplain forests continue to be lost as a result of increasing and ever- intensifying land use. On private land, floodplains have been lost to development (including structures and roads), reservoirs, and agriculture. The few remaining privately held floodplain forests are typically highly fragmented and overrun with non- native plant species. In addition, there are no assurances that these areas will remain forested. Federal and state lands offer the best opportunities for their protection. However, within national and state forests, floodplain forests are managed for multiple uses. While best management practices (including 50- 100 ft buffers around streams) are used, timber harvests are often conducted in floodplain forests due to their accessibility and high productivity.

The continuing loss of floodplain forests has led to their classification as "rare" or "imperiled" by many organizations and agencies. 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 Elkmont 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 has formally adopted the rating system developed by NatureServe as the definitive rating system for community vulnerability in the NPS *Interim Guidelines for Assessment of Impairment to Natural Resources*. NatureServe, the former science branch of The Nature Conservancy, has 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. By definition, communities with a G2 designation are "Imperiled: Generally 6- 20 occurrences and/or few remaining acres **or** very vulnerable to elimination throughout its range due to specific factors."

Over a period of several decades, The Nature Conservancy developed a national, hierarchical system of classifying vegetation. The classification is now actively managed by NatureServe. In consultation with state and federal agencies, NatureServe applies objective rarity ranking criteria to both species and vegetative communities. They have cooperative relationships with every state and their rarity ranks of species and communities serve as the accepted standard for federal land management agencies including the NPS. NatureServe scientists reviewed vegetation data from Elkmont and

have described its forests as rare and significant and stated that "…protection of a site with remnant alluvial forest and with the potential for recovery of natural hydrologic processes would be a significant contribution to the conservation of biological diversity…"

In addition, *Southern Forest Resource Assessment* (2002), a combined effort of the USDA Forest Service, US EPA, USFWS, and TVA, 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 upon the decisions of numerous ownerships with varying objectives that typically do not include conservation.

The montane alluvial forest community type represents a late successional forest community. Because of perpetual disturbance in the Elkmont environment for at least the past 100 years, including intensive lumbering operations, this plant community has been heavily impacted. If allowed the opportunity to succeed, many of the community types found within the Elkmont floodplain currently mapped as "human influence" (HI) will transition over time into plant communities with species composition more closely resembling that of the typical condition of montane alluvial forest.

Vulnerable Associations (G3)

Appalachian White Pine – Xeric Oak Forest (PIs/OzHf)

This association contains white pine (*Pinus strobus*), chestnut oak (*Quercus prinus*) and scarlet oak (*Q. coccinea*), as dominant species, occurring singly or in combination, each contributing between 25 and 75% of the total canopy coverage. In the Park, this forest type has a well- developed canopy and subcanopy. While it exists over a restricted range (based on suitable environmental conditions such as elevation, soil moisture, etc.), it is not threatened across this range.

Appalachian Montane Oak- Hickory Forest (Rich Type) (OmH)

This association includes forests dominated by white oak, occurring over circumneutral soils in the Southern Blue Ridge and adjacent inner Piedmont. In the Park and elsewhere where they are found, Appalachian montane oak- hickory forests can occur over a broad elevation range (2,000 to 4,500 feet), and can occur in exposed topographic settings (upper slopes), as well as on more protected sites (edges of coves). Upper Piedmont examples may be found below 1,000 feet. This forest type is naturally limited to richer sites in the Southern Blue Ridge Mountains and adjacent inner Piedmont. Later successional, unaltered occurrences are rare. Some stands have been impacted by removal of more valuable timber species (e.g. *Quercus alba* and other oak species) and the loss of herbaceous species diversity from the effects of logging.

Southern Appalachian Eastern Hemlock Forest (Typic Type) (T)

This community is found in forests of lower or protected slopes and terraces with eastern hemlock (*Tsuga canadensis),* occurring over a dense to patchy shrub stratum of rosebay rhododendron (*Rhododendron maximum*). In the Park, this forest is found in association with streams on low slopes with north- facing aspects. Most of the forests containing hemlock are in relatively inaccessible areas that can only be reached on foot.

Within the Park, eastern hemlock is a dominant or codominant species in seven vegetation associations and covers over 12,863 hectares (31,786 acres). In addition, it is a secondary component and common overstory or understory species in 16 other associations covering 6,132 hectares (15,152 acres). It is present as scattered inclusions in another 10,486 hectares (25,911 acres) (Welch et al. 2002). Hemlock stands sampled in 1994 averaged 213 years of age, with a maximum age of 435 years (Yost et al. 1994).

Eastern hemlock is a late successional species that is long- lived, with a life span of up to 800 years. It is exceptionally shade- tolerant, and is known to be capable of surviving in the forest understory for up to 350 years (NPS 2000a). The root system of Eastern hemlock is generally very shallow, making it vulnerable to mortality during drought periods. When present in stream and river corridors, the shade provided by hemlock trees moderates water temperatures. As a result, hemlocks in these instances are important for maintaining the habitats of cold water fish, such as brook trout. The dense foliage of hemlock forests also helps to protect watersheds by slowing spring runoff, and reducing the impact of heavy rainfall on soils by intercepting raindrops.

The occurrence of eastern hemlock forests has been significantly reduced from that of pre- European settlement (Burns and Honkala 1990; USDAFS 2004a). Recent data indicate that the decline of eastern hemlock forests may have a significant effect on riparian ecology. When streams draining hemlock forests were compared to similar streams draining hardwood forests, data indicated that aquatic invertebrate diversity was significantly higher in hemlock forests (USGS 2003a). This information highlights the potential importance of preservation and restoration of eastern hemlock forests that have been damaged or logged in the past.

Eastern hemlock forests provide habitat for a variety of mammals, birds, rodents and other organisms and hemlock trees are an important winter food source for a variety of wildlife. A total of 96 bird and 47 mammal species are currently known to be associated with hemlock forests in the Northeastern United States (NPS 2000a). Cottontail rabbits eat shoots and needles, while seeds and needles are eaten by ruffed grouse and red squirrels (Petrides 1998). Other wildlife associated with hemlock forests include black bear, bobcat, turkey and southern red- backed vole (Burns and Honkala 1990). Examples of birds include black- throated blue warbler, dark- eyed junco, blue- headed vireo, wood thrush, and ovenbird (Petrides 1998; Tennessee Ornithological Society 2002).

Eastern Hemlock Management Considerations

In the 1980s, a tiny, aphid- like insect, the hemlock woolly adelgid (*Adelges tsugae*), began threatening eastern hemlock forests. It was found to be infesting large forested areas, such as Shenandoah National Park (NPS 2002c). The first hemlock woolly adelgid occurrence at the Park was documented in May of 2002. Approximately 40 infested sites have been documented since then, but treatment began almost immediately. Three treatment methods, including two chemical and one biological method, have been implemented. The techniques employed on individual trees or those in developed, easily accessible areas, incorporate the use of either an insecticide or a soap solution, or a combination of the two. The insecticide is injected into the soil where it is taken up by the roots and eventually integrated into the leafy tissues of the tree. When the insects

feed on the sap of the tree, they also ingest the pesticide. For smaller trees, a soap solution is applied by spraying the infected areas of the tree, which kills the soft- bodied insects on contact. A third treatment using biological control has been initiated through the propagation and release of *Sasajiscymnus tsugae*, a non- native beetle that preys on the adelgids. This type of treatment is better suited for large, isolated areas that are not easily accessible. Elkmont is one of many areas in the Park that has received treatment for hemlock woolly adelgid (NPS 2003c). Treatment at the District has included both insecticide soil injections and foliar application of an insecticidal soap solution.

During the past 20 years, hemlock woolly adelgid has been held primarily responsible for significant declines detected in hemlock forests of the eastern United States. This trend has produced widespread concern among state and federal agencies that manage forested public lands. In response to an appeal from the NPS, US Geological Survey's Leetown Science Center, among others, has begun research to assess the potential long-term impacts of this negative development (USGS 2003a).

Apparently Secure Associations (G4)

Appalachian Low- Elevation Mixed Pine / Hillside Blueberry Forest (PI/OzH)

This community is found on low- elevation ridges and steep upper slopes dominated by Virginia pine. In the Park, it is found at elevations below 2,300 feet on gentle to moderately steep slopes and low ridges. Sites supporting this community are exposed, typically with southern and western aspects. This community is frequently fire-suppressed and affected by Southern pine beetle (*Dendroctonus frontalis*). As a result, it typically has standing dead trees, thick litter layers, and much understory encroachment by hardwood species.

Southern Appalachian Cove Forest (CHx)

This association represents deciduous forests of concave lower slopes and flats at middle elevations (2,000 to 4,500 feet) in the Southern Blue Ridge. In the Park, this forest is found in low, protected topographic positions, often near small streams, on gentle to moderate slopes with northerly aspects. Many of these sites were logged in the past, possibly because of their accessibility. Although it occupies sites with specific environmental conditions, this community is not rare. It is secure throughout its range, but susceptible to impacts by logging outside the Park due to its location in accessible topographic positions.

Appalachian Montane Oak- Hickory Forest (Chestnut Oak Type) (OzHf)

This community is known from low to intermediate elevations of the Southern Blue Ridge escarpment and Piedmont transition areas. It occurs on relatively exposed landforms below 3,000 feet elevation on moderately steep to steep, convex middle to upper slopes and ridges with mostly northern to southwestern aspects. In the Park, the elevation at which this forest community is found ranges from 1,650 to 2,600 feet. Appalachian montane oak- hickory forests range from "apparently secure" to "secure" over their range.

Secure Associations (G5)

Chestnut Oak Forest (Xeric Ridge Type) (OzH)

This community is found on xeric ridgetops in the Southern Blue Ridge, ranging south and east into the upper Piedmont and north into the Central Appalachians. It occurs over shallow, rocky soils, primarily on south- to west- facing slopes and ridgetops. In the Park, this community is found on middle to upper convex slopes and ridges with mostly southern and western aspects. It is found within the District and is widely distributed elsewhere in the Park.

Southern Appalachian Acid Cove Forest (CHxA- T)

This association includes hemlock- hardwood forests of lower to intermediate elevations in the Southern Blue Ridge and upper Piedmont, ranging from southwestern Virginia, south and west to northwestern Georgia. In the Park, this community is found on low slopes and flats, but also occurs on moderate to steep protected slopes. It is often associated with streams, but is not classified as a wetland. Southern Appalachian Acid Cove Forest is one of the most wide- ranging communities in the Park, occurring in most drainages from the 1,840 to 3,020 foot elevation range.

Ruderal Associations (GD)

Early Successional Appalachian Hardwood Forest (Hx)

This plant community occurs in areas that have been cleared and primarily revegetated from root and stump sprouts. Stands are dominated primarily by early succession species. Species vary throughout, but these forests are typical of areas which were once clearcut, old fields, graded for road construction, or cleared by fire or other natural disturbances. In the Park, these forests are found on low slopes and flats, typically below 3,000 feet elevation and particularly in areas of heavy settlement or past logging or farming activities. Although this forest type represents early succession vegetation, many disturbed montane alluvial forests at Elkmont are now included in this association, making them a conservation priority.

Virginia Pine Successional Forest (PI)

This community occurs in areas where canopy removal and intensive land use has created dry, open conditions and bare mineral soil, allowing for the establishment of Virginia Pine. These habitats include old fields, old pastures, clearcuts, and burned or eroded areas. Potential sites of this community in the Park include areas below 2,000 feet that have been subject to disturbance by humans over the past 50 years. Virginia Pine Successional Forest is an early successional community that is not of conservation concern.

Eastern White Pine Successional Forest (PIs- T)

This forest is an early successional forest dominated by white pine, typically with a very dense canopy and little understory. In the Park and elsewhere, it is commonly associated with anthropogenic disturbance and could potentially occur anywhere within the range of the *Pinus strobus* Forest Alliance. The woody and herbaceous species associated with this forest type vary with geography but are typically ruderal (species that become established in waste areas) or non- native species that favor openings or disturbance. This forest represents early successional vegetation and is not of conservation concern.

Other Designations

Human Influence (HI)

Areas classified as "HI" have been disturbed by human activities such as farming, logging, clearing for pasture, building construction and roads. Although the vegetation communities are in the early stages of succession, the secondary classification, such as "L", "T" or "R" indicates that plant species such as tulip tree, eastern hemlock and rhododendron, (respectively) are present as a secondary component in those areas which provides some indication of the community type that would develop if left undisturbed. Areas dominated by tulip tree could, over time, succeed into southern Appalachian acid cove forest or Appalachian montane alluvial forest (see p. 182- 184), while areas dominated by eastern hemlock or rhododendron may develop into southern Appalachian eastern hemlock forest.

Distribution of Vegetation Associations within the District

The influences of prior land uses and clearing for construction of roadways, buildings and the Elkmont Campground are evident in the condition of plant communities throughout the District. Many of these communities are described as "successional", indicating that they are in various stages of recovery from past disturbances. The current distribution of vegetation is a result not only of disturbances such as logging and development, but is also influenced by slope, elevation, soil types and the interactions between plants and wildlife that affect whether or not a particular plant will survive in one area or colonize another area. The distribution of plant communities found in each area of the District is discussed in more detail below. Based upon its landscape position, proximity to the major river, and residual vegetation, the floodplain area that comprises Millionaire's Row was likely the best example of montane alluvial forest within the study area prior to settlement. Also based upon these conditions, this area offers the best likelihood of success for future restoration efforts. Despite intensive past land use, the contemporary condition of this area suggests that, in the absence of further large- scale human disturbance, it will continue to develop into mature montane alluvial forest. (Jenkins 2005)

Millionaire's Row

Millionaire's Row is a group of buildings located primarily between the Little River and Bearwallow Branch, with one building just south of Bearwallow Branch. The dominant vegetation association in this area is Appalachian Montane Oak- Hickory Forest. A portion of this community along Bearwallow Branch was significantly disturbed previously by road construction, stream relocation and by construction of the cabins. Early Successional Appalachian Hardwood Forest dominated by tulip poplar (*Liriodendron tulipifera)* and Southern Appalachian Cove Forests communities are present in this area as well. The canopy in Millionaire's Row is dominated by tulip poplar, pine and oak species, and eastern hemlock (*Tsuga canadensis*). The mid- level canopy is primarily flowering dogwood (*Cornus florida*), red maple (*Acer rubrum*) and eastern hemlock. Sassafras (*Sassafras albidum*) is the most common sapling and rosebay rhododendron is the most frequently occurring shrub in the shrub layer. The scattered large sycamore trees (*Platanus occidentalis*) in this area indicate the presence of montane alluvial forest prior to human disturbance (Jenkins Pers. comm. 2004).

Wonderland Club

The Wonderland Club is comprised of a group of buildings located primarily on a ridge between the Little River and Catron Branch. The vegetation association found in this area is primarily Appalachian Montane Oak- Hickory Forest. Portions of the area also contain Appalachian Low- Elevation Mixed Pine/ Hillside Blueberry Forest, Eastern White Pine Successional Forest and Virginia Pine Successional Forest. Successional forests in this area are indicative of the previous disturbance from construction of roadways, the Wonderland Hotel, Annex and adjacent cabins. Some slopes in this area include dense stands of rosebay rhododendron (*Rhododendron maximum*) undergrowth.

Campground

The campground is located within and adjacent to the floodplain of the Little River on the alluvial flats below and along the lower portion of Mids Branch. The primary classification of this area is Human Influence (HI), indicating that there has been and continues to be a strong human disturbance effect on the natural community in this area. The secondary classification of the campground area is Early Successional Appalachian Hardwood Forest dominated by tulip poplar. The understory is relatively sparse and the herbaceous layer is patchy due to development and high concentration of recreational visitors. The occurrence of scattered, large sycamore trees in the campground is suggestive that this area, like portions of the floodplain in Millionaire's Row, was montane alluvial forest prior to human disturbance (Jenkins Pers. comm. 2004).

Daisy Town and Society Hill

Daisy Town is located in the area between Jakes Creek and Bearwallow Branch, while Society Hill lies farther upstream along Jakes Creek and near Tulip Creek, a tributary to Jakes Creek. The structures in Daisy Town occupy much of the former forest and most of the vegetation in this area is classified as Human Influence, a classification indicative of the prior disturbance that occurred in the area due to logging, road construction, construction of buildings, and ongoing disturbance during the longstanding former occupation of buildings. The secondary classification of most of these two areas is Early Successional Appalachian Hardwood Forest. Lesser amounts of Appalachian Montane Oak- Hickory Forest (Rich Type), Southern Appalachian Cove Forest (Typic Montane Type), Chestnut Oak Forest (Xeric Ridge Type) and Virginia Pine Successional Forest are present as well.

3.2.2.3 Wetland Community Types

The National Wetlands Inventory (NWI) identifies a thin strip of wetland along the Little River. The NWI characterizes the wetland as riverine, upper perennial, unconsolidated bottom, sand, and permanently flooded. The riverine system includes all wetlands and deepwater habitats contained in natural or artificial channels periodically or continuously containing flowing water or forming a connecting link between two bodies of standing water. The upper perennial system is characterized by a high gradient and fast water velocity. Unconsolidated bottom includes all wetlands and deepwater habitats with at least 25 percent cover of particles smaller than stones (less than 6 to 7 cm) and a vegetative cover less than 30 percent, while the sand designation indicates that unconsolidated particles smaller than stones are predominantly sand, although finer or coarser sediments

may be intermixed. Permanently flooded indicates that water covers the land surface throughout the year in all years.

Five additional wetlands associated with the tributaries and floodplain of the Little River that are not shown on the NWI were identified within the District as well. The five wetland community types were classified using *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979).

Little River Wetlands

Those wetland areas proximate to the Little River, and its tributaries are classified as riverine, upper perennial, unconsolidated bottom, cobble- gravel, and permanently flooded. The steep banks and undulating floodplain along much of the river limit wetlands to areas extending just above the normal bankfull channel. Due to the scouring effect of seasonal flooding, the wetland boundary along the bank is somewhat dynamic, with wetland vegetation becoming established in areas where sediment deposition occurs as flood water recedes. The streambed and immediate stream bank generally contain only sparse areas of vegetation, with some areas colonized by dense stands of twisted sedge (*Carex torta*). The majority of vegetation growing along the Little River is dominated by upland species including eastern hemlock, tulip tree, rhododendron, and birch species (*Betula* spp.).

Tributary Wetlands

The Elkmont Historic District contains six tributaries to the Little River including Bearwallow Branch, Catron Branch, Mids Branch, Slick Limb Branch, Pine Knot Branch and Jakes Creek. It also includes Tulip Creek, a tributary to Jakes Creek.

The wetland type most closely associated with the tributaries is riverine, lower perennial, unconsolidated bottom, sand, and permanently flooded. The floodplains of the Little River tributaries are more defined and contain palustrine wetlands comprised of three different wetland types. The first type is classified as emergent, persistent wetland, and is located in highly disturbed areas and is dominated by Japanese grass (*Microstegium vimineum*). The remainder of these emergent, persistent wetlands in less disturbed areas is dominated by sweet Joe- pye weed (*Eupatorium purpureum*), southern lady fern (*Athyrium felix- femina*), Cherokee sedge (*Carex cherokeensis*), smartweed (*Polygonum cespitosum*) and Christmas fern (*Polystichum acrostichoides*). The second wetland type is classified as shrub- scrub, broad- leaved deciduous wetland and is dominated by mountain laurel (*Kalmia latifolia*) and spicebush (*Lindera benzoin*) with rosebay rhododendron as a subordinate species. The third type is classified as forested, broad-leaved deciduous wetland, dominated by sycamore and red maple. The presence of sycamore in these wetlands is an indication that prior to disturbance, these areas may have been occupied by montane alluvial forest.

Wetland Functions and Values

Wetlands provide a variety of potential values depending on their position in the landscape and proximity to other plant communities, wildlife and their habitats, and people. Wetlands were assessed during the field delineation and their functions and values categorized according to procedures described in the Highway Methodology Workbook supplement (U.S. Army Corps of Engineers 1999). This supplement is

accepted by the U.S. Army Corps of Engineers as an appropriate methodology to evaluate the inherent functions and values provided by wetlands to humans and the environment. Eight functions and five values were examined in the wetland investigation, including groundwater recharge/discharge; flood flow alteration; fish and shellfish habitat; sediment/toxicant retention; nutrient removal; production export; sediment/shoreline stabilization; wildlife habitat; recreation; educational/scientific values; uniqueness/heritage; visual quality /aesthetics; and endangered species habitat.

The principal functions and values of the wetlands within the Elkmont Historic District included fish and shellfish habitat; production export; wildlife habitat; recreation; and uniqueness/ heritage. The function of fish and shellfish habitat reflects the ability of the seasonal or permanent water body associated with the wetland to provide habitat for fish and shellfish. The function of production export considers the ability of the wetland to produce consumable or usable products for humans or other living organisms. The wildlife habitat function reflects the ability of the wetland to provide habitat for a variety of animal types and species that are often found in or near wetlands. The recreation value of a wetland considers both consumptive and non- consumptive types of activities and the ability of the wetland to provide opportunities for them. The uniqueness/heritage value reflects the ability of the wetland or its associated water bodies to supply special values.

Floodplain wetlands are considered important transition areas between riverine systems and the surrounding upland for a variety of reasons. They provide a unique environment for wetland plants to become established and subsequently provide habitat for a number of wetland- dependent species. Floodplain wetland vegetation aids in stabilizing soils and preventing erosion and scour during flood events. This vegetation also captures nutrients and sediments present in surface water runoff before they enter into surface water bodies. The floodplain associated with the section of the Little River that flows through the District is somewhat limited due to the prior construction of roadways adjacent to the river and retaining walls which prevent expansion of the floodplain. However, both the Little River floodplain wetlands and the tributary wetlands still have the ability to perform a variety of vital functions.

3.2.3 Threatened, Endangered, Rare and Sensitive Species

3.2.3.1 Federally- Listed Species

According to the Tennessee Department of Environment and Conservation Division of Natural Heritage, there are seven federally- listed species in Sevier County, which includes the District (Table 3- 6). None of these species are known to occur in the District or the surrounding Gatlinburg quadrangle. However, some of these federally-listed species could potentially occur within the District because of the presence of suitable habitat. This includes the Indiana bat (*Myotis sodalis*). Other federally- listed species that do not occur within the District because of lack of suitable habitat include spreading avens (*Geum radiatum*), spruce- fir moss spider (*Microhexura motivaga*), orange- footed pearly mussel (*Plethobasus cooperianus*), snail darter (*Percina tanasi*), and Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*). A brief description of the life history for those species that could potentially occur within Elkmont Historic District follows. A summary of all federally- listed species is provided in Table 3- 6.

Table 3- 6: Federally- Listed Species for the Elkmont Historic District Region

Scientific Name	Common Name	Habitat	Occurrence in Elkmont Historic District	Federal Status	State Status	Global Rank*
Plants						
Geum radiatum	spreading avens	Grows on thin, acidic soils and in cracks of cliffs with a northwest orientation at high elevations (over 1310 meters); at the bottom of rocky slopes and infrequently in openings in heath balds	Unlikely; habitat not suitable	Endangered	Endangered	G1
Insects						
Microhexura motivaga	spruce- fir moss spider	Coniferous forests at high elevations dominated by red spruce and Fraser fir; usually found in areas with damp moss mats on rocks and boulders that have a high level of canopy cover	Unlikely ; the District elevation is <2400 feet, habitat not suitable	Endangered	Unknown	G1
Mollusks						
Plethobasus cooperianus	orange-footed pearly mussel	Clean, fast- flowing rivers that are medium to large in size and have a muddy, rubble, gravel or sand substrate	Unlikely; Suitable habitat not present (large rivers with muddy substrate); no hydrologic connection to known populations	Endangered	Endangered	G1
Birds						
Haliaeetus leucocephalus	bald eagle	Mature riparian forest	Likely; foraging habitat present; known to occur in the Park	Threatened	D	G4
Fish						
Percina tanasi	snail darter	Shallow reaches of creeks and medium- sized rivers with good water quality and cool, medium to fast flowing waters with a gravelly substrate	Unlikely; no suitable habitat present (large, fast rivers)	Threatened	Threatened	G2G3
Mammals						
Glaucomys sabrinus coloratus	Carolina northern flying squirrel	Habitat in the transition zone between coniferous (red spruce and Fraser fir) and northern hardwood (beech, yellow birch, maple, hemlock, red oak and buckeye) forests; mesic forests with large, widely spaced trees, a thick evergreen shrub layer and a high number of snags.	Unlikely; habitat is not suitable	Endangered	Endangered	G5T1
Myotis sodalis	Indiana bat	Hollow trees, loose tree bark and crevices in cliffs, bridges, buildings and towers for roosting; riparian forest for foraging	Likely; foraging, roosting and potential maternity habitat present; known to occur in the Park	Endangered	Endangered	G2

Sources: USDA FS 2002; NatureServe 2003; NHCP 2003; USDI FWS 1992, 1995, 2003; TDEC DNH 2003 * See Table Key on following page

Key for Table 3- 6:

Global rank:

G1 = extremely rare and critically imperiled, generally with five or fewer occurrences in the world, or very few remaining individuals, or because of some special condition the species is particularly vulnerable to extinction

G2 = very rare and imperiled, generally with six to twenty occurrences and less than 3000 individuals, or because of some factor (s), vulnerable to extinction

G3 = very rare and local throughout its range or found locally in a restricted range, or, because of other factors, vulnerable to extinction throughout its range; generally between 21 and 100 occurrences and fewer than 10,000 individuals

G4 = apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery; viability of the species is of long- term concern

G5 = demonstrably secure globally, though it might be quite rare in parts of its range, especially at the periphery

T# = taxonomic subdivision (trinomial)

State Status:

D = Deemed in need of management. Applies to any species or subspecies of non- game wildlife which the executive director of the Tennessee Wildlife Resources Agency believes should be investigated, in order to develop information relating to populations distribution, habitat needs, limiting factors, and other biological and ecological data and to determine management measures necessary for their continued ability to sustain themselves successfully. This category is analogous to "Special Concern".

Bald Eagle (*Haliaeetus leucocephalus*)
The bald eagle is a large bird of prey that is federally listed as threatened in the lower 48 states, though not federally protected in Alaska or Canada. It was downlisted from endangered to threatened in 1995. This brown bird is up to 90 cm (3 ft) tall, has a wingspan of approximately two meters (6 ft), and acquires white feathers on its tail and head that give it a "bald" appearance as it matures (baldeagleinfo.com 2003). It preys mainly on fish, but will also take waterfowl, small mammals and carrion, depending on availability. Nests are built in large trees and sometimes on cliffs or rock outcrops in secluded areas. A typical nest is two to three meters (6 to 10 ft) wide and at least one meter (3 ft) deep. Nests are rarely built at a distance greater than three kilometers (2 miles) from water (USDI FWS 1995). The past decline of the population was attributed to environmental contamination from pesticides that resulted in accumulation of toxins in adult birds, leading to reproductive failure. Environmental contaminants such as pesticides, herbicides, lead (from lead shot) and mercury in the tissues of fish continue to pose threats to eagle populations (USDI FWS 1995). Additional threats are posed by loss and alteration of habitat due to road building, clear cutting, trail and boat launch construction, human disturbance, declining food supply and illegal shooting. Since the 1970s, the number of breeding bald eagles has doubled every six to seven years in the contiguous United States (NatureServe 2003). Bald eagles are known to occur in all of the lower 48 states, and in 1995, there was an estimated total of 3,014 occupied bald eagle territories. Twenty- seven counties in Tennessee, including Sevier County, have documented bald eagle occurrences. Although the Park has no record of nesting bald eagles, it contains an ample supply of preferred habitat. The Little River, which supplies high quality water and contains a diverse array of fish species, provides potential foraging habitat and large trees nearby present possible nesting sites in the District.

Indiana Bat (*Myotis sodalis*)
The Indiana bat is a small brown bat that can be difficult to distinguish from its relative, the little brown bat (*M. lucifugus*). It is approximately 9 cm (3.5 inches) long with dull, grayish brown fur on the dorsal side, lighter brown fur on the ventral side and a light colored nose (NCHP 2003). This bat lives in trees from spring to fall and hibernates in caves during winter. Limestone caves are the primary sites used as hibernacula, but occasionally, abandoned mines and other underground hollows are utilized (USDA FS 2002). Hibernation occurs from early October until late March and April when the bats roost in tightly huddled masses of 500 to 1,000 individuals (DLA 2003).

In summer, males continue to use caves for roosting, while females utilize hollow trees, loose tree bark and crevices in cliffs, bridges, buildings and towers for roosting and raising their young (DLA Inc. 2003; NCHP 2003). Groups of 25 to 100 females raise their young in clusters called colonies. A wide range of tree species are used, indicating that tree shape and condition are more important characteristics than the tree species in determining suitable maternity habitat (USDA FS 2002). Although breeding occurs in fall, sperm is stored in the uterus of the female throughout the hibernation period until spring when fertilization occurs. In June, females give birth to a single offspring (NCHP 2003). In summer, foraging habitat consists primarily of forests near streams, but the most consistent habitat characteristic appears to be a closed canopy. Recent studies have indicated that over 57 percent of the maternity colonies were found in forests with an 80 to 100 percent tree canopy and 30 percent were found in forests with an intermediate

canopy (30 to 80 percent cover). The diet of Indiana bats consists of flying insects, but varies according to prey species availability (NatureServe 2003).

Indiana bat populations are found primarily in the Midwest and eastern United States, with the largest portion of the United States population hibernating in Indiana, Kentucky and Missouri caves (NatureServe 2003). Since 1950, there has been a precipitous decline in its population nationwide, and in Tennessee, their current status is S1. This status indicates that the species is extremely rare and critically imperiled in the state with five or fewer occurrences, or very few remaining individuals, or imperiled due to some special condition where the species is especially vulnerable to extinction. The bat was originally documented in 1937 at Park headquarters near Gatlinburg, approximately 8 km (5 miles) from the District. Since then, surveys of the Blowhole Cave in Whiteoak Sink documented bat numbers from approximately 2,000 to 20,000. In 1992, a smaller colony of approximately 200 Indiana bats was found hibernating in Bull Cave (DLA Inc. 2003). Blowhole Cave and Bull Cave are both located in Blount County approximately 18 km (11 miles) west of Elkmont. Since Indiana bat colonies have been documented in the Park and the District contains riparian habitat suitable for foraging, it is likely that the bats would use this habitat for foraging and possibly for rearing young. The District contains some areas of closed canopy forests highly favored by Indiana bats for maternity colonies and areas with an intermediate canopy (30 to 80 percent cover) that could also provide suitable habitat for females to rear their young and for roosting.

Primary threats to the continued viability of Indiana bat populations are related to disturbance of hibernacula. Disturbance to bats can be direct and intentional, such as burning, stoning, shooting and clubbing. However, indirect, unintentional risks to the populations occur when hibernating bats are disturbed by noise from spelunkers, tour groups, recreational explorers and scientific researchers. Even though it does not cause immediate fatality, the physical activity initiated by this type of disturbance results in the depletion of energy stores provided by body fat that the bats need to survive winter hibernation. Consequently, bats may die before they emerge from hibernation and are able to replenish lost reserves of energy (NCHP 2003). Additional threats come from natural events such as flooding or ceiling collapses in caves, and from human related activities such as pesticide application, habitat degradation and tree removal (USDA FS 2002).

3.2.3.2 State Listed Species

There are 55 species in Sevier County that are listed by the state of Tennessee as endangered or threatened (TDEC DNH 2004). The state listed species include 45 plants, two birds, four fish, one reptile, two mammals and one mollusk. Five of these state listed species are also on the federal list of threatened and endangered species (spreading avens, snail darter, Indiana bat, northern flying squirrel, orange foot pimpleback) and were discussed previously in Section 3.2.3.1. Two of the state listed fish species [lake sturgeon (*Acipenser fulvescens*) and blue sucker *(Cycleptus elongates*)] are not discussed in this document because they do not exist in the District, nor do they have potential to become established in the District due to lack of suitable habitat.

While no species on the state or federal lists of rare species for Sevier County were observed in the District, several rare species that are known to occur in other Tennessee

counties were identified during the 2003 and 2004 field investigations. They include butternut trees (*Juglans cinerea*), a state threatened species not listed by the state for Sevier County, but known to occur in seven locations throughout the District, and Fraser's sedge (*Cymophyllus fraserianus*), a State Special Concern species observed in both Society Hill and Millionaire's Row.

State Listed Plant Species

Of the 45 state listed plant species in Sevier County, only 15 have potential habitat in the District and seven are known to occur in the Gatlinburg quadrangle, in which the District is located. Since plants have a limited capacity to colonize areas distant from the parent plant, only those within the Gatlinburg quadrangle are being considered. The eight species include running bittercress (*Cardamine flagellifera*), rough hawkweed (*Hieracium scabrum*), Fraser's yellow loosestrife (*Lysimachia fraseri*), broadleaf bunchflower (*Melanthium latifolium*), mountain fetterbush (*Pieris floribunda*), yellow nodding lady's tresses (*Spiranthes ochroleuca*), southern nodding trillium (*Trillium rugelii*) and chamomile grapefern (*Botrychium matricariifolium*).

Running Bittercress (*Cardamine flagellifera*)

Running bittercress is a state threatened species that occurs in six states and in only five Tennessee counties. It prefers habitat along mountain streambanks and has an S2 rank in the state (indicating it is very rare and imperiled, with six to 20 occurrences and less than 3,000 individuals, or because of some factor(s) that make it vulnerable to extirpation from Tennessee). It produces flowers in May and fruit in June. Primary threats to running bittercress are from disturbance of the forest herb layer, conversion of land, habitat fragmentation and forest management practices (NatureServe 2003). The nearest known occurrence to the District was documented in 1964, approximately 14 km (9 miles) from Elkmont, south of Pigeon Forge on a steep slope near the park entrance. Although the District has no record of running bittercress occurrence, it does contain potential habitat suitable for the species.

Rough Hawkweed (*Hieracium scabrum*)

Rough hawkweed is an herbaceous plant that produces yellow flowers clustered at the top of the stem. Ovate, hairy leaves are born on hairy stems that are sometimes slightly red. Flowering occurs from June to September. It is a state threatened species with an S2 rank and is found in forests, along the perimeter and in clearings (Nearctica.com, Inc. 2003). The nearest known occurrence is from a 1935 record, which located the plant at Elkmont in the sterile sandy soil of an old field at an elevation of 670 m (2,200 feet). Although rough hawkweed is currently not known to occur in Elkmont Historic District, suitable habitat for the species could still be found in the area.

Fraser's Yellow Loosestrife (*Lysimachia fraseri*)

Fraser's yellow loosestrife is a perennial herb that grows to approximately 0.8 to 1.2 meters (2.6 to 4 ft), produces showy flowers with five yellow petals and bears lanceolate leaves in a whorled arrangement. Flowering occurs from mid- June to July and fruit is produced from September to October (GDNR 1995). This species is listed as endangered by the state of Tennessee and is also a federal species of concern. It is found on gravel bars and shrub islands in streams and on sunny, rocky slopes and roadsides (GDNR 1995). Since Fraser's yellow loosestrife tends to favor disturbed ecosystems, succession

presents the greatest threat to populations; however, if the level of disturbance is too high, populations may not survive. Fire suppression and dam construction are the greatest threat to populations in more natural settings. A 1935 occurrence of Fraser's yellow loosestrife was described as being located "near Gatlinburg", but no habitat information was included and the species has not been observed in the Park since (NatureServe 2003). Fraser's yellow loosestrife has been known to occur in an area near Elkmont, and the District contains disturbed areas, roadside habitat and streams with rocky slopes favored by this species. Therefore, it is possible that Fraser's yellow loosestrife could be found in the District.

Broadleaf Bunchflower (*Melanthium latifolium*)
Broadleaf bunchflower is a perennial herb that produces white flowers, an underground bulb, and long, narrow leaves, and grows to a height of 0.5 to 1.6 m (1.6 to 5 ft) tall. It prefers habitat that occurs on slopes and in ravines, gorges and coves with rich, moist, rocky, well drained soils. In general, it is found at elevations from 305 to 1,524 m (1,000 to 5,000 ft). In Tennessee, it is only known to occur in areas of high elevation (USDA FS 2004b). This species produces flowers from July to August and fruits from August to October. The broadleaf bunchflower is listed by the state of Tennessee as endangered and has been documented at four sites in the Gatlinburg quadrangle including Sugarland Mountain, at Huskey Gap Trail, on the Foothills Parkway in a small ravine between the two branches of Mill Creek, and on the west side of a ravine, west of Crooked Arm Ridge. The closest sites are at Sugarland Mountain and Huskey Gap Trail, approximately 3.2 to 6.4 km (2 to 4 miles) east of Elkmont. Since the District contains the rocky, well-drained soils and slopes favored by broadleaf bunchflower, it is possible that the species could be found in the area. In addition, since known occurrences are within several miles of the District new plants could potentially become established in the area if seeds are transported by wildlife or on the clothes or shoes of people moving from one area to the other.

Mountain Fetterbush (*Pieris floribunda*)
Mountain fetterbush is a state threatened species with a rank of S2. This erect, broadleaf, evergreen shrub grows to a height of 1 to 2 m (3 to 7 ft) and produces fragrant, white flowers easily visible above the dense foliage of the shrub. It generally occurs on balds at high elevations (USDA FS 2004c). Flowering occurs from May to June and fruit is produced from August to October. A 1956 occurrence was documented across from Park headquarters, approximately 8 km (5 miles) from Elkmont. However, the District does not contain the high elevation bald habitat favored by mountain fetterbush. Therefore, it is highly unlikely that the species would be found within the District.

Yellow Nodding Lady's Tresses (*Spiranthes ochroleuca*)
Yellow nodding lady's tresses is a state endangered species that prefers moist mountain woods habitat. Flowering occurs from September to October and fruits are produced during the same period. Only four counties in Tennessee have documented occurrences of this orchid. It has a state rank of SH, indicating it may be extirpated from Tennessee. It has been known to occur on hillsides in dry, sandy soil in the vicinity of Elkmont and at Fighting Creek Gap in the Park. The District includes areas of moist mountain woods habitat preferred by yellow nodding lady's tresses and the species has been documented as occurring approximately 1.6 km (1 mile) from the District at Fighting Creek Gap.

Therefore, a population of yellow nodding lady's tresses could potentially exist within the District or may become established in the future.

Southern Nodding Trillium (*Trillium rugelii*)
Southern nodding trillium is an herbaceous plant with large, white flowers. It can be distinguished from similar species by the pendulous quality of the flowers that hang below its leaves. Unlike the northern species, the pistil and stamens on southern nodding trillium are purple. It is found in rich, non- acid, open hardwood forests at an elevation of approximately 3,000 feet (Dudley 1998- 2002). It is listed as a state endangered species and has a flowering period that occurs between April and May, with fruit being produced from May to July. It has been known to occur at the Park in the vicinity of the Holston Assembly Grounds near Mynatt Park, approximately 5 miles (8 km) from the District. Although southern nodding trillium has been documented as occurring in the surrounding area, the District is located entirely at elevations of 2,400 feet or less. Therefore, Elkmont does not contain habitat suitable for southern nodding trillium, nor is the species likely to be found in the District.

Chamomile Grapefern *(Botrychium matricariifolium)*
Chamomile grapefern is a perennial herbaceous, non- flowering plant with thick leaves that grows to a height of 4 to 12 inches (10 to 30 cm). Its preferred habitat is moist, partially shaded, coniferous forests or slopes in deciduous forests (Williams 1990). Reproduction is by sporulation that occurs from June to August (TN DNH 2003). This fern is a state special concern species known to occur in only three counties in Tennessee, including Sevier County. It is considered critically imperiled in the state of Tennessee and has a global rank of G5, indicating it is secure globally (Natureserve 2005). Three populations have been documented in the Park, including one located near the Little River in the Millionaire's Row area of Elkmont Historic District.

State Listed Wildlife Species
Endangered and threatened plant species have limited mobility since their seeds must be transported by wind, wildlife or other carriers in order to colonize a new location. Consequently, in contrast to wildlife, they have a relatively limited potential to inhabit an area outside the quadrangle in which they occur. Wildlife have somewhat greater mobility and a greater likelihood to move from an area wider than the quadrangle that contains the District. Therefore, in addition to federal and state listed species that occur in the Gatlinburg quadrangle, Sevier County listed wildlife species are described below as well.

State listed wildlife species found in Sevier County that could find suitable habitat in the District include common raven (*Corvus corax*), peregrine falcon (*Falco peregrinus*), North American river otter (*Lontra canadensis*), longhead darter (*Percina macrocephala*) and northern pine snake (*Pituophis melanoleucus melanoleucus*). These species could potentially occur within the District and are discussed below.

Common Raven (*Corvus corax*)
The common raven is a large, black bird that is listed as a state threatened species with a rank of S2. This rank indicates the species is very rare and imperiled within the state, with six to twenty occurrences or few remaining individuals, or because of some

factor(s) making it vulnerable to extinction. The common raven is an omnivorous bird that eats carrion and insects such as maggots and beetles that feed on carrion. Other animal foods include small mammals, reptiles, frogs, young or wounded birds and some invertebrates. Plant foods consist of grains, acorns and cherries. This bird is active during the day and gregarious, sometimes roosting in large flocks. Breeding occurs in winter and eggs are laid in late February or early March. The female incubates three to six eggs, but after hatching, the young are cared for by both parents (UM 1995- 2003b).

The raven is found in a variety of habitats that include riparian lowlands to mountains, but it usually prefers areas that contain hills or mountains, especially those with steep rock faces. Vegetation varies from hardwoods and coniferous forests to more open grasslands and shrubby areas. Nests are built on rocky outcrops, in coniferous trees or on man- made structures such as bridges and billboards (NatureServe 2003). Major threats to this species are related to humans and include harassment, poisoning (due to ingestion of poisoned animal remains) and becoming caught in traps set for other animals (UM 1995- 2003b). The common raven has been known to occur in Sevier County, but not in the Gatlinburg quadrangle. It has been found in a wide range of habitats that include hardwood and coniferous forests that are found in the District and it has been documented as occurring in the county that contains Elkmont. Therefore, the District contains potential habitat that could support individuals or populations of common raven.

Peregrine Falcon *(Falco peregrinus)*
In Tennessee, the peregrine falcon is considered extremely rare and critically imperiled with five or fewer non- breeding occurrences or very few remaining individuals, or because of some special condition in which the species is particularly vulnerable to extinction (S1N rank). This bird of prey has pointed wings, a black cap, white throat, pale breast with brown bars and black vertical bands extending from the eyes down the neck. The feet are large and strong and the bill is hooked allowing it to carry and tear its prey into pieces (WDNR 2003). The peregrine falcon preys mainly on small to medium-sized birds that include a variety of songbirds and waterfowl, but it will sometimes eat small mammals, lizards, fish and insects (NatureServe 2003). In urban settings, it has been known to consume large number of pigeons and starlings, but tends to be an opportunistic hunter, taking whatever prey is available (WDNR 2003). Peregrine falcons occupy a wide range of habitats that include coniferous and hardwood forests, cliffs, deserts, shrublands, riparian wetlands, tidal flats, tundra and cities as long as there are suitable nesting ledges. Nests are usually constructed on cliff shelves or holes in steep rocky slopes. However, peregrine falcons may also nest on riverbanks, in open bogs, on large stick nests constructed by other bird species, in holes in trees and on man- made nesting platforms or structures (tall buildings, bridges, quarries) (NatureServe 2003).

Sexual maturity is reached at two or three years of age. Following breeding, the female lays three to five buff- colored eggs dotted with flecks of red- brown. After approximately 32 days of incubation, primarily by the female, hatching occurs. The young remain in the nest for 35 to 45 days and are fed by the female. After the young begin flying, the parents teach them to hunt for several weeks until they are able to capture prey on their own. The decline of peregrine falcon populations after the mid-1950s was attributed to extensive use of pesticides like DDT. Research linked the

pesticide to reduced estrogen and calcium levels, which resulted in thin- shelled eggs that were not strong enough to hold the weight of the incubating parent. Although DDT has been banned in the United States, it is still produced here and sold for use in countries where the birds spend the winter months (WDNR 2003). In addition to threats from persistent pesticides and other contaminants in the environment, habitat loss, shooting by hunters, and poaching of young in the nest are additional threats.

Thirteen Tennessee counties, including Sevier County, have records of peregrine falcon occurrences. There are two known occurrences of peregrine falcon in the Park, one at Greenbrier Pinnacle and the other at Alum Cave. The most recent siting was at Greenbrier Pinnacle, approximately 24 km (15 miles) from Elkmont. In April 2004, a pair of peregrines were observed displaying behaviors indicating that they were in the midst of egg incubation (NPS 2004g). Since the District does not contain the cliff habitat favored for nesting, it is unlikely that the species would rear their young in the area. However, the area includes a variety of bird species suitable as prey for the peregrine falcon. Therefore, it is possible that the peregrines nesting in the Park might use the District for hunting.

North American River Otter (*Lontra canadensis*)

The North American river otter is a state listed threatened species in Tennessee with a rank of S3, signifying that the species is rare and uncommon with 21 to 100 documented occurrences. This medium- sized mammal has a long, narrow body and short legs, a wide, flat head with a broad nose and small, rounded ears. The feet are webbed and the wide, tapered tail is used as a rudder when the otter is swimming. The fur is brownish, short and dense on most of the body except on the throat where it is grayish- white. Otters have distinctive facial whiskers that are highly sensitive to physical contact (DLA 2002).

River otters' prey consists primarily of slow moving or schooling non- game fish such as cyprinids, suckers (*Catostomus spp.*), chubs (*Semotilus sp.*), shiners (*Notropis spp.*), catfish (*Ictalurus spp.*) and perch (*Perca spp.*). They will also prey upon a variety of crustaceans, amphibians, insects, small birds and waterfowl, mammals and plants. The river otter is mainly active at night, but also in early morning and late afternoon (Hill 2001). It lives in a variety of aquatic habitats, including streams, lakes, ponds, swamps and marshes (DLA 2002). Young are raised in tree cavities, dense shrubs near rivers, undercut streambanks, tall marsh grasses and under tree roots or in dens excavated or constructed by other animals (Hill 2001). The North American river otter is widely distributed from Alaska and Canada throughout the United States, except in parts of the southwest. In the Park region, the species was historically common, but by the time the Park was established, river otters were rare in the Park due to unrestricted trapping. From 1986 to 1994, a reintroduction program was conducted that included release of approximately 137 individuals relocated from North Carolina, South Carolina and Louisiana. Historical records exist for an occurrence near Sugarlands Visitor Center, and since the reintroduction program was initiated, there have been sightings at Abrams Creek, Hazel Creek and at Elkmont (DLA 2002). Since the North American river otter has been sighted in the District fairly recently, and there is ample stream habitat available, it is likely that the species currently lives in or near the District.

Longhead Darter (*Percina macrocephala*)

The longhead darter is a threatened species in Tennessee with a rank of S2 (indicating it is very rare and imperiled with 6 to 20 known occurrences or few remaining individuals, or because of some factor(s) that make it vulnerable to extinction). It is also a federal species of concern. This small fish has a long, tapered head and a distinctive pattern of continuous black patches along the upper one half of the body, a black spot on the caudal fin and a mark below each eye. Habitat for the longhead darter consists of clean, medium- sized rivers with high velocity stream flow and riffles with a rocky substrate or pools with minimal turbidity (PA DCNR 2003). Life history and accurate population data are lacking due to difficulty in sampling with conventional methods. However, researchers believe spawning occurs from March to May and eggs have an incubation period of 27 days when water temperatures are at 10° Celsius. The eggs and larvae are vulnerable to predation since they are left to develop without any parental protection or rearing. For the young that survive, sexual maturity is attained in approximately two years. The population appears to be at risk primarily from various sources of sedimentation that reduce reproductive success, chemical contamination and dam construction (NatureServe 2003). The longhead darter is not known to occur in the Gatlinburg quadrangle, but it has been documented in Sevier County. The portion of the Little River that flows through the District is medium- sized with some of the characteristics preferred by this species. Therefore, although the longhead darter is not known to occur in the District, there is potential habitat for the species and it is possible that the longhead darter may occur there in the future.

Northern Pine Snake *(Pituophis melanoleucus melanoleucus)*

The northern pine snake is a large snake with a threatened species status in Tennessee and a rank of S3 (indicating it is rare and uncommon with 21 to 100 occurrences statewide). This snake, with wide dark bands, can reach a length of 2.5 m (approximately 8 ft) and has a range that includes northern Georgia and Alabama, most of South Carolina and parts of Tennessee, North Carolina, Mississippi, West Virginia, Virginia and New Jersey (CSI 2004). The snake is able to excavate tunnels and spends much of its time underground. It is thought to prefer large areas of upland habitat with some canopy cover, considerable ground cover and limited human disturbance. However, natural fire disturbance seems to be important for maintaining its habitat. It is a nonvenemous snake that preys on small mammals, rodents and birds by wrapping itself around the prey and causing suffocation. It lays eggs in underground nests that are usually located in open areas with sandy soils (NJDFW 2004). Major threats to the population are lack of fire, habitat fragmentation and land development (CSI 2004). Additional risks to the northern pine snake stem from human disturbance such as the use of off road vehicles and indiscriminate killing (NatureServe 2003). A historical record of occurrence was from Norton Creek near Gatlinburg, approximately 1.6 km (one mile) north of the Park boundary and 8 km (5 miles) from the District. A recent record of occurrence was at the NPS Headquarters office in Gatlinburg, approximately 11.2 km (7 miles) from the District (Nichols Pers. comm. 2004). Because this area is somewhat similar to Elkmont in topographical elevation, the pine snake would most likely occur in the sandy, dry ridges that surround the District.

3.2.3.3 Rare Species and Species of Concern

There are 18 Federal Species of Concern (FSC) listed by the U.S. Fish and Wildlife Service (USFWS) that are known to occur in Sevier County, Tennessee (USDI FWS 2004). The Tennessee Department of Environment and Conservation (TDEC) currently also has 36 plants, 13 mammals, six birds, one amphibian, three fishes and one mollusk on its list of rare species for Sevier County. Some of the species are found on both of these lists (Table 3- 7). While these species have no official federal status and are not protected under the provisions of the Endangered Species Act , both USFWS and TDEC request that agencies avoid impacting these species because they are rare and could eventually be elevated to state or federal listing as threatened or endangered if they continue to decline in numbers. Rare species and species of concern are listed in Table 3- 7 below along with their state status, habitat requirements, and potential for occurrence in the District.

3.2.3.4 Other Species Considered

Synchronous Fireflies

There are 14 species of fireflies in the Park. None of these species are federally or state listed; however, synchronous flashing is exhibited by one species (*Photinus carolinus)*. Large numbers of male fireflies gather in June and fly over the ground searching for a mate. As they fly, the group simultaneously emits flashes of light for six to eight seconds with breaks up to 10 seconds. Females may counter with a flash less intense from the ground (Omara- Otunnu 2003).

Photinus carolinus appears to occur at elevations of at least 2,000 feet in the Great Smoky Mountains and north into Pennsylvania (Milius 1999). The District contains some of the sites in the Park where *P. carolinus* has been observed. The grassy areas near creeks and rivers, and other open grassy areas at Elkmont provide suitable habitat that supports large numbers of the fireflies.

The firefly larvae are predaceous, with primary prey items that include earthworms, snails and slugs. They may also feed on dead invertebrates. Habitat for larvae consists of decaying woody or leafy organic matter along streambanks, pond shorelines and in open meadows. Adults prefer habitat similar to the larvae (Branham 1998).

Table 3- 7: Rare Species of Sevier County (Federal Species of Concern and State Special Concern Species)

Scientific Name	Common Name	Federal Status	State Status	Habitat Requirements	Habitat Available in the District	Identified In or Near the District
PLANTS						
Acer saccharum ssp leucoderme	Chalk maple	Not listed	Special concern	Circumneutral rocky woods	Yes	No
Acrobolbus ciliatus	Liverwort	Not listed	Special concern	Spruce fir forests and moist ravines on rocky substrate	No	No
Agrostis mertensii	Arctic bentgrass	Not listed	Special concern	Mountain balds and moist ravines	No	No
Anastrophyllum saxicola	Liverwort	Not listed	Special concern	High elevation rocky peat; heath and wet rocks	No	No
Botrychium matricariifolium	Chamomile grapefern	Not listed	Special concern	Mountain woods and thickets	Yes	Yes
Cacalia rugelia=Rugelia nudicaulis	Rugel's ragwort	FSC	Endangered	High elevation open woods	Yes	No
Calamagrostis cainii	Cain's reed grass	FSC	Endangered	High elevation rock outcrops and slide areas	No	No
Cardamine clematitis	Mountain bittercress	FSC	Threatened	In and along rocky streams	Yes	No
Cardamine rotundifolia	Roundleaf watercress	Not listed	Special concern	Wet soils, swamps, or flowing water	No	No
Cephaloziella spinicaulis	None	Not listed	Special concern	Crevices of rock outcrops	Yes	No
Clintonia borealis	Clinton's lily	Not listed	Special concern	High elevation mesic forests	No	No
Cymophyllus fraserianus	Fraser's sedge	Not listed	Special concern	Mixed mesophytic forests	Yes	Yes
Entodon concinnus	Lime entodon	Not listed	Special concern	Moist, calcareous rocks	No	No
Euonymus obovatus	Running strawberrybush	Not listed	Special concern	High elevation woods	Yes	No

Table 3-7: (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Requirements	Habitat Available in the District	Identified In or Near the District
PLANTS (continued)						
Glyceria nubigena	Smoky Mountains manna grass	FSC	Threatened	Mountain balds and open seeps	No	No
Grimmia olneyi	Grimmia moss	Not listed	Special concern	Dry rocks and cliffs at high elevations	No	No
Hymenophyllum tayloriae	Gorge filmy fern	Not listed	Special concern	Gorges, waterfall spray zones, moist ceilings of cliff crevices and narrow stream gorges	No	No
Lejeunea blomquistii	Blomquist leafy liverwort	Not listed	Special concern	Mid- elevation gorges on rock or bark	Yes	No
Listera smallii	Appalachian twayblade	Not listed	Special concern	High elevation swamps or bogs	No	No
Lysimachia fraseri	Loosestrife	FSC	Endangered	Dry open woods	Yes	No
Megaceros aenigmaticus	Megaceros	Not listed	Special concern	Mid- elevation streams on wet, shaded rocks	Yes	No
Menziesia pilosa	Minniebush	Not listed	Special concern	Heath balds and cliffs	No	No
Mielichhoferia elongata	Moss	Not listed	Special concern	Woods above 5,000 feet	No	No
Milium effusum	Tall millet grass	Not listed	Special concern	Rich woods	Yes	No
Orthondontium pellucens	Translucent orthondontium	Not listed	Special concern	Soil peat or rock in heath balds	No	No
Panax quinquefolius	American ginseng	Not listed	Special concern	Rich woods	Yes	No
Plagiochila corniculata	Liverwort	Not listed	Special concern	Mature fraser fir and mountain ash bark	No	No
Plagiochila sharpii	Sharps leafy liverwort	Not listed	Special concern	Shaded, moist ledges and bluffs	Yes	No
Plantanthera psycodes	Small purple fringed orchid	Not listed	Special concern	Wet woods and bog margins	Yes	No

Table 3- 7: (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Requirements	Habitat Available in the District	Identified In or Near the District
PLANTS (continued)						
Prunus virginiana	Choke cherry	Not listed	Special concern	Moist coves and slopes	Yes	No
Saxifraga caroliniana	Gray's saxifrage	FSC	Endangered	Rocky woods	Yes	No
Silene ovata	Mountain catchfly	FSC	Endangered	Rich woods	Yes	No
Streptopus roseus	Rosy twisted stalk	Not listed	Special concern	Wet cliffs and mountain woods	Yes	No
Tetradontium brownianum	Little Georgia	Not listed	Special concern	Montane rocky seeps and falls	Yes	No
Thelypteris phegopteris	Northern beechfern	Not listed	Special concern	Cliffs, ravines on shaded streambanks; in partial shade of rich, moist woodlands	Yes	No
Zanthoxylum americanum	Northern prickly ash	Not listed	Special concern	Moist woods and thickets	Yes	No
MAMMALS						
Condylura cristata	Star- nosed mole	Not listed	D	Low, wet ground near lakes or streams	Yes	No
Microtus chrotorrhinus carolinensis	Southern rock vole	Not listed	D	Cool, moist rocky woodlands	Yes	No
Myotis leibii	Small- footed bat	FSC	D	Hemlock forests, in caves and mines	Yes	No
Napaeozapus insignus	Woodland jumping mouse	Not listed	D	Forested or brushy areas near water, wet bogs, stream borders	Yes	No
Neotoma floridana haematoreia	Eastern woodrat	FSC	D	Talus slopes, rocky outcrops, bluffs, crevices and caves	Yes	No
Parascalops breweri	Hairy- tailed mole	Not listed	D	Sandy loam with good vegetative cover, not heavy, wet soils	Yes	No

Table 3- 7: (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Requirements	Habitat Available in the District	Identified In or Near the District
MAMMALS (continued)						
Plecotus rafinesquii= Corynorhinus rafinesquii	Rafinesque's big- eared bat	FSC	D	Buildings, caves, trees with hollows and/or exfoliating bark	Yes	No
Sorex cinereus	Common shrew	Not listed	D	Moist areas in forests, open areas and brushlands	Yes	No
Sorex dispar	Long- tailed or rock shrew	Not listed	D	Cool, moist rocky areas in deciduous forests and mixed deciduous- coniferous forests	Yes	No
Sorex fumeus	Smoky shrew	Not listed	D	Hemlock forests with deep litter layer	Yes	No
Sorex longirostris	Southeastern shrew	Not listed	D	Open fields and woodlots; prefers moist areas	Yes	No
Sorex palustris punctulatus	Water shrew	FSC	D	Bogs or montane alluvial forests	Yes	No
Synaptomys cooperi	Southern bog lemming	Not listed	D	Low, damp bogs and meadows with heavy growth of vegetation	Yes	No
BIRDS						
Accipiter striatus	Sharp- shinned hawk	Not listed	D	Forest and open woodland, coniferous , deciduous or mixed forests	Yes	No
Contopus cooperi	Olive- sided flycatcher	Not listed	D	Forest and woodlands; coniferous, deciduous or mixed forests	Yes	No

Table 3- 7: (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Requirements	Habitat Available in the District	Identified In or Near the District
BIRDS (continued)						
Haliaeetus leucocephalus	Bald eagle	Threatened	D	Forests and woodlands near medium to large rivers, lakes or other bodies ofwater	Yes	No
Lanius ludovicianus migrans	Migrant loggerhead shrike	FSC	Not listed	Open brushy areas, meadows, pastures, orchards and thickets along roads	Yes	No
Limnothlypis swainsonii	Swainson's warbler	Not listed	D	Forested wetland, coniferous, hardwood, or mixed forests; shrubland / chaparral	Yes	No
Sphyrapicus varius	Yellow- bellied sapsucker	Not listed	D	Riparian areas; coniferous, hardwood or mixed forests; suburban areas	Yes	No
Tyto alba	Common barn owl	Not listed	D	Herbaceous wetlands, cliffs, cropland, hedgerows, grasslands, savannah; suburban areas	No	No
AMPHIBIANS						
Cryptobranchus alleganiensis	Hellbender	FSC	D	Clear, fast flowing streams and rocky bottom rivers	Yes	Yes
Desmognathus wrightii	Pigmy salamander	Not listed	D	Spruce- fir forests; hardwood forests at lower elevations	Yes	No
Eurycea junaluska	Junaluska salamander	FSC	D	Rocky areas along streams	Yes	No

Table 3-7: (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Requirements	Habitat Available in the District	Identified In or Near the District
FISH						
Carpiodes velifer	Highfin carpsucker	Not listed	D	Medium to large rivers and creeks, oxbows, sloughs, and ponds with sand or gravel substrate and medium to fast current	Yes	No
Cycleptus elongates	Blue sucker	FSC	Threatened	Swift flowing, large river habitats with high turbidity; sometimes in reservoirs	No	No
Etheostoma acuticeps	Sharphead darter	FSC	Not listed	Large fast flowing creeks with riffles and chutes; medium rivers with coarse gravel rubble or boulder substrate	Yes	No
Percina aurantiaca	Tangerine darter	Not listed	D	Creeks and small rivers with moderate to steep gradient; clear, moderately deep, rocky pools below riffles	Yes	No
Percina macrocephala	Longhead darter	FSC	Threatened	Fast riffles of clear, small to medium rivers	Yes	No
Phoxinus tennesseensis	Tennessee dace	Not listed	D	Spring- fed streams at ridge and valley limestone region	No	No
MOLLUSK						
Io fluvialis	Spiny riversnail	FSC	Not listed	Small streams or rivers with strong currents and limestone outcrops	No	No

Source: USFWS 2004; TDEC 2004; NatureServe 2004
Status: FSC = Federal Species of Concern; D= State of Tennessee vertebrate Species of Concern

3.2.4 Water Quality

The primary waterway traversing the District is a tributary of the Tennessee River known as the Little River. The NPS operates water quality monitoring stations along the Little River both upstream and downstream of the District. According to information provided by the NPS, no appreciable degradation of the water quality currently occurs between these monitoring locations.

The Little River flows in a northwest direction and has a channel length of approximately 36 km (22.4 mi) within Park boundaries. Gradients along the river range from 16 m/km (52.5 ft/mi) downstream from Elkmont to as much as 110 m/km (361 ft/mi) in the steep headwater tributaries. The main channel is perennial, with mean monthly discharges that range from 3.5 m^3/ s (123.6 ft^3/s) during base- flow conditions in September to 14.8 m^3/s (522.6 ft3/s) at high flow in March. From 1964 to 1995, average annual runoff from the basin was 93 cm (36.6 in) (Mast and Turk 1999). TDEC monitors a site on the Little River that is characteristic of the middle reaches of the watershed. The width varies from 7.6 to 12 m (25 to 40 ft), and the maximum depth is 0.7 m (2.4 ft). The site has approximately 85 percent canopy- cover and a streambed substrate that consists primarily of boulders (60 percent), cobbles (30 percent), and gravels (10 percent). The river also has occasional pools that contain some bedrock, silt and organic debris.

One of the responsibilities of TDEC, Division of Water Pollution Control (WPC) is the formal adoption of water quality standards, including the approval of water quality criteria. In Tennessee, the criteria determine the level of water quality protection for each of the designated uses. Those uses include fish and aquatic life protection, recreational use, domestic water supply, industrial water supply, irrigation, wildlife and livestock watering, and navigation. The highest level of water quality protection is awarded to streams and lakes designated Outstanding National Resource Waters (ONRW). Streams are nominated for ONRW status because they:

1. have important habitat for ecologically significant populations [including rare, threatened and endangered (T&E) species];
2. offer specialized recreational opportunities;
3. have outstanding scenic or geologic values; and
4. have very high existing water quality.

Tennessee's Water Quality Control Act also contains an anti- degradation statement that protects existing uses of all surface waters as established under the Act. In 1997, four streams within the Park were nominated and subsequently selected as ONRW. They include the Little River (whose entire watershed is within Park boundaries), Abrams Creek, West Prong Little Pigeon River and Little Pigeon River. These streams are significant regionally as well. With assistance from the United States Environmental Protection Agency, WPC personnel are subdelineating ecoregions within the state and characterizing water quality at carefully selected reference streams as part of the Ecoregion Reference Stream Monitoring program (NPS 2002b). A sampling site on the Little River within the District was selected as a reference site as part of the program to aid in implementing water quality standards. Information from the stream will help establish clean water goals for other streams in the Blue Ridge Mountains ecoregion.

The Elkmont Historic District sampling site is located near the gate across Little River Road. Habitat assessments, physical measurements, and chemical and biological samples were collected beginning in 1996. Ten habitat parameters were evaluated including epifaunal substrate/available cover, embeddedness, velocity/depth regime, sediment deposition, channel flow status, channel alteration, riffle frequency, bank stability, vegetative protection, and riparian zone vegetative width. Each habitat parameter is given a numeric ranking from 0 to 20, with 20 being the highest level. While the top score possible is 200, the Little River sampling site scores ranged from 193 to 197. Some points were lost at this site because there is very little slow velocity/shallow depth habitat and occasional low flow on the stream (NPS 2002b).

Mast and Turk (1999) collected and analyzed 61 water- quality samples as part of the Hydrologic Benchmark Data Network (HBN) by the U.S. Geological Survey (USGS). The USGS gauging station is located on the Little River approximately 12 km (7.5 miles) downstream from Elkmont in Blount County. Fourteen HBN sampling sites are located in the watershed, one within the District boundary and one just upstream from the boundary. Table 3- 8 lists instantaneous discharge, median concentrations and ranges of major constituents in stream water collected at the gage, and volume- weighted mean (VWM) concentrations in wet- only deposition measured at the National Atmospheric Deposition Program (NADP) station near Elkmont campground.

Table 3- 8: Values of Physical Properties and Major Ion Concentrations from Little River, 1985–1995, and Wet Precipitation Collected at the Elkmont Station

Parameter	Stream Water						Precipitation VWM[a]
	Minimum	First quartile	Median	Third quartile	Maximum	n	
Discharge, instantaneous	1.0	2.8	5.1	8.5	20	57	Not reported
Specific conductance, field	9.6	14	17	20	61	56	Not reported
pH, field	6.4	6.8	6.9	7.2	7.7	56	4.5[b]
Calcium	48	65	75	87	190	59	4.5
Magnesium	23	30	34	38	70	59	1.4
Sodium	19	39	44	48	61	59	2.7
Potassium	7.7	13	13	15	26	59	0.9
Ammonium	<0.7	<0.7	<0.7	1.4	3.6	59	10
Alkalinity, laboratory	60	96	120	140	260	59	Not reported
Sulfate	25	35	42	58	130	59	34
Chloride	8.5	11	14	17	49	59	3.1
Nitrite plus nitrate	<3.6	9.7	11	14	31	56	15[c]
Silica	83	90	95	110	120	58	Not reported

[Concentrations in units of microequivalents per liter, discharge in cubic meters per second, specific conductance in microsiemens per centimeter at 25°C, pH in standard units, and silica in micromoles per liter; n, number of stream samples; VWM, volume- weighted mean; <, less than]

[a] Values are volume- weighted mean concentrations for 1980- 1994; [b] Laboratory pH; [c]Nitrate only

Atmospheric deposition of sulfate, nitrate and hydrogen in the Southern Blue Ridge Province is among the highest reported in the Eastern United States. Based on over 15 years of recorded data, the VWM pH of precipitation measured at the Elkmont NADP station was 4.5. The dominant cations in precipitation were hydrogen, which contributed 63 percent of the total cation charge, and ammonium, which contributed 20 percent. Sulfate and nitrate were the dominant anions, accounting for 65 and 29 percent, respectively, of the total anions (Mast and Turk 1999).

Water in the Little River is dilute and weakly buffered. The pH ranges from 6.4 to 7.7, with a median near neutral (6.9), unlike the precipitation, which tends to be acidic. The dominant stream water cations were calcium and sodium, and the dominant anion was alkalinity. The low concentrations of compounds derived from weathering, particularly alkalinity, are attributed to the weathering resistant sandstones and quartzite of the underlying Precambrian bedrock. The median chloride concentration in stream water (4 millequivalents / liter) is approximately four times higher than the VWM concentration of chloride in precipitation. The difference between average annual runoff and precipitation suggests that evapotranspiration accounts for about a twofold increase in the concentration of precipitation. This implies that as much as half of the stream- water chloride may be derived from sources other than precipitation.

Taking into account the cumulative effects of evapotranspiration and inputs of sulfate in dry deposition, these data suggest that a considerable portion of atmospherically deposited sulfate remains in the basin. Adsorption on clays and organic matter in the soil environment is the most likely means for retention of sulfate (Mast and Turk 1999). The stream contains lower concentrations of both nitrate and ammonium when compared to precipitation, indicating the Little River basin is also an important sink for nitrogen compounds. On the contrary, data from streams found at higher elevations in the Park show nitrate concentrations similar to those in precipitation. The retention of both sulfate and nitrate in the Little River Basin is likely a significant contributing factor in buffering stream water from the effects of acidic deposition (NPS 2002b) at low elevations in the Park.

In a comparative study, a separate sampling program was conducted at points upstream, within, and downstream of the District during a ten- year period from 1993 to 2003 when the NPS collected quarterly water quality samples. This information was collected from three (3) separate stations. The sampling site located the farthest downstream from the District is near Metcalf Bottoms, which lies approximately 10 miles downstream from the Elkmont station. A third sampling site is located upstream from the District near the Cucumber Gap Trail. A summary of the data collected from these stations is provided in Tables 3- 9 through 3- 11.

In stream waters downstream from Elkmont, neither chloride nor nitrate concentrations were elevated, evidence that the wastewater discharge from Elkmont does not affect water quality during periods of low visitor use in the Park. Stream water nitrate concentrations in the Park vary seasonally, with the highest concentrations in winter and spring and the lowest concentrations in autumn. The uptake of nitrogen by microorganisms may play a major role in reducing nitrogen concentrations during the early stages of leaf fall (NPS 2002b).

Table 3- 9: Little River Water Quality at Metcalf Bottoms

	Units	Min.	Average	Median	Maximum	# of Samples
Hydrogen	µeq/L	0.08	0.32	0.30	0.89	46
Conductivity	µs/cm	11.45	15.45	15.47	21.00	44
PH	none	6.14	6.55	6.52	7.10	46
Calcium by IC	µeq/L	24.22	86.75	87.30	124.02	38
Calcium by AA	µeq/L	0.00	59.97	67.75	82.09	9
Magnesium by IC	µeq/L	17.52	30.49	30.77	58.31	38
Magnesium by AA	µeq/L	20.49	26.07	26.58	29.63	9
Sodium	µeq/L	24.34	38.68	39.69	50.61	46
Potassium	µeq/L	4.58	12.36	12.33	19.10	46
Ammonium	µeq/L	0.00	0.28	0.00	7.76	46
Sulfate	µeq/L	25.68	34.55	33.63	63.22	46
Chloride	µeq/L	6.40	15.17	13.39	38.01	46
Nitrate	µeq/L	0.00	8.82	8.49	29.52	46

Source: McGill Associates 2004

Table 3- 10: Little River Water Quality at Elkmont Road and Little River Road

	Units	Min.	Average	Median	Maximum	# of Samples
Hydrogen	µeq/L	0.11	0.40	0.37	1.08	36
Conductivity	µs/cm	6.40	14.20	13.83	20.70	36
pH	none	5.97	6.45	6.44	6.95	36
Calcium by IC	µeq/L	23.75	71.56	73.04	142.96	24
Calcium by AA	µeq/L	23.70	57.00	60.05	70.15	13
Magnesium by IC	µeq/L	12.98	28.89	24.82	96.90	24
Magnesium by AA	µeq/L	7.74	22.41	24.20	25.93	13
Sodium	µeq/L	10.40	36.54	36.41	55.34	36
Potassium	µeq/L	3.19	12.39	11.24	19.81	36
Ammonium	µeq/L	0.00	2.02	0.00	47.00	36
Sulfate	µeq/L	11.62	31.72	32.44	41.92	36
Chloride	µeq/L	4.52	18.02	17.29	37.90	36
Nitrate	µeq/L	0.00	9.48	10.56	19.32	36

Source: McGill Associates 2004

Table 3- 11: Little River Water Quality at Cucumber Gap Trail

	Units	Min.	Average	Median	Maximum	# of Samples
Hydrogen	µeq/L	0.14	0.47	0.45	1.25	38
Conductivity	µs/cm	10.92	13.18	13.22	19.90	38
PH	none	5.90	6.36	6.35	6.85	38
Calcium by IC	µeq/L	20.75	60.73	52.90	102.89	24
Calcium by AA	µeq/L	37.75	52.51	50.45	74.00	15
Magnesium by IC	µeq/L	12.57	22.82	21.02	46.89	24
Magnesium by AA	µeq/L	19.42	21.69	21.40	23.65	15
Sodium	µeq/L	13.69	34.93	36.19	69.62	38
Potassium	µeq/L	4.77	11.31	10.59	19.46	38
Ammonium	µeq/L	0.00	1.06	0.00	19.21	38
Sulfate	µeq/L	27.36	32.84	32.47	45.36	38
Chloride	µeq/L	10.77	17.94	15.09	42.46	38
Nitrate	µeq/L	0.00	11.86	12.00	23.07	38

Source: McGill Associates 2004

Although most of the constituents sampled at the three locations show a slight increase from the highest sample point in the watershed at Cucumber Gap down to the lowest sample point at Metcalf Bottoms, it does not appear that the District has any significant impact on surface water quality. In fact, of the parameters listed above, most values for the Little River exceed standards established by the state of Tennessee for those parameters in drinking water by a large margin (TDEC DWPC 2004). Because the data shown in Tables 3- 9 to 3- 11 are fairly consistent between sampling locations, no appreciable degradation of the water quality in the Little River is apparent between the water quality monitoring locations. A reasonable conclusion can be drawn from this information that there is currently no measurable degradation of water quality occurring as a result of activities occurring in the District.

3.2.5 Floodplains

Floodplains have the potential to provide floodwater storage following heavy rain events and prevent damage by reducing the rate at which floodwaters are released. By allowing a more gradual release of storm water, the potential for damage due to erosion can be greatly reduced. In addition, floodplains provide short- term storage of flood waters, allowing suspended sediments to settle out. Vegetation within floodplains provides nutrient and sediment filtration while stabilizing soils and providing wildlife habitat for a variety of terrestrial and aquatic wildlife. The capacity of floodplains to provide protection depends on a number of factors relating to the hydrology of the area. Some of those factors include the location of the floodplain relative to its watershed, whether flood storage is provided upslope of the floodplain, whether the watershed contains a high percentage of impervious surfaces, whether hydric soils are present, and the density of vegetation.

The District is traversed by two (2) primary waterways, the Little River, and its tributary, Jakes Creek. Other, smaller waterways in the District include Bearwallow Branch, Tulip Branch, Catron Branch, Mids Branch, Pine Knot Branch and Slick Limb Branch. The Little River drainage basin above the confluence of Jakes Creek consists of approximately 39 square miles of generally steep, rugged, forested terrain.

Research related to existing floodplain mapping in this area revealed that existing Flood Hazard Boundary Maps did not include coverage of the District area. While the existing Flood Insurance Rate Maps did provide coverage, the accuracy of this information was questionable. Therefore, to determine the maximum anticipated runoff from the 100- year storm event for the District, the United States Geological Survey National Flood Frequency, computer software (version 3.0) was used in conjunction with a topographic map, developed specifically for the District, and HEC- RAS engineering software (version 3.1.1) to ascertain the limits of the 100- year base flood. This method allows for demonstration of the approximate floodplain limits in a manner compatible with Federal Emergency Management Agency standards. The 100- year floodplain boundary is shown on the Existing Condition and Alternatives maps provided in Chapter 2 (Figures 2- 1 through 2- 8).

The results of this study indicate that the existing bridge structures over the Little River within the District are adequate to pass the volume of runoff created by the 100- year storm event. In addition, the bridge over Jakes Creek along the upper end of Jakes Creek

Road (above the Kuhlman cabin (40)) is also adequate to pass the designated storm event. However, the drainage culverts located along Bearwallow Branch (at Jakes Creek Road and Daisy Town Loop Road) are not adequate to pass the required volume of water during the 100- year storm event. As a result, storm water will be detained behind these structures and will overtop the roadways at these locations during a 100- year storm event. This study also indicates that the Miller cabin (46), Young cabin (48), Faust cabin (47) and garage, and minor portions of the lower levels to the rear of some of the Society Hill cabins along Jakes Creek lie within the 100- year floodplain.

None of the project alternatives under consideration contain facilities or improvements that encroach in the 100- year floodplain on or above the ground surface. There are subsurface water and wastewater lines that cross the floodplain area to reach cabins within Millionaire's Row and as subaqueous crossings of Jakes Creek. There are also water and wastewater lines crossing the Campground Bridge and the Jakes Creek Cemetery Bridge, but these lines would be attached to these bridges above the 100- year flood elevation. Because none of the encroachments described above impact the regulatory floodplain, revisions to the floodplain would not be necessary.

3.2.6 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. Land managers are also required to actively protect, preserve and enhance the Park's resources (NPS 2004h). Over the past 24 years, air quality research and monitoring in the Park has indicated 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 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 2004h). The 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, one of which is located within the District. The following sections describe three parameters that are important indicators of air quality: visibility, ground- level ozone and acid precipitation.

Visibility

Visibility is recorded as the distance one can see in miles. Over that past 50 years, visibility in the Park has declined approximately 80 percent in summer and 40 percent in winter (NPS 2004h). Many pollutants contribute to reductions in visibility, but sulfur dioxide (SO_2) 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 percent) to reduced visibility (NPS 2004h). While average yearly visibility at the Park is 25 miles, it would be more than four times that distance (113 miles) without

the influence of human development. At times, visibility has dropped to less than one mile (NPS 2001b). In 1999, the Environmental Protection Agency (EPA) instituted the Regional Haze Rule that mandates a return to natural conditions for visibility on the haziest days by 2064 and preservation of the current high visibility days. In fall 2001 the Tennessee Valley Authority announced that controls for sulfur dioxide emissions would be installed on three power plants closest to the Park. These controls are anticipated to reduce sulfur dioxide emissions from those plants by more than 95 percent.

Ozone

Ground level ozone is another parameter that is often examined when analyzing air quality research. 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 (NPS 2001c).

Although there are several air pollutants for which there are national ambient air quality standards have been established in the United States, the quality of air in the Great Smoky Mountains National Park is largely reflective of ambient ozone levels. Ozone at the ground level has many direct impacts. In humans and animals, oxidants in ozone can cause eye, nose, and throat irritation. Chronic exposure to high ozone levels can result in loss of lung function. Ozone can also oxidize plant material and can, in conjunction with its associated pollutants, result in reduced visibility. Therefore, it is critical to minimize ozone concentrations whenever practical. While vehicles do not emit ozone directly, they do emit nitrogen oxides (NOx) and volatile organic compounds (VOCs) that react in the sunlight of the atmosphere to form ozone. Table 3- 12 presents some historical data on ozone levels in the Park.

Table 3- 12: Great Smoky Mountains National Park Ozone Concentrations (1997 to 2001)

Location	Largest 1- hour ozone concentrations, by year, ppb				
	1997	1998	1999	2000	2001
Look Rock, 1st Max.	117	135*	125*	111	96
2nd Max.	115	120	123*	108	93
3rd Max.	115	119	117	102	93
4th Max.	110	118	117	100	91
Cades Cove, 1st Max.	102	106	116	98	93
2nd Max.	99	101	102	97	88
3rd Max.	99	100	101	92	87
4th Max.	95	97	100	89	87

Source: McGill Associates 2004

*exceeds national ambient air quality standards

The national ambient air quality standard for ozone was a 1- hr concentration of 120 parts per billion (ppb). In past years, there have been violations of that standard within the Park. However, data indicates that ozone levels in the Park have been trending downwards in the recent past and no violations of ozone standards occurred during 2000 or 2001. This trend is consistent with efforts being made in Tennessee to reduce statewide NOx emissions. Indeed, the 1999 NOx emission inventory showed about 2022

tons per day (tpd) of NOx being emitted in Tennessee, while the 2007 emission inventory projection shows only 1439 tpd (McGill Associates 2004).

Ozone is a regional pollutant that is dependant on a large number of variables such as pre- cursor pollutant emissions (mainly NOx and VOCs). Ozone is also highly dependent on weather. The amount of sunshine, air temperature, cloud cover, humidity, and wind speed and direction can significantly affect ground level ozone concentrations (McGill Associates 2004).

When ozone reaches 85 to 104 ppb at ground level, it can adversely affect the health of people who are active outdoors, especially children and those with respiratory illnesses. Consequently, the EPA recommends that people in those populations limit their outdoor activity time when ozone reaches those levels (NPS 2002d). The data in Table 3- 12 indicate that ozone concentrations in the Park have consistently been above the level at which they are known to be harmful to humans. Harmful effects on people include coughing, sinus inflammation, chest pains, throat irritation, lung damage and compromised immune system (NPS 2001c). Studies have shown 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 (NPS 2002d).

In addition to human health effects, adverse impacts to vegetation have also been documented. Field surveys have revealed that 90 species of plants show symptoms of damage like those due to ozone exposure. Controlled studies indicate that the levels of ozone in the Park are harmful to 30 species of plants. Generally, higher ozone levels and greater damage to leaves has been observed at higher elevations in the Park. In addition, reduced growth rates have been observed in specific plant species such as yellow- poplar and black cherry (*Prunus serotina*) (NPS 2001b).

Recently, the EPA revised air quality standard for ozone to provide increased protection for human health, lowering the compliance level from 0.12 ppm for a one- hour period to 0.08 ppm averaged over an eight- hour period. In response to a proposal from the Governors of Tennessee and North Carolina, the entire Park was designated non-attainment for the 8- hour ozone National Ambient Air Quality Standards on April 15, 2004. Consequently, steps must be taken to reduce emissions from both stationary and mobile sources in the non- attainment counties. Plans must be submitted by June of 2007 and attainment achieved by 2009 (NPS 2004h).

Acid Precipitation

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. Values lower than 7.0 are considered acidic, while those above 7.0 are alkaline (NCSU 2004). The pH of uncontaminated rainwater is 5.0 to 5.6 (slightly acidic). The pH of rainfall in the Park averages 4.5, approximately five 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 2001c). In addition to acid deposition from clouds and rainwater, these contaminants also derive from dry particulate matter. Acid deposition causes increased levels of nitrates in soils that can adversely impact vegetation and aquatic organisms. Most streams at high elevations in the Park have little

buffering capacity to neutralize acids formed from sulfur and nitrogen emissions. In addition, acid deposition has resulted in nitrogen saturation of soils, an effect that has been associated with the loss of calcium in Park soils. The reduction in this important nutrient can adversely impact vegetation and stream ecology. Acidic soils also cause the release of aluminum that can potentially harm vegetation by inhibiting nutrient absorption (NPS 2001b).

3.3 Interpretation and Visitor Use

3.3.1 Visitor Experience

If any one thing is conclusive about visitor use in the Park, it is that it will likely continue to increase, as it has historically since the Park opened in June 1934. The location of Elkmont within the Park's boundaries and ease of access to the area have ensured that it is one of the Park's more heavily used areas. Visitors to the Park have wide- ranging expectations for their experience at the Park and a number of factors shape the quality of that experience. While some factors are personal such as demographics (age, level of education, race or ethnicity and gender), personality, motivation and past experience, others relate to social or cultural variables.

The opportunities for diverse visitor experiences are determined largely by the variety, attractiveness and accessibility of the natural and cultural resources to visitors and the relationship of these resources to the Park's purpose and significance. Expectations for quality recreation experiences are different for various user groups, and they change over time. This raises contention between groups for whom quiet and solitude is a primary concern and other groups who desire enhanced facilities and organized programs. The quality of visitor experience can also be affected by the amount of available support facilities (such as parking lots, information centers or rest rooms), the extent to which these facilities are crowded, and the availability of necessary information. Those who participate in organized programs will naturally have more interactions with other visitors. Within the boundaries of Elkmont Historic District are a wide variety of recreational opportunities provided by the diversity of the land, area, and facilities. Primary uses by visitors to the District include:

- Camping
- Backcountry camping
- Day hiking
- Fishing
- Swimming
- Canoeing/kayaking
- Conducting research
- Driving and walking through the cabin area
- Birding
- Wildflower and wildlife viewing
- Ranger- led walks
- Campfire programs
- Photography
- Picnicking
- Fall leaf- change viewing
- Cross- country skiing

3.3.2 Visitor Facilities

Ample opportunities for both active and passive recreational activities exist within the District. Primary uses of the resources found within the District consist of trail use and access; camping; backcountry pursuits; water- based activities; educational programs and driving or walking through areas with historic buildings. The District includes a campground, a campground contact station, and several trails.

The campgrounds and trails provide very high- quality exposure to the natural and cultural resources of the Smoky Mountains and draw visitors to this portion of the Park. The District's cabins, Wonderland Hotel, and the Appalachian Clubhouse have the potential of providing very high quality exposure to resources as well. Although many of the trails are on the logging railroad grades and former roads, the surrounding forest continues to recover from prior human use impacts. Little River is one of the most scenic streams in the Park and has excellent trout fishing opportunities. The trail system at Elkmont provides access to high- elevation scenery for the hardiest of hikers. The easy grade of Little River Trail makes it a popular hike for novice overnight backpackers (Minnigh Pers. comm. 2002).

Elkmont Campground

The Little River provides opportunities for fishing, tubing, swimming and paddling activities and the campground can accommodate tents and recreational vehicles and trailers for overnight stays. Elkmont Campground is one of the most highly utilized sites for camping in the Park. In recent years, approximately 36 to 40 percent of the visitors staying in Park campgrounds used the Elkmont Campground. According to historical and recent data, 40 to 50 percent of the visitors enter the District primarily to access their campsite at the Elkmont Campground (NPS 2002a; 1987 to 1993; 2002 and 2003). Of more than $1 million generated by camping sales at the Park, Elkmont contributed approximately 44 percent.

The Elkmont Campground first opened shortly after the Park was established. It expanded in the 1950s, and, as part of the Mission 66 movement, was formally developed into the 1960s. Mission 66 was a ten- year construction program that was established in the mid- 1950s, and was aimed at improving overcrowding facilities in the National Parks by 1966, the fiftieth anniversary of the NPS. Mission 66 construction projects in the Great Smoky Mountains National Park included construction of campgrounds and park housing as well as road improvements and utility facilities (Brown 2000).

In 1964, the number of campsites at Elkmont was reduced from between 360 and 400 sites to 338 sites, each with a larger area. This change was implemented to improve the camping experience. Sometime after 1971, the sites were reduced from 338 to 240. In the 1990s, the number of sites was again reduced and today, there is a total of 220 campground sites. In more recent years, due to federal budget limitations, the camping season at Elkmont was reduced from year- round operation to the nine months from March to November (NPS 2002a). Even with these changes, visitation to the campground remains high. While the visitor use period was reduced by 25 percent, the campground still has an average annual visitation of between 90,000 and 100,000 people. According to data collected by the Park, overnight stays in the campground in the last several years totaled 93,918 in 2002 and 98,601 in 2003 (Tables 3- 13 and 3- 14; NPS 2002 and 2003). This is comparable to other data collected over the past several decades, as

reflected in Table 3- 13 below. In addition to the campground, visitors are also attracted to the area for backcountry access. Approximately 4,000 visitors entered the District in 2001 for access to backcountry camping sites (see Table 3- 16).

Table 3- 13: Visitation to the Elkmont Campground (1994 to 2003)

Year	Total Number of Visitors
1994	113,251
1995	109,158
1996	104,534
1997	117,562
1998	107,722
1999	107,620
2000	104,403
2001	98,242
2002	93,918
2003	98,601

Source: NPS 2002 and 2003

Table 3- 14: Elkmont Campground – Annual Visitor Use Breakdown (1987- 1993)

Activity	Total Number of Users by Year						
	1987	1988	1989	1990[1]	1991	1992[1]	1993
Overnight Visits							
Tents	59,835	73, 483	54,941	59,032	62,629	65,739	62,645
RVs/Trailers	57,276	70,508	55,548	55,374	55,708	55,876	39,294
Groups (except backcountry)	3,914	5,058	3,908	42,506	7,206	6,123	400[2]
TOTAL OVERNIGHT	121,025	149,049	114,397	156,912	125,543	127,738	102,339
Picnic							
No. Parties	524	812	226	353	81	- -	- -
No. Persons	327	2,077	653	883	10,113	- -	- -
TOTAL	851	2,889	879	1,236	10,194	- -	- -
Miscellaneous							
Hiking	23,747	14,766	1,702	4,036	3,731	4,133	4,434
Horseback Riding	216	156	26	65	62	94	107
Swimming	2,861	8,543	1,358	3,082	3,140	2,544	2,956
Fishing	2,057	4,142	1,276	2,157	1,399	1,752	1,889
Canoeing/ Kayaking	28	44	189	327	128	129	137
Tubing	846	3,346	2,716	2,687	2,272	1,846	1,380
TOTAL	29,755	30,997	7,267	12,354	10,732	10,498	10,903
TOTAL FOR YEAR	151,631	182,935	122,534	170,502	146,469	138,236	113,242

Source: NPS 2002a

[1] Metcalf Bottoms open, picnic area at Elkmont closed.

[2] Inconsistency in recordkeeping. Figure appears to be for 1- 2 month period only.

Trails

The trail system originating from Elkmont includes seven secondary and six tertiary trails that connect with other trails in the area and provide opportunities for beginning to more experienced hikers. Trails for visitors on horseback are also available. Some 60 miles of trails can be easily accessed from trailheads originating in the District. Due to the extensive trail system, use by both day and overnight hikers constitutes a significant proportion of all recreational uses for the area. Trailheads within the District include the Little River Trail (6.2 mi.) and Jakes Creek Trail (3.3 mi.). Between the Jakes Creek and Little River Trails, eight secondary and five tertiary connecting trails form loops to other trails within the region, providing a trail system with diverse terrain to satisfy novice and experienced hikers, as well as those on horseback. The Elkmont Nature Trail (0.8 mi.) is self- guided with no arterial trail connections.

The Little River Trail and its connecting trails constitute the most extensive system, covering approximately 38.8 of the 62.1 miles, or 62.4 percent of trail miles identified as originating within the District. Jakes Creek Trail and its related trails traverse another 22.5 miles, or 36.2 percent of all trail miles represented, while the Elkmont Nature Trail, at 0.8 mile, represents 1.3 percent of the total. Table 3- 15 identifies the primary trailheads and the extensive trail network originating within the District.

Table 3- 15: Trailheads and Connecting Trails Originating in Elkmont Historic District

Trail Name	Use Type	Length (miles)	Access Point
Little River	Hiking	6.2	Parking area near campground
Jakes Creek	Hiking, Horseback Riding	3.3	Parking area near campground
Curry Mountain	Hiking	3.3	Little River Road Trailhead and Meigs Mountain Trail
Cucumber Gap	Hiking	2.4	Little River and Jakes Creek Trails
Goshen Prong	Hiking	7.6	Little River Trail
Huskey Gap	Hiking	4.1	Little River Trail
Elkmont Nature	Hiking	0.8	Little River Road
Meigs Mountain	Hiking, Horseback Riding	6.1	Jakes Creek Trail
Miry Ridge	Hiking, Horseback Riding (in lower ½ only)	5.0	Jakes Creek Trail
Rough Creek	Hiking	2.8	Little River Trail
Sugarland Mountain	Hiking	11.9	Rough Creek and Huskey Gap Trails
Meigs Creek	Hiking	3.5	Meigs Mountain Trail
Panther Creek	Hiking, Horseback Riding	2.2	Jakes Creek Trail
Lynn Camp Prong	Hiking, Horseback Riding	3.7	Miry Ridge Trail
Middle Prong	Hiking, Horseback Riding	1.8	Panther Creek and Lynn Camp Prong Trails

Source: NPS 2002a

Seasonal trends in trail use are similar to those for use of other facilities in the Park, with the lowest numbers of people observed during the period from November to March and peak usage occurring primarily during the summer months from June to August.

Backcountry Pursuits

While it is unclear when the policy of requiring that permits be issued for all backcountry camping, it dates back to at least the early 1950s. By 1969, the Park had 18 backcountry shelters and maintained some 713 miles of trails (GRSM 1969). In 1972, a rationing system for camping along the Appalachian Trail and other popular trails within the Park was implemented. Rationing was instituted to address problems of large groups and proportions of visitors camping in and around shelters, creating substantial resource damage and crowding (Schlatter 1972; GRSM 1975).

The 1982 General Management Plan identifies some 478,184 acres (93 percent) of the Park lands as being within the "Natural Zone," which effectively constitutes the Park's backcountry area. In 1983, the first advanced reservation and first- come/first- serve requests for backcountry camping were introduced (Click 1983). By 1993, the number of backcountry sites had grown to 84 designated sites (51 open to horses, 15 rationed) and 18 shelters (13 open to horses, all rationed). For this same year, the Park reported 96,459 backcountry overnight stays, representing the sixth highest backcountry use within NPS (NPS 1993).

Table 3- 16 Backcountry Use Trends for Overnight Stays by Month (2001)

Month	Average Number of Permits*	Average Number of Users*	Total Camper- nights / Permits
January	14	37.2	83.1
February	33	87.6	195.8
March	73	193.8	433.2
April	49	130.1	290.8
May	92	244.3	546
June	101	268.2	599.3
July	55	146	326.4
August	43	114.2	255.2
September	50	132.8	296.8
October	79	209.7	468.7
November	29	77	172.1
December	27	71.7	160.2
2001 Totals	645	1,712.6	3,827.6

*Average of seven backcountry sites derived from self registration records from the Elkmont Campground.
Source: NPS 2002a

Today, there are 102 designated backcountry sites, eight of which are within the vicinity of the District. Four camping shelters (Derrick Knob, Silers Bald, Double Spring Gap, and Mount Collins) are accessible from the Jakes Creek and Little River Trailheads. Campers using these campsites register for overnight use by completing a camping permit at one of the 13 self- registration stations in the Park. The vast majority of the permits for these campsites are issued through the Sugarlands and Elkmont Campground permit stations (Minnigh 2002). While detailed records have not been kept for every backcountry site, records for sites 23 and 24 were found dating back to 1995 (Table 3- 17). Backcountry sites are accessed via the Goshen Prong and Little Creek Trails (Gray Pers. comm. 2002).

The system of trails within the vicinity of the District provides very high- quality exposure to the natural resources of the Smoky Mountains and is the main draw for

hikers to this portion of the Park. The trail system provides access to high elevation scenery for the hardiest hikers, while the easy grade of Little River Trail makes it a popular hike for novice overnight backpackers to reach the lower elevation backcountry campsites.

Table 3- 17: Backcountry User Trends for Sites 23 and 24 (1995 – 1999)

Year / Site		Annual Camper- nights (rationed)	Total Annual Camper- nights (rationed & unrationed)	Park- wide Total Annual Camper- nights	% of Park Total Camper- nights
1995	Site 23	1,002	1,433		
	Site 24	1,064	1,522		
Total for both sites		2,066	2,955	94,542	3.1%
1996	Site 23	1,128	1,613		
	Site 24	1,819	2,601		
Total for both sites		2,947	4,214	102,385	4.1%
1997	Site 23	1,155	1,652		
	Site 24	1,722	2,463		
Total for both sites		2,877	4,115	92,851	4.4%
1998	Site 23	1,246	1,782		
	Site 24	1,646	2,354		
Total for both sites		2,892	4,136	95,977	4.3%
1999	Site 23	1,203	1,720		
	Site 24	1,627	2,327		
Total for both sites		1,830	4,047	92,994	4.4%
Total (1995- 1999)		13,612	19,465	478,749	

Monthly use trends for overnight stays for 2001 are derived from the self –registration records submitted at Elkmont Campground. In the year 2000, an estimated 857 cars parked overnight at the two trailheads in the District for an average of two nights each. This estimate is based upon use figures for the seven backcountry campsites accessed from these two trailheads. Little River Trailhead receives 61 percent of this overnight parking use (Minnigh Pers. comm. 2002).

Water- based Activities

Since the Little River and its tributaries are central features in the District landscape, water- based activities attract a number of visitors. Fishing attracted visitors to the Smoky Mountains well before creation of the Park. The Little River is considered to have some of the best trout fishing in the region. Originally the native brook trout was present in most streams above 2,000 feet elevation. However, the effects competition with non- native species and from extensive logging operations in the early 1900s included loss of trout habitat in some locations and a subsequent reduction in the numbers of brook trout. Removal of trees overhanging the stream banks of water bodies throughout the area resulted in loss of shade and higher water temperatures than brook trout are capable of tolerating. Massive disturbance of vegetation and soils resulted in erosion of the denuded hillsides and subsequent sediment inflow into the streams. This damage to stream habitat resulted in elimination of brook trout from about 50 percent of its original range, leading to the stocking of both brook and brown trout. Brook, brown, and rainbow trout were introduced into Smoky Mountain streams by various groups, including logging companies, private citizens, and the state of Tennessee prior to Park establishment.

Both fly and spin anglers utilize the waters of the Little River near the roadside leading to Elkmont Campground and in other areas along the river. For the 7- year period between 1987 and 1993, the average annual number of people fishing within the District was 2,096

with a peak in 1988 of 4,142 (NPS 1987 to 1993). In addition to fishing, the waters that run through Elkmont Historic District provide for a number of other water- based activities. Table 3- 14 presents a general breakdown of visitor use within Elkmont. Based on averages taken for the seven- year sample period between 1987 and 1993, some 3,000 swimmers, 140 canoeists/kayakers, and more than 2,100 tubers participate in water-based activities from or within the District on an annual basis.

Educational Programs

The intent of the visitor use program is to enhance visitors' appreciation of the Park's natural, cultural and aesthetic values by providing opportunities for resource related activities (NPS 1982). Visitors to the Park have certain expectations of the types of experiences they desire and feel are acceptable in a National Park setting. The types of experiences available in the Park are centered primarily on appreciation of natural and cultural resources and species diversity.

Drafted in 1918 by the National Parks Educational Committee to encourage educational opportunities in National Parks, the following objectives are among the earliest expressions of NPS founders concerning Park management:

- to educate the public in respect to the nature and quality of the national parks;
- to further the view of the national parks as classrooms and museums of nature;
- to use existing publicity and educational systems so as to produce a wide result;
- to combine in one interest the sympathy and activity of schools, colleges, and citizen organizations in all parts of the country; and
- to study the history and science of each National Park and collect data for future use.

From the earliest days of the Park, its extensive and varied resources have served as the backdrop for research and learning. The Park provides a practical outdoor laboratory for scientists of multiple disciplines as well as classrooms for children experiencing the sensory pleasures, magnitude of the mountains and the rich diversity of the Park's natural communities for the first time.

In recognition of the need to educate the visiting public on significant resources within the Park, NPS developed a *Comprehensive Resource Education Plan* (CREP; NPS 2001a) that defined resource education themes and described a variety of programs offered through the Resource Education program. The intent of these programs is to provide opportunities for the public to learn about the history and existing condition of the Park. As described in the CREP Park Visitor Experience Statement, it is the intent of the Resource Education efforts to enable the general public to experience the following:

> By visiting Great Smoky Mountains National Park, visitors will realize that GRSM is part of the US National Park System and understand the reasons why this System was established. Visitors will become aware of the rules and regulations that govern the Park and have a safe and enjoyable visit by learning about the educational and recreational opportunities that exist there. Through resource education programs, Park visitors will gain knowledge of the resource issues facing the Park and gain an understanding of the Park's significance and resource education themes. Resource education programs and media will help

> Park visitors develop a sense of stewardship and protection for the Park's resources. This sense of stewardship will be translated into these visitors' everyday actions at home, including support for management actions affecting the Park (NPS 2001a).

While resource education and interpretation is one of many recreational user experiences within the District and Park- wide, it is perhaps one of the most important, and key to the overall objectives of the Park. Over time, the general understanding and expectations of what is broadly known as education has changed. This has impacted the nature and direction of programs offered through the years. A variety of programs have been offered at Elkmont and many of the earliest resource education efforts focused heavily on the natural elements of the Park. However, the Park has strived to balance the coverage of offerings between natural and cultural resources of the area.

By the 1980s, as one of the visitor concentration points in the Park, Elkmont Historic District offered an extensive spectrum of interpretive program events. Some of the "walks and talks" still offered bear names and follow routes developed 20 or more years ago. New programs have also been put into the traditional mix of ranger- led programs, including the "Nature's Palette" artist walk and "Remember This Special Place," an exploratory talk on individual meanings and feelings about the Smokies. Numerous diversified "walks and talks" and campfire programs are directed at teaching the public how to read the landscape, as well as interpretation of natural and cultural history.Interpretive program contacts, based on a five- month period in 1998, are shown below in Table 3- 18 with respect to programs offered at Elkmont during this period.

Table 3- 18: Interpretive Program Contacts at Elkmont (June to October 1998)

Ranger Interpretive Contact/Program	Number of Persons Per Month[1]					Total for 5- mo. Period
	June	July	Aug	Sept[2]	Oct[3]	
Elkmont Campground	932	1596	609	58	186	3381
Elkmont VIP Talks	6	- -	- -	3	- -	9
Elkmont Weekly Talks	87	418	367	83	326	1281
Elkmont Stream	12	17	8	- -	6	43
Elkmont Town	71	399	61	- -	26	557
Jakes Creek	- -	- -	9	- -	- -	9
Upper Little River	- -	6	13	- -	10	29
Elkmont Slick Limb	- -	8	10	- -	22	40
Elkmont Mids Branch	6	- -	8	- -	- -	14
Elkmont Bearwallow	11	14	18	15	16	74
Junior Ranger Program Elkmont	23	28	6	- -	- -	57
Monthly Totals	1,148.00	2,486.00	1,109.00	159.00	592.00	5,494.00

[1] Taken from raw data from Ranger roving contact reports, accuracy and completeness is dependent upon reports recovered for this period.
[2] Data for September 1998 is incomplete.
[3] Data for October 1998 is incomplete.

While this may not represent a complete picture of the array of interpretive programs and ranger contacts through such programs, it does offer a fairly detailed account of the range of "walks and talks" given during this time frame, as well as contacts made with Park visitors during roving reports. In addition to the typical "walks and talks", an

extensive publications program, and campfire programs, the Park has also undertaken other educational avenues including "Parks as Classrooms." This was a pilot program for a 5- year period (1991 to 1996) seeking to integrate the Park's natural and cultural values with interdisciplinary learning experiences, while meeting the state's curriculum requirements.

The "Parks as Classrooms" program underwent a comprehensive evaluation in late 1996 and is still in place to teach youth about the significance and interconnectedness of all things. The most recent programs and interpretive media offered by the Park include:

Evening Program Topics

- Bears of the Smokies
- Waterfalls of the Smokies
- Hiking in the Smokies
- History of a Mountain People
- The Civilian Conservation Corps
- Wildlife in the Smokies
- Off the Beaten Path
- Return of the Elk
- Move for a National Park
- Places and People of the Great Smokies
- Biodiversity in the Smokies
- History of Elkmont
- Great Smokies Overview
- The Double Life of Amphibians

Guided Hike Topics

- Reading the Landscape
- Old Elkmont Town Walk

Interpretive Media

Sales Items:

- *Last Train to Elkmont* (Weals)
- *Whistle Over the Mountain* (Schmidt and Hooks)
- *Logging in the Smokies* (Pierce)
- *Call Me Hillbilly* (Russel)
- *Woman of the Mountains* (Bush)
- *The Wild East* (Brown)
- *Great Smoky Mountains: From Natural Habitat to Park* (Pierce)
- *Strangers in High Places* (Frome)
- Little River Lumber Company and Railroad 2004 Calendar
- Logging History postcard strip
- Elkmont self guiding Nature Trail folder

Exhibits:

- Elkmont self- guiding Nature Trailhead wayside
- Signage at Wonderland Club and in Daisy Town

Ranger roves are routinely scheduled at Elkmont and through the campground to assist park visitors, answer questions, and discourage vandalism to structures during the summer months.

3.3.3 Visitor Use Data

The University of Idaho's Visitor Services Project conducted a Visitor Use Study at the Park in 1996. The report does not seek to draw conclusions about specific sites or areas of the Park and resource use within them; however several general conclusions can be drawn. The study indicates that 43 percent of summer visitors and 41 percent of all fall visitors to the Park accessed the Park through the Gatlinburg entrance (Littlejohn 1997). Given the proximity of the Elkmont area to the Gatlinburg entrance and Sugarlands Visitor Center, it is clear that a substantial number of visitors to the Park, particularly those staying for less than a full visitor day, could use trails and/or trailheads that originate in the District.

Since Great Smoky Mountains National Park opened in 1934, visitor use has increased and the trend will likely continue. During the first 20 years of the Park's establishment, visitation rose from 154,000 to 1,945,100, with annual increases from four to 95 percent. Data indicates only three years had a drop in total visits and two of those were during war time. During the 1950s and 1960s, visitation generally tended to increase, although not as dramatically. Annual increases during this period were between one and 31 percent, with most increases less than 10 percent. Again, only three years showed a decline in visitation and those declines were five percent or less. From 1971 to 1991, annual visits rose from 7,173,000 to 8,654,459, with annual increases up to 12 percent. Eight of these years showed declining numbers of visitors up to 14 percent, although most declines were less than six percent. The last ten years of the twentieth century showed similar visitation trends. Average annual increases were less than ten percent and three years showed declines of approximately one to seven percent. For the last ten years, average annual visitation to Great Smoky Mountains National Park has been between 9 and 10 million, higher than any other park in the country.

Table 3- 19: Visitation Projections for Elkmont Historic District (2002- 2015)

Year	Projected Visitation		
	Low	Moderate	High
2002	388,425	390,756	393,086
2003	390,756	394,279	397,803
2004	400,190	401,383	402,577
2005	404,992	406,200	407,408
2006	409,852	411,074	412,297
2007	414,770	416,007	417,244
2008	419,748	420,999	422,251
2009	424,785	426,051	427,318
2010	429,882	431,164	432,446
2011	435,041	436,338	437,635
2012	440,261	441,574	442,887
2013	445,544	446,873	448,202
2014	450,891	452,235	453,580
2015	456,301	457,662	459,023

Source: NPS 2004

The "Low" value assumes an average increase of 1.2 percent based on actual visitation history from 1991 to 2001. This number is represented in the "High" column. The "Moderate" value represents the average visitation based on the projected increase.

Visitation to Elkmont generally reflects the trend for increased visitation to the Park. During the first twenty years of the Park's establishment, annual visits to Elkmont rose

from approximately 21,000 to 105,424, an overall increase of 400 percent. During the 1950s and 1960s, visits to Elkmont continued to increase, although at a lower rate of approximately 150 percent. From 1971 to 1991, the trend continued, but visitation only increased a total of 31 percent. From 1991 to 2001, visitation again increased by a total rate of 12 percent.

Seasonal trends for camping and backcountry use indicate the lowest rates during the colder months from November to February during which time the Elkmont Campground is closed. The primary peak in usage occurs in June and two secondary peaks occur in March and October. Even though the campground is closed during the winter months, backcountry camping opportunities are still available and overall trends for visitor use in Elkmont are comparable to those for camping and backcountry use. During the past 30 years, the average number of annual visits attributed to District has been approximately 350,000. In 2001, annual visitation to the District was approximately 375,000. Projections for visitation to the District over the next 10 years range from a low of 400,190 in 2004 to a high of 459,023 in 2015 (Table 3- 19). In economic terms, the potential annual benefit from visitor recreation use is over $1 million. This is based on information gathered relating to the use of the District for the campground, hiking trails and access to backcountry areas (NPS 2002a).

3.4 Socioeconomic Environment

The potential labor force in Sevier County, defined as citizens over the age of 16, is 56,576. The majority (66.6 percent) are employed as civilians, while 0.1 percent serves in the Armed Forces. Approximately 33.4 percent of the working age population is not in the labor force and the unemployment rate is 4.3 percent. The top three occupations in the county are management, professional and related; service; and sales and office. Occupations that comprise less than 15 percent of the total include production, transportation and material moving; construction, extraction and maintenance; and farming, fishing and forestry. The top industry category, approximately 22 percent of the total, includes arts, entertainment, recreation, accommodation and food services. The next three largest industry groups are retail trade (15.8 percent); education, health and social services (11.9 percent); manufacturing (11.4 percent); and construction (10.8 percent). Most workers, 78 percent, earn private wages or salaries. Workers in local, state or federal government make up 11.3 percent of the workforce, while 10.3 percent of the wage earners are self- employed. The median income for individual, full- time female and male workers is $20,646 and $27,139, respectively (U.S. Census Bureau 2000a).

Considering the status of the Park as one of the nation's most popular parks, it is not surprising that the top industry category would include businesses that have close ties to tourism. Recreation, accommodation, and food service industries supply important service to Park visitors. Sevier County is one of the most popular vacation locations for people traveling within the United States. The greatest proportion of tourists comes from within Tennessee and neighboring Georgia and North Carolina. Guests of Sevier County stay an average of 3.9 nights, have an average of three people in a party, and often are returning for a repeat visit (74 percent). In 2003, the number of guest rooms available in Sevier County was 25,289 with hotel and motel rooms comprising 68 percent of the total. The market has indicated steady growth in cabin and condominium rentals as well (Lodging Resources, Inc. 2004).

One study concluded that 43 percent of summer visitors and 41 percent of fall visitors accessed the Park by way of the Gatlinburg entrance (NPS 2002a). Visitation to Gatlinburg mirrors the trend of visitation to the Park. Summer and fall are the seasons that receive the highest rates of visitation at 33 and 34 percent, respectively. Spring and winter are less popular seasons for people to travel to the area, with only 13 and 19 percent, respectively. Consequently, the demand for lodging during summer and fall is generally the highest. In nearby Pigeon Forge, from June to October, occupancy rates for lodging properties vary between 71 and 95 percent. From November to May the rates are much lower, ranging from 30 percent in January to 58 percent in May and October. Average daily rates for lodging range from $27 in January to $65.50 in July (Lodging Resources, Inc. 2004).

3.4.1 Population and Environment

Elkmont is located in Sevier County, Tennessee. Sevier County has an estimated population of 73,703, which represents an approximate increase of 39 percent from 1990 to 2000. The majority of the population is white, with minorities comprising the following portions of the population: black or African American: 0.6 percent; American Indian and Alaska Native: 0.3 percent; Asian: 0.6 percent; Hawaiian and other Pacific Islander: less than .05 percent; persons of Latino or Hispanic origin: 1.2 percent. The average number of people per household is 2.48 with a median household income of $34,719. In 1999, an estimated 10.7 percent of the population was living below the poverty level (U.S. Census Bureau 2000b).

The majority of the housing units in Sevier County have two or three bedrooms, with approximately 50 percent of the residents receiving their water supply through a public system or a private company and slightly less receiving their water from a private well. Sewage is most often (69 percent of the households) stored in septic tanks or cesspools for disposal, with approximately 28 percent serviced by a public sewer system. The primary source of heating fuel in Sevier County is electricity (65 percent) with an additional 16 percent of the households utilizing wood and ten percent utilizing fuel oil, kerosene, etc. as their principal heating source (U.S. Census Bureau 1990).

The two population centers closest to Elkmont are Gatlinburg and Pigeon Forge. These two towns are also gateway communities to the Park. In 2000, Gatlinburg had a population of 3,382 with a median age of 46.8 and the residents are primarily white (Area Connect 2000). Pigeon Forge has a population of 5,083 with a median age of 37.6. As in Gatlinburg, there are a small number of minority residents that comprise approximately five percent of the population (U.S. Census Bureau 2000c).

3.4.2 Land Use

The land surrounding the Park is primarily composed of forested mountains and hills. The small portion of neighboring land suitable for cultivation has been developed for agricultural use. Small towns and rural developments are sparsely spread across the region, but land use in some areas is rapidly changing as the population of the area continues to increase. A large part of land in the area is publicly owned and includes two National Parkways, three National Forests, a Cherokee Indian reservation and an assortment of water bodies developed by the Tennessee Valley Authority for flood control, recreation and power generation (NPS 1982a).

Sevier County contains 592 square miles of land with a population density of approximately 120 people per square mile (U.S. Census Bureau 2000b). Approximately one- third of the southern portion of the County is National Park land that is primarily forested and undeveloped. Within the Park, the 1982 General Management Plan designated management zones where specific strategies are employed to achieve a common set of goals. Guidelines outline which activities are appropriate for each zone and, within those zones exist subdivisions called subzones. Most of the area in the Park (91.2 percent) is designated Natural Environment with the majority in subzone Natural Environment - Type 1. Management in these areas emphasizes allowing natural processes to dominate the landscape. Active management is utilized only to aid in restoring the environment to a condition that would have existed had there not been human disturbance and invasion by nonnative plants and wildlife. Acceptable forms of development include trails, designated campsites, signs, trail bridges, pit toilets, and hitching rails. Visitor use is allowed in these areas as long as the activities promoted do not result in appreciable degradation of the resource. Compatible recreation includes hiking, fishing, horseback riding, swimming and backcountry camping (NPS 1982).

The second largest area in the Park is designated Development with three subzones: transportation (5.9 percent), general Park development (0.6 percent) and Park utilities (0.1 percent). This zone includes areas that enable visitors to experience the natural and cultural resource values for which the Park was created. Incorporated in this zone are roads that provide access, parking areas, interpretive displays and areas designated for camping and picnicking. Other acceptable forms of development in these areas are buildings, utility systems and storage areas needed for efficient operation and maintenance of the Park. Elkmont Historic District falls under the transportation and general Park development subzones, which have a total area of approximately 34,000 acres in the Park. The transportation subzone consists primarily of public roadway corridors. The general Park development subzone encompasses regions that include facilities for picnicking, camping, public and staff accommodations, historical and natural resource interpretation, parking, and park operation and maintenance (NPS 1982).

3.4.3 Access and Circulation

Elkmont is located in relative close proximity to large population centers, only a one to two- day drive for many people living in the eastern 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 1982). From the north, travelers can reach the Park from Interstate Route 75 or 81, from the east via the Blue Ridge Parkway or Interstate Route 40, from the west via Interstate Route 40 and from the south via U.S. Route 441 or Interstate Route 75. The Blue Ridge Parkway is a national parkway and primary scenic drive for the region, allowing drivers to reach the Park from Shenandoah National Park in Virginia. Additional transportation in the area is provided by bus lines and commercial airlines that serve the two closest large cities, Knoxville and Asheville, Tennessee (NPS 1982). A broad network of foot and horse trails provides visitors with non- motorized access to the area. One of those trails, the Appalachian Trail, is a 2,174 mile hiking trail that bisects the Park and has been designated a National Scenic Trail.

The District is approximately 3 miles (5 km) from the Park's northern boundary, making it easily accessible from Gatlinburg, one of the Park's gateway communities. Elkmont is also a short distance from Newfound Gap Road, which bisects the Park. This road leads from the Oconaluftee Visitor Center on the North Carolina side of the Park to the Sugarlands Visitor Center on the Tennessee side, near the Gatlinburg entrance to the Park. Data indicates that this road receives the heaviest traffic volumes of any road in the Park. However, the roadway that connects Pigeon Forge to Gatlinburg just outside of the Park boundary has even greater traffic levels (NPS 1982). Even visitors with limited time to spend in the area are able take advantage of the recreational opportunities at Elkmont due to the proximity to Sugarlands Visitor Center and the gateway communities of Gatlinburg, Pigeon Forge and Townsend.

Roadways in the Elkmont Area

The existing roadways that provide access to the District extend along Little River Road, from just south of the Sugarlands Visitor Information Center, Newfound Gap Road to the east and Little River Road to the west. Five sections of roadway and one (1) intersection provide primary access to the District and are:

- Newfound Gap Road from the Sugarlands Visitor Information Center to the intersection with Little River Road (1.8 miles)
- Little River Road from Newfound Gap Road to the intersection with Elkmont Road (4.8 miles)
- Little River Road from Elkmont Road to the intersection with Little Greenbrier Road (4.7 miles)
- Little Greenbrier Road from Little River Road to the intersection with US 321 (2.8 miles)
- Little River Road from Little Greenbrier Road to the intersection with Highway 73 (7.6 miles)
- Intersection of Little River Road and Elkmont Road (unsignalized)

Newfound Gap Road is a two- lane paved roadway with one travel lane in both the north and south directions. This road passes through the Park and connects Gatlinburg, Tennessee to Cherokee, North Carolina. The posted speed limit and general travel speed is 25 miles per hour (mph) within the vicinity of the District. Little River Road is a two- lane paved roadway with one travel lane in both the east and west directions.

Little Greenbrier Road is predominately a two- lane paved roadway with one travel lane in both the north and south directions. The roadway narrows to a single lane at a bridge crossing the Little River, approximately 500 feet (ft) from the intersection with Little River Road. Little Greenbrier Road and Highway 73 provide connections between US 321 and Little River Road.

Roadways Within Elkmont Historic District

The paved roads that access the District are in fair (minor cracking or potholes) to good (no potholes, shows signs of normal use) overall condition. However, narrow, one- way roads leading through the cabin areas are deteriorating and in need of repair and resurfacing.

The main road leading into Elkmont is NPS Route 18 (Elkmont Road) that extends from Little River Road to the Elkmont campground. Elkmont Road is a two- lane, paved road that is 1.47 miles long. The road has one 3,055- square- foot parking area. The road surface is in fair condition with occasional minor cracking and some minor surface depressions. Roadway drainage is good. This roadway has a paved bridge in good condition that crosses the Laurel Branch just west of the northern portion of the District.

NPS Route 233, Elkmont Campground Road, starts at the intersection of Elkmont Road and Little River Road at the park guard station. This circulatory roadway provides access to all the campground facilities within the District on both the eastern and western banks of the Little River. The campground loop is paved and is approximately 6.92 miles long. The road surface is in good condition with minimal cracking and good drainage. This roadway has a concrete bridge that spans the Little River.

NPS Route 133, Little River Road, starts at Elkmont Road and continues to the Little River Trail trailhead. This 1.64 mile long, two- lane roadway is partially paved. Approximately one- half (0.79 miles) of this road is unpaved. The road surface is in fair condition with occasional minor cracking and some minor surface depressions. Roadway drainage is good. This roadway crosses the Little River and is gated along Millionaire's Row.

NPS Route 134, Jakes Creek Road, provides access to the southern end of the District and connects to Little River Road in two spots. Jakes Creek Road is paved and is approximately 0.71 miles long. The roadway surface is in fair condition with occasional minor cracking and some minor surface depressions. Roadway drainage is good. This roadway crosses Jakes Creek at its southern end and includes two smaller crossings. One crossing is over Bearwallow Branch and the other is over Tulip Creek.

In addition to these functioning roadways, there is a roadway which is currently closed. This roadway branches off Elkmont Road near the Wonderland Hotel, continues to the northwest, and crosses the Little River with a wooden bridge (Bridge 76). This bridge is in poor condition and is currently closed to vehicular traffic. See Table 3- 20 for a summary description of the internal roads serving the District. Roadway locations are also depicted on the existing condition map of the District (Figure 2- 1).

Table 3- 20: Internal Roads Serving Elkmont Historic District

Route No.	Route Name	Route Description	Condition	Paved Miles	Unpaved Miles	Total Miles
018	Elkmont Road	From Little River Road to campground	Fair	1.47	0	1.47
133	Little River Road	From Route 018 (Elkmont Road) to trailhead	Fair	0.85	0.79	1.64
134	Jakes Creek Road	From Route 133 (Little River Road) to gate	Fair	0.71	0	0.71
233	Elkmont Campground	From Route 018 (Elkmont Road) to end of campground loop	Good	6.92	0	6.92

Other secondary roads provide access to a variety of destinations within the District. These secondary roads are discussed below.

- Wonderland Hotel and Adjoining Cabins
  The Wonderland Hotel area is accessed by a dirt/gravel roadway (Catron Branch Road) that winds around the hill at a moderate grade and terminates at the rear of the Hotel. This roadway continues on as a dirt road through the cabin area above the Hotel, eventually emerging on the Old Road to Gatlinburg, a gravel road that turns off Elkmont Road just before it reaches the Wonderland Hotel. This roadway is currently gated on each end and is only accessed occasionally by NPS service vehicles. This roadway through the cabin area and beyond is now little more than a dirt trail. It is very narrow for one- lane traffic and has a soft base. Consequently, it is washed out and rutted in many locations. At the northern end of this road, Catron Branch crosses through a corrugated metal culvert pipe that is now partially obstructed. Water currently flows around the culvert pipe and has washed away the roadbed at the crossing.

- Appalachian Clubhouse and Adjoining Cabins
  Jakes Creek Road, which passes through Daisy Town, is a narrow, one- lane asphalt road with broken pavement and potholes. This road is bordered on both sides by stone walls that run through most of the cabin area and ends at the Appalachian Clubhouse. While the road itself is sufficiently wide for one- way vehicular traffic, its narrow width and the restriction created by the stone walls make the road unsuitable for a combination of vehicles and pedestrians. However, with no exhibits in this area to generate pedestrian traffic and only limited vehicular traffic, this roadway has an acceptable capacity. Current traffic patterns require that all traffic in the Daisy Town and Society Hill areas, including the Jakes Creek trailhead, leave the area through the use of this one- way road.

- Society Hill
  Jakes Creek Road through Society Hill is a narrow, one- lane asphalt road with broken pavement and potholes. This road lacks the stone walls which are found in Daisy Town and has sufficient width to allow two cars to pass in opposite directions, but is not wide enough to safely allow two continuous lanes of traffic. The adjacent front yards of the cabins are sufficiently wide enough to accommodate pedestrian traffic at a safe distance from passing cars. Drainage from this roadway is good.

- Millionaire's Row
  An existing narrow roadway extends through Millionaire's Row, but vehicular access to it is currently not allowed. Access approximately one mile further up the roadway was provided at one time; however, the Park gated the roadway to prevent vehicular access because of inadequate parking, restricted room for vehicles to turn around, and the broken and potholed pavement condition. The road is currently utilized by pedestrians for access to the Little River hiking trails and occasionally by Park service vehicles.

Existing Traffic Patterns

Roadway capacities and needs are based on the quality and quantity of use. In defining the type of transportation facility required to service an area, estimating the traffic utilizing the area is the first step. According to historical traffic data and current traffic counts, the District currently generates 986 trips during an average 24- hour period. The term "trip" refers to one vehicle passing through a specific point on a roadway in either

direction. For example, if one (1) vehicle carrying four (4) people enters the District via Elkmont Road for a picnic at noon and then leaves by the same route at 3:00 PM on the same day, that would constitute two (2) trips (one entering trip and one exiting trip). The District currently draws these trips by with hiking, camping and various day- use attractions.

In a traffic study performed for the District in 2004 (McGill Associates 2004), trip distributions were developed based on existing traffic patterns, surrounding population centers, and engineering judgment. It was estimated that a large portion of trips (60 percent) will access the District from the north on Newfound Gap Road from Gatlinburg, Pigeon Forge, Knoxville, and from I- 40. Approximately thirty percent of the trips will access the District from the northwest via Highway 73 from Townsend and Maryville from US 321. Five percent of the traffic will access the site from the north via Little Greenbrier Road from US 321. The remaining five percent will access the site from the south via US 441 from Cherokee, North Carolina.

Traffic and Circulation Study

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. The peak weekday in July represents an average peak period for the purposes of analysis and this traffic condition is expected to occur several times throughout the year. The peak Saturday traffic condition in October occurs only a limited number of times throughout the year on especially "high visitation" days to the Park.

Existing weekday peak hour traffic volumes for the roadways and intersections within the District were analyzed using the methodology outlined in the 2000 edition of the *Highway Capacity Manual* published by the Transportation Research Board. *Highway Capacity Software 2000* was utilized to analyze the roadway segments and unsignalized intersections. The capacity analysis for an unsignalized intersection does not provide an overall level of service, but does provide a level of service for movements that must yield to conflicting traffic. The Levels of Service designations were used as evaluation criteria for this study.

The *Highway Capacity Manual* defines capacity as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions." Level of Service is a term used to represent different driving conditions, and is defined as a "qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers." Level of Service varies from level "A", representing free flow, to level "F" where greater vehicle delays are evident.

For the purposes of this study, two types of capacity analyses were performed. The first type of analysis involves specific sections of roadway and is referred to as a Two- Way Highway Analysis. Two- Way Highway Analysis measures Level of Service in terms of Percent Time Spent Following a vehicle and the average travel speed a vehicle can expect to experience on a defined section of roadway. The Level of Service determined by a two- way analysis varies by the classification of the roadway in question.

There are two classifications of roadways. A Class I roadway most often serves long-distance trips or provides connecting links between facilities that serve long- distance links. Users of a Class I roadway have an expectation of traveling at a high rate of speed and, therefore, mobility is a high priority for these drivers. Class II roadways are facilities which connect Class I facilities, serve primarily recreational traffic or travel through rugged terrain. Motorists on a Class II facility do not necessarily expect to travel at a high rate of speed and mobility is not as critical. Class II facilities only consider Percent Time Spent Following a vehicle in determining the Level of Service. Each of the roadway segments included in this study serve recreational traffic and is considered to be in mountainous terrain and will be analyzed as a Class II facility. Table 3- 21 provides *Highway Capacity Manual* Levels of Service and related Percent Time Spent Following per vehicle for a two- way facility. For example, a Percent Time Spent Following of 80 percent on a Class II facility results in a Level of Service D for that segment.

Table 3- 21: Highway Capacity Manual Levels of Service Criteria

Two- Lane Highways (Class II)	
Level of Service	Percent Time Spent Following
A	0- 40
B	40- 55
C	55- 70
D	70- 85
E	>85

The performance of an intersection also measured in terms of delay per vehicle and presented in terms of Level of Service. Table 3- 22 provides *Highway Capacity Manual* Levels of Service and related delay per vehicle for both signalized and unsignalized intersections. Levels of Service are stated in terms of delay. For example, a delay of 30 seconds for a movement at an unsignalized intersection results in a Level of Service D for that movement.

Table 3- 22: Highway Capacity Manual Levels of Service and Delay

	Unsignalized Intersection	Signalized Intersection
Level of Service	Control Delay per Vehicle (seconds)	Control Delay per Vehicle (seconds)
A	0- 10	0- 10
B	10- 15	10- 20
C	15- 25	20- 35
D	25- 35	35- 55
E	35- 50	55- 80
F	>50	>80

According to the Highway Capacity Manual, "Capacity and other traffic analyses focus on the peak hour of traffic volume, because it represents the most critical period for operations and has the highest capacity requirements." The analysis of Level of Service is based on peak rates of flow within the peak hour.

Per standards set in the *Highway Capacity Manual*, the procedures for the analyses performed for this study are adjusted based on the traffic flow rates that occur during the peak 15 minutes of the peak hour. The adjusted peak hour flow rate to be used in determining the design hour flow rate is found by dividing the peak hour volume by a

"peak hour factor", which has been developed for urban and rural roadways. The *Highway Capacity Manual* recommends a factor of 0.88 to be used for the analysis of rural roadways such as those found within and leading to the District. For example, if a peak hour volume of 1,500 vehicles were observed and a factor of 0.88 was applied for the purposes of analysis, a design hour flow rate of 1,705 vehicles per hour (1,500 vehicles / 0.88) is calculated for the peak 15- minute period of the peak hour. With application of this factor, a traffic volume of approximately 426 vehicles (1,705 vehicles per hour x 0.25 hour) would occur for the peak 15 minute period. This means that the roadway design must consider that approximately 28.4 percent of the total traffic volume is expected to pass through the District in a peak 15- minute period instead of 25 percent (15 minutes of the hour) expected if the traffic arrived uniformly.

2004 Peak Traffic Volumes

As previously discussed, two- way automatic counts were performed at several points within the District in April of 2004. This traffic data was then converted to the two selected time periods of interest: the peak hour traffic occurring on a weekday in July and a Saturday in October. These conversions were made using the average daily traffic (ADT) data provided by the NPS at the automatic traffic recording station on Newfound Gap Road.

The average number of daily trips was then converted to the number of trips expected in both peak conditions using the adjustment factors discussed earlier. The adjustment factors were applied only to trips that were associated with land uses considered to be unconstrained. Constrained trips are associated with land uses with a limited amount of spaces to be used. For instance, the campground is a constrained land use because there are only 220 campsites available for use. Only a certain number of trips can be expected to access the site no matter what the time of year. For the purposes of this analysis, the campground was considered to be fully occupied and, based on guidance provided in the *Highway Capacity Manual* for estimation of trips to campgrounds and other recreation sites, each lot was assumed to produce an average of three trips per day. The hiking trails and day- use trips are considered to be unconstrained since there is essentially no limit to how many people could utilize these land uses during a given period of time. The total number of trips expected to access the District is as follows: on a weekday in July (1,169 trips) and on a Saturday in October (1,340 trips). However, not all of these trips will affect the surrounding roadway network.

Some trips will be considered internal trips. Internal trips are those trips originating from within and ending within Elkmont. For example, a vehicle entering Elkmont that traverses thorough the District visiting the trails, exhibits, restaurant, etc., and exiting Elkmont is considered an external trip. However, if that same trip originated in the campground, at the hotel or at a cabin, it would be considered an internal trip. The number of internal trips is divided into two categories – trip "generators" and trip "attractors". Trip attractors are reflective of the visitation to the District, while trip generators define the amount of travel within the District. Trip generators are facilities associated with lodging accommodations, such as the campground, and, in several of the proposed alternatives, the Wonderland Hotel, Annex and cabins. Trip attractors include features such as the trails, backcountry camping, day- use facilities, exhibits, and the Wonderland Hotel restaurant, as applicable for each alternative. Individual stops at attractors, no matter how numerous or repetitive are considered part of the same trip

(internal or external). The District is expected to generate 915 external trips on a weekday in July and 1,010 external trips on a Saturday in October. Refer to Table 3- 23 for a breakdown of these trips.

Table 3- 23: Existing Traffic Summary of Trip Attractors for the District

Land Use	Number of Trips		
	Average Day	Weekday- July	Saturday- October
Campground	660	660	660
Backcountry Camping	3	5	6
Elkmont Nature Trail	2	3	4
Jakes Creek Trail	31	50	65
Little River Trail	36	58	75
Day- Use	254	393	530
Total	**986**	**1,169**	**1,340**
Internal	**163**	**254**	**330**
External	**823**	**915**	**1,010**

Source: McGill Associates 2004

Analysis of Existing Peak Hour Traffic Conditions

Elkmont Road is the only access point for vehicular traffic into the District. The weekday peak hour traffic condition on this road occurs between the hours of 1:00 PM and 3:00 PM. The peak could occur during either the 1:00- 2:00 or 2:00- 3:00 hour since a recorded traffic volume of 77 vehicles was observed during both time periods. The peak hour volume represents 10 percent of the total daily traffic traveling to/from Elkmont Road on a typical weekday. As for the Saturday peak hour traffic condition, the hour of study was determined to be between 2:00 PM and 3:00 PM and the peak traffic is expected to be 12.5 percent of the total daily traffic. The peak hour traffic conditions analyzed as part of this study were determined by using 10 percent of expected daily weekday traffic in July and 12.5 percent of daily Saturday traffic expected in October as the peak hour volumes.

In order to determine the current Level of Service of the roadway segments and the intersection within the District, the 2004 traffic volumes were analyzed under existing lane configurations and traffic control conditions. The results of the two- way roadway analysis are presented in Table 3- 24 and the results of the intersection analysis are presented in Table 3- 25.

Capacity analysis indicates that the roadway segment of Newfound Gap Road from the Sugarlands Visitor Information Center to Little River Road currently operates at an undesirable Level of Service D during the weekday and at a Level of Service of E during Saturday peak hour traffic conditions. These poor Levels of Service are due primarily to high traffic volumes caused by seasonal traffic visiting the area. Capacity analysis also indicates that the roadway segments on Little River Road and Little Greenbrier Road operate at an acceptable Level of Service C or better during the weekday peak hour and an acceptable Level of Service D or better during the Saturday peak hour traffic condition.

Capacity analysis of the unsignalized intersection indicates that the westbound left turn movement from Little River Road onto Elkmont Road experiences minor delays (of less than 10 seconds/vehicle) and operates at Level of Service A during both weekday and

Saturday peak hours. In addition, the minor approach of Elkmont Road operates at Level of Service B during the weekday peak hour and Level of Service C during the Saturday peak hour. These are acceptable levels of service.

Table 3- 24: Analysis of Existing (2004) Traffic Conditions (Two- Way Roadway Analysis)

ROADWAY SEGMENT	WEEKDAY		SATURDAY	
	Level of Service	Percent Time Spent Following	Level of Service	Percent Time Spent Following
Newfound Gap Road: Sugarlands Center to Little River Road	D	83.1	E	92.2%
Little River Road: Newfound Gap Road to Elkmont Road	C	66.7	D	75.3%
Little River Road: Elkmont Road to Little Greenbrier Road	C	63.4	D	73.4%
Little Greenbrier Road: Little River Road to US 321	A	38.7	B	44.8%
Little River Road: Little Greenbrier Road to Highway 73	C	61.7	D	71.4%

Table 3- 25: Analysis of Existing (2004) Traffic Conditions (Unsignalized Capacity Analysis)

INTERSECTION	APPROACH	LANE CONFIGURATIONS	PEAK HOUR LEVEL OF SERVICE	
			WEEKDAY	SATURDAY
Little River Road	WB	1 Left Turn –Through	A[1]	A[1]
	EB	1 Through – Right Turn		
[1] Elkmont Road	NB	1 Left Turn, 1 Right Turn	B[2]	C[2]

[1]Level of service for left turn movement on major approach
[2]Level of service for minor approach

Projected (2015) Traffic

Background traffic volumes are needed to estimate the growth of traffic and subsequent change in traffic conditions projected under each alternative. Background traffic is that component of traffic due to growth of the surrounding area that is anticipated to occur regardless of whether the proposed alternative is implemented. The future year of analysis was selected by looking at a period of time ten years beyond the completion of the EIS process. For the purposes of this study, it is assumed that any improvements to be made to the District will be completed and potential lodging facilities may be approaching peak occupancy by 2015.

The year 2015 daily traffic volumes were estimated by applying an annual growth rate to existing (2004) traffic volumes. Historical visitation data for the Park were used to determine an annual growth rate for this area. In 2001, the annual number of visitors to the Park was 9,457,373. Historical visitation data indicate an annual growth rate of approximately one percent over the most recent twelve years of data available. Projected visitation for Elkmont Historic District through 2015 is provided in Table 3- 19.

Analysis of Background (2015) Traffic Conditions
The background year 2015 peak hour traffic volumes were analyzed using the methodology outlined in the *Highway Capacity Manual* as previously noted for the existing traffic conditions. The results of the two- way roadway analyses and unsignalized intersection analysis are presented in Tables 3- 26 and 3- 27.

Capacity analysis indicates that the roadway segment of Newfound Gap Road from the Sugarlands Visitor Information Center to Little River Road continues to operate at an undesirable Level of Service E during the weekday peak hour and the operation deteriorates to a failing Level of Service during the Saturday peak hour. These poor Levels of Service are due primarily to the high traffic volumes occurring on this roadway segment due to seasonal traffic accessing the area. Capacity analysis also indicates that the roadway segments on Little River Road and Little Greenbrier Road operate at an acceptable Level of Service D or better during both the weekday and Saturday peak hour traffic conditions.

Table 3- 26: Analysis of Background (2015) Traffic Conditions (Two- way Roadway Analysis)

ROADWAY SEGMENT	WEEKDAY		SATURDAY	
	Level of Service	Percent Time Spent Following	Level of Service	Percent Time Spent Following
Newfound Gap Road: Sugarlands Center to Little River Road	E	87.7	F	N/A
Little River Road: Newfound Gap Road to Elkmont Road	D	71.5	D	77.6%
Little River Road: Elkmont Road to Little Greenbrier Road	C	66.9%	D	73.8
Little Greenbrier Road: Little River Road to US 321	B	41.1%	B	46.5%
Little River Road: Little Greenbrier Road to Highway 73	C	64.8%	D	74.0%

Capacity analysis of the unsignalized intersection indicates that the westbound left turn movement from Little River Road onto Elkmont Road and the minor approach of Elkmont Road both continue to operate at acceptable Level of Service during the weekday and Saturday peak hours.

The data in Table 3- 27 show that the traffic conditions at the intersection of Little River and Elkmont Roads remains at an acceptable Level of Service through the period to 2015.

Table 3- 27: Analysis of Background (2015) Traffic Conditions (Unsignalized Capacity Analysis)

INTERSECTION	APPROACH	LANE CONFIGURATIONS	PEAK HOUR LEVEL OF SERVICE	
			WEEKDAY	SATURDAY
Little River Road	WB EB	1 Left Turn - Through 1 Through – Right Turn	A	A
Elkmont Road	NB	1 Left Turn, 1 Right Turn	B	C

The proposed changes to the District for each project alternative must be considered in the analysis as well in determining a future Level of Service for roadways affected by implementation measures in that alternative. These potential effects on the Level of Service of roadways within the District are provided and discussed in detail in Chapter 4 for each of the proposed alternatives.

Parking Lots

During peak visitation, parking within the District is inadequate. The primary destinations within the District, excluding the campground, are the Little River Trail trailhead and Jakes Creek trailhead. Of these, only Jakes Creek trailhead has any parking space dedicated for use, and that space is inadequate for the demand of the peak season.

Wonderland Hotel and Adjoining Cabins

There currently are no parking areas dedicated to serving the Wonderland Hotel area. Visitors who wish to walk up to the Wonderland Hotel area park off the road in the dirt/gravel road shoulder at the base of the Hotel steps, where there is sufficient room for approximately six (6) cars. Others may park in the few parking spaces of an asphalt parking area in front of the visiting scientist apartments (Building 600) across from the Wonderland Hotel steps, if there are spaces available. This asphalt parking area is in generally good condition and receives relatively little use. A larger gravel/dirt parking area behind the existing Wonderland Hotel currently is not accessible to the general public because the road to the Hotel is gated. This lot has the potential to provide parking for approximately 35 cars if it were available for parking. It is in generally fair condition, but would quickly deteriorate with regular vehicular traffic. This lot is not considered ADA compliant due to the condition of its gravel surface.

Appalachian Clubhouse and Adjoining Cabins

Daisy Town currently has one gravel parking lot adjacent to the Appalachian Clubhouse that could accommodate between 10 and 15 cars. Since this area is not currently a popular destination within the District, this lot is not typically filled to its capacity. For this reason, the existing gravel surface is in generally good condition, but would deteriorate quickly with increased vehicular traffic. This lot is not considered ADA compliant due to the condition of its gravel surface.

Jakes Creek Trailhead

The Jakes Creek Trailhead parking lot is located along Jakes Creek Road just below the access point to the trail. This parking lot has a gravel/dirt surface and is little more than a

wide spot in the road, capable of providing parking for approximately eight cars. On weekends during the peak season, it is estimated that as many as 30 cars are parked in this area to access Jakes Creek Trail (NPS 2002a). The parking pattern is random and uncontrolled in this area.

Little River Trailhead

The Millionaire's Row area serves as the trailhead for the Little River hiking trail and its connecting trails. There are currently no designated parking lots in this area. Parking is accomplished randomly and uncontrolled in the gravel/dirt shoulders along the sides of the road as space permits. Roadside parking can safely accommodate approximately 12 cars. Estimated average use of this area for parking is similar to that experienced at the Jakes Creek trailhead, with the addition of those who use the trail to access the river for fishing (NPS 2002a). This would indicate peak parking of approximately 35 cars per day.

In addition, one parking area approximately 3,055- square- feet, exists along Elkmont Road within the District. This lot provides parking for visitors hiking on the Elkmont Nature Trail. Another area, approximately 1,936- square- feet in size, is located outside the District along Little River Road beside the Little River for trail access.

3.5 Other Resources

3.5.1 Viewshed

The aesthetic value of an area can be assessed by examining the visual character and quality of an area, while also considering the viewer response to that area or view. The visual character of a place is the product of both the natural features and those created by human development such as roads, buildings and bridges. Visual quality is assessed by examining the vividness, intactness and unity of the view, defined as follows (StanCOG 2001):

- Vividness is the visual power or memorability of landscape components (how distinctly landscape components are remembered) as they combine in striking or distinctive visual patterns
- Intactness is the visual integrity of the natural and human –built landscape and its freedom from encroaching elements; this factor can be present in well-kept urban and rural landscapes, as well as in natural settings.
- Unity is the visual coherence and compositional harmony of the landscape considered as a whole.

A viewshed is defined as all of the surface area that can be viewed with an unobstructed sightline from a specific location or series of locations, such as a hilltop overlook, road way or trail. In addition to examining the visual character and quality of an area, the perspective of the viewer must also be considered when evaluating a viewshed. The sensitivity and response of the viewer can be wide ranging. For instance a person traveling to work would not be very sensitive to the details in the surrounding landscape, but visitors walking or driving through a national park would be traveling at a slower pace and have a much greater awareness of the views around them (high visual sensitivity) (StanCOG 2001). The regional context should be considered as well, given that a human built structure would be a much more significant visual element in an area dominated by natural features than it would in an urban setting.

The District is situated within the valley formed by the Little River and its associated tributaries. While most of the development in the District has occurred in low lying, relatively open areas adjacent to the river and its tributaries, the Wonderland Hotel and adjacent buildings are located on a ridgeline that is generally hidden from the main road. Due to relatively dense forestation, topography and/or overgrown vegetation adjacent to buildings, the majority of the historic buildings have obstructed views of 100 feet or less. Many areas that were previously open pasture have succeeded to a variety of woody species. The vegetation is predominately native to the area and includes a variety of evergreens, deciduous and herbaceous plants. However, former human occupation has resulted in the introduction of many non- native plant species as well.

Most of the District's visitors are pedestrians or vehicle occupants traveling at a relatively low speed. Since these visitors have more opportunities to observe the viewsheds than a faster moving vehicle simply because they will be traveling at a slower rate, the intensity of the views (or the frequency of the selected viewpoints) will be high. Visual quality also changes naturally over time as vegetation type and condition can be altered rapidly by fire, insects, weather and man- made impacts.

Viewshed Mapping

The viewshed can consist of a plan view or a map of areas. To analyze the viewshed in the District, different techniques were used to assess the visual sensitivity. These techniques included the use of ARCGIS Spatial Analyst (Version 9.0) computer software to illustrate views of and from the transportation and pedestrian corridors within the District. This software uses data points at approximately 10- foot increments along the corridors to define visual resources and the intensity of those resources. This software analyzes the digital terrain to identify areas that may be viewed without the consideration of vegetation to simulate winter views. Parameters are also modified within the software to represent a summer view by restricting the field of view evaluated by the software. In the District, the majority of the buildings have obstructed views of 100 feet or less. This method is used to evaluate the intensity of viewsheds experienced by a typical visitor to the District.

To assess the linear features of Elkmont, three (3) composite viewshed maps were prepared (see Appendix D). The composite viewshed combines individual viewsheds along a road or trail and combines them to assess which areas are most visible from the corridor. Viewpoints were considered at approximate 10- foot intervals along the corridors. This interval spacing was derived by considering the user group, which consists primarily of pedestrians or vehicle occupants traveling at a relatively low speed. The viewshed maps in Appendix D are separated into different areas to allow an assessment of each area. The smaller areas mapped were Elkmont Road (Figure 1), Wonderland Club Area (Figure 2), Daisy Town Area (Figure 3), Campground Area (Figure 4), Jakes Creek Area (Figure 5), and Millionaire's Row Area (Figure 6). Each small area's multi- point viewshed map used the vehicular or pedestrian corridors as the viewpoint. The visible land was broken into three shades of red. The dark red areas indicate the land that is seen from the most viewpoints while the light red is seen from the fewest number of viewpoints.

The small area viewshed maps were combined to create composite viewshed maps for the entire District (Figures 7, 8 and 9). These composite viewsheds were mapped using

three (3) different techniques to show the viewshed visibility. The first map was created in the same manner as the small area map using three (3) shades of red referring to the most and least visible areas (Figure 7). The second map was created using five (5) shades of red referring to the visible land (Figure 8). This map was created to determine the most critical areas of the District.

The third map used existing vegetation as a factor in the viewshed assessment (Figure 9). Vegetation changes rapidly due to fire, insects, weather and man- made impacts and is typically not used as a control measure for visual assessment. Because most of the areas in the District have some degree of vegetation, this viewshed map uses a boundary of one hundred feet on both sides of the viewshed corridors. One hundred feet on both sides of the corridor was considered the average foreground visibility of these corridors during spring and summer season when deciduous vegetation is in full leaf.

The findings of this study show that most existing long- range views occur from and along the existing transportation corridors. However, because these corridors exist generally along low- lying areas of the valley, the opportunity for panoramic views is limited, again, by topography and vegetation. Therefore, most viewsheds are limited to individual areas of the District (Wonderland area, Millionaire's Row area, etc.).

Photo- Realistic Simulations

In addition to the mapping technique described above, representative photo- realistic simulations have been prepared. Digital photographs were taken from several areas of the District and are provided in Appendix D. Most of the photographed areas represent historically or architecturally significant views, while others are areas where parking lots are proposed. The purpose of the simulations is to show the existing condition and demonstrate the potential visual impacts of some of the components of the proposed Alternatives. The simulations illustrate the visual effects of removing existing buildings and design techniques used to mitigate viewshed impacts through the use of vegetation buffers in proposed parking areas. This work is intended to demonstrate impacts on specific buildings to generally relate the magnitude of changes associated with other buildings within the District. Representative simulations were created at the following locations: Appalachian Club Parking Area, Daisy Town Parking Area, Vernon Moore Cabin (58- 1A), Beaman Cabin (58- 8H), Daisy Town Cabins and Parrot Cabin (44).

3.5.2 Soundscape

Sound currently generated within the Elkmont Historic District consists of natural sound from rivers, creeks, animals, etc. and human- produced sounds, such as those produced by vehicles visiting the District, campground sounds (noise made by power generators, human interaction, etc.), and sounds made by maintenance equipment. It is expected that numerous sources of human- produced sound will result from this project. These sounds may come from sources such as exhaust fans on heating, ventilation and air conditioning (HVAC) systems, electrical motors on vents, gas- powered motors on various types of machines (landscaping equipment), and construction noises, etc. One of the primary human- produced sources of sound will likely be additional vehicles entering the site.

Noise is basically defined as unwanted sounds. It is emitted from many sources including airplanes, factories, railroads, power generation plants, and highway vehicles. Traffic noise

is usually a composite of noises from engine exhaust, drive train, and tire- roadway interaction. The magnitude of noise is usually described by its sound pressure. Since the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, usually described in decibel (dB). Sound pressures described in decibels are called sound pressure levels and are often defined in terms of frequency weighted scales (A, B, C, or D). The A- weighted decibel scale is used in vehicular noise measurements because it places the most emphasis on the frequency range to which the human ear is most sensitive (1,000 to 6,000 Hertz). Sound levels measured using the A-weighted decibel scale are often expressed as dBA. Throughout this report, all noise levels will be expressed in dBA's. Several examples of noise pressure levels in dBA are listed in Table 3- 28.

Table 3- 28: Noise Levels for Common Sounds

(dBA)	Common Sounds	Noise Impact
140	Shotgun blast	
	Jet 100 feet away at takeoff	Pain
	Motor test chamber	Human ear pain threshold
130	Firecrackers	
120	Sever thunder	
	Pneumatic jackhammer	
	Hockey crowd	
	Amplified rock music	Uncomfortably loud
110	Textile loom	
	Subway / elevated train, heavy city traffic	
	Farm tractor, power lawn mower	
	Newspaper press, noisy factory	Loud
90	Diesel truck at 40 mph 50 feet away	
80	Crowded restaurant, garbage disposal	
	Average factory, vacuum cleaner	
	Passenger car at 50 mph 50 feet away	Moderately loud
70	Quiet typewriter	
60	Singing birds, window air- conditioner	
	Quiet automobile	
	Normal conversation, average offices	Quiet
50	Household refrigerator	
	Quiet office	Very quiet
40	Average home	
30	Dripping faucet	
	Whisper 5 feet away	
20	Light rainfall, rustle of leaves	Average person's threshold for hearing
	Whisper	Just audible
10		
0		Threshold for acute hearing

Sources: World Book, Rand McNally Atlas of the Human Body, Encyclopedia Americana, "Industrial Noise and Hearing Conversation" by J. B. Olishifski and E.R. Harford (Researched by N. Jane Hunt and published in the Chicago Tribune in an illustrated graphic by Tom Heinz).

Most individuals are exposed to fairly high noise levels from many sources as they go about their daily activities. The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

1) The amount and nature of the intruding noise.

2) The relationship between the background noise and the intruding noise.
3) The type of activity occurring where the intruding noise is heard.

In considering the first of these three factors, it is important to note that individuals have different hearing sensitivities to noise. Loud noises bother some more than others and some individuals become agitated if an unwanted noise persists. The time patterns of noise also enter into an individual's judgment of whether or not a noise is offensive. For example, noises occurring during sleeping hours are usually considered to be much more disruptive than the same noises in the daytime. With regard to the second factor, individuals tend to judge unwanted noise in terms of its relationship to noise from other sources (background noise). The blowing of a car horn at night when the background noise levels are low would generally be more objectionable than the blowing of a car horn in the afternoon when background noise might be high. The third factor is related to the interference of noise with activities of individuals. In a 60 dBA environment, normal conversation would be possible while sleep might be difficult. Activities requiring high levels of concentration may be interrupted by loud noise while activities requiring manual effort may not be affected to the same degree.

Abatement Criteria

The Federal Highway Administration (FHWA) noise abatement criteria (NAC) set forth in the Code of Federal Regulations, Title 23 CFR, Part 772 were used to evaluate existing and future noise levels. A summary of the noise abatement criteria for various land uses is presented in Table 3- 29. This study focused on Category B criteria because this activity category most closely resembles the types of activities that occur within the District now and will continue into the future. To be consistent with the NAC, the Equivalent Sound Level (Leq) will be used for this study. The Leq is a level of constant sound that, in a given situation and time period, has the same energy as sound levels that vary over time. In other words, the fluctuating sound levels are represented in terms of steady noise level with the same energy content.

Table 3- 29: Noise Abatement Criteria (Hourly A- Weighted Sound Level – decibels [dBA])

Activity Category	Leq (h)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extreme significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 (Exterior)	Picnic areas, recreation areas, playground, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B
D	- - -	Undeveloped lands
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums

Source: Title 23 Code of Federal Regulations, (CFR) Part 772, U.S. Department of Transportation, FHWA

Ambient sound level measurements were conducted to quantify the existing noise levels in the District for the purposes of comparing this base information to future noise levels. Table 3- 30 presents sound readings conducted on Friday, April 16 and Saturday, April 17, 2004 within the District between the hours of 6:00 pm and 8:30 pm. Table 3- 31 presents

readings conducted on Sunday, April 18, 2004 at two locations at the Cades Cove visitor center between 12:30 pm and 1:30 pm. The time period of the readings conducted within the District were taken during a period of the day when activity was somewhat minimal, while the readings taken within Cades Cove were taken during a period of significant activity. The differing time periods provide a conservative comparison between the two reading sites. Tables 3- 30 and 3- 31 illustrate the noise measurement locations and resulting levels.

Table 3- 30: Ambient Sound Level Readings within Elkmont Historic District

Site No.	Date	Location	Sound Level Leq - dBA	Comments
1	4/17/04	End of road near Cemetery	36.5 dBA	sunny, light wind (~0- 5 mph); some birds
2	4/17/04	In front of hotel at old fountain	46.9 dBA	sunny, light wind (~0- 5 mph); some birds; river nearby could be heard
3	4/17/04	Parking lot behind hotel	43.3 dBA	sunny, light wind (~0- 5 mph); some birds; river nearby could be heard
4	4/17/04	Next to Elkmont Road at hotel steps	51.7 dBA	sunny, light wind (~0- 5 mph); some birds; river nearby could be heard; 2 cars passed meter during reading
5	4/17/04	Nature Trail parking lot near campground	49.4 dBA	sunny, light wind (~0- 5 mph) some birds (woodpecker nearby) river nearby could be heard children in campground could be heard
6	4/17/04	Millionaire's Row	55.3 dBA	Evening , light wind (~0- 5 mph) river nearby could be heard – loud
7	4/17/04	Parking lot Millionaires Row	48.7 dBA	Evening , light wind (~0- 5 mph) river nearby could be heard 1 minivan started during reading
8	4/17/04	Jakes Creek Trailhead on road near creek	60.4 dBA	very light wind (~0- 5 mph) some birds; river nearby could be heard
9	4/17/04	Society Hill	50.8 dBA	very light wind (~0- 5 mph) river nearby could be heard
10	4/17/04	Daisy Town At beginning of one- way road	50.1 dBA 46.8 (no cars) 58.9 (diesel truck) 53.7 (Ford Expedition)	very light wind (~0- 5 mph) some birds; river nearby could be heard
11	4/17/04	In front of Appalachian Clubhouse	52.0 dBA	very light wind (~0- 5 mph) some birds; river nearby could be heard; jeep started during reading
12	4/17/04	Gate to Jakes Creek Cemetery	50.1 dBA	very light wind (~0- 5 mph)
13	4/17/04	Campground – Loop C near Little River Rd	43.5 dBA 41.8 (no vehicles)	Evening, light wind (~0- 5 mph) some birds; river and people talking nearby could be heard

Ambient noise levels measured within the District ranged from as low as 36.5 dBA to as high as 60.4 dBA. Sound levels measured away from rivers/creeks and human- produced sound generators were relatively low, one of which measured below 40 dBA. Sound

levels near rivers and vehicles were relatively high, one of which exceeded 60 dBA near Jakes Creek Trailhead, due to the noise generated by Jakes Creek. There was little distinction between sound levels recorded near rivers/creeks and vehicles. Depending upon the distance from the source, noise levels were about the same for a car or sport utility vehicle and a swift moving river or creek. A variety of readings were taken of similar vehicles at similar distances from the meter to verify the readings. In addition, sound readings were compared for similar responses to the same input source to ensure the accuracy of the meter.

As previously mentioned, sound readings were taken at two locations within Cades Cove to determine human- produced noise levels for "exhibit- type" land uses. While it is not exactly representative of Elkmont Historic District, these readings do represent sound levels that are generated by visitors arriving by vehicles and interacting within the Cades Cove environment. Both measurements were conducted on April 18, 2004, the weekend after Easter when some schools were on Easter vacation.

Table 3- 31: Ambient Sound Level Readings at Cades Cove

Site No.	Date	Location	Sound Level Leq - dBA	Comments
1	4/18/04	Cades Cove Information Center in grass near parking lot adjacent to visitor information stand	54.9 dBA	sunny, light wind (~5- 10 mph) people talking ~20 ft. away vehicles starting in parking lots vehicle doors opening/closing children playing ~50 ft. away vehicles passing Visitor Center on Cades Cove Rd ~20 mph 84 vehicles (cars, trucks and vans) were counted during sound measurement (15 minute period)
2	4/18/04	Abram's Visitor Center in grass in center of gravel parking lots ~100 vehicles in parking lot at start of reading with continuous vehicle "turn-over"	52.8 dBA	sunny, light wind (~5- 10 mph) children/people talking ~20 ft. away; vehicles starting/stopping in parking lots; vehicle doors opening/closing; vehicles traveling around parking lot loop ~5- 10 mph; crows squawking READINGS OF VARIOUS VEHICLES 39.5 dBA – no vehicles or people 55.0 dBA – vehicles on both sides of meter 62.7 dBA – loud diesel truck entering lot (> 100 feet from meter) 52.5 dBA – normal car 48.3 dBA – car starting 100 ft. from meter 52.5 dBA – car starting 50 ft. from meter 49 to 65 dBA – two motorcycles

Sound levels at Site No. 1 shown in Table 3- 31 were recorded at the entrance to Cades Cove in a grassy area near the visitor center booth adjacent to the paved parking lot. A total of 84 vehicles were counted during the 15- minute recording period. The majority of these vehicles stopped at the visitor's center, with the remaining continuing on to the Cades Cove loop. Travel speed was estimated to be an average of approximately 15 to 20 mph. People were interacting near the visitor booth. The sound meter was located approximately 30 feet from both the visitor booth and the parking lot. While several vehicles generated very high sound levels (in excess of 60 dBA), the Equivalent Sound Level for the period was 54.9 dBA.

Sound readings at Site No. 2 shown in Table 3- 31 were measured in a grassy area located between the parking lot loop road near the entrance to the Abram's Visitor Center. Several gravel parking areas are located in this area. A total of 65 vehicles were counted during the recording period (29 vehicles entered and 36 exited). There were approximately 100 vehicles parked at the facility at the beginning of the study. Travel speed was estimated to be an average of approximately 5 to 10 mph. The sound meter was placed in the center of the parking lot loop road, approximately 20 feet away from the road on each side. Although there were several different types of vehicles each generating various levels, there were periods with no human- produced sound. The resulting Equivalent Sound Level for the period was 52.8 dBA.

As shown in Table 3- 31, several "instantaneous" readings of various vehicles were conducted. These readings were taken in an effort to show what can be expected from differing types of vehicles traveling though the District. With no vehicles or other human- produced sound, the ambient sound level was 39.5 dBA. One reading reached 65 dBA, an increase of over 25 dBA, when two motorcycles passed 20 feet from the meter. However, it should be noted, that these readings represent the maximum sound level of the reading over a very short period of time (less than one minute) and not the steady sound level given by Equivalent Sound Level over an extended period of time.

3.6 NPS Operations

Current NPS operations include maintenance of existing infrastructure. Existing condition of the infrastructure at Elkmont Historic District is described in the following paragraphs.

Wastewater Treatment

Existing Sanitary Sewer Facilities

The Park operates a wastewater collection and treatment system in the Elkmont Historic District within the Park. Currently, a wastewater collection system consisting of gravity sanitary sewers serves the campground, located in the center of the District. Campground wastewater treatment and disposal is provided by an activated- sludge wastewater treatment plant. There is also an inactive gravity sanitary sewer line serving the Daisy Town and Society Hill cabin areas, with treatment and disposal formerly provided by a septic disposal system. Gravity sewers connect the Wonderland Hotel and adjoining cabins to a separate inactive septic disposal system.

Elkmont Campground Collection Systems

The Elkmont Historic District has a gravity sanitary sewer system that currently serves twelve restrooms in the campground areas. The system has two main branches with one

branch located on either side of the Little River. The western branch extends from the wastewater treatment plant, south along the campground roadway and ends at the southern most campground restroom. The eastern branch serves campsites on the eastern side of the Little River and connects to the western branch via an under- stream crossing of the Little River just north of the Elkmont Campground Bridge.

Visual observations of the campground sanitary sewer system were made by opening several manholes and indicated that the sewer pipe is most likely composed of cast iron material in adequate (usable, but showing signs of wear and maintenance needs) condition. All manholes observed were constructed of prefabricated concrete and appeared to be in good (usable, showing little sign of wear and require little or no maintenance) condition. During the collection system inspection, some water was observed moving through manholes even though the restrooms were closed for the winter. This indicates that the collection system may be experiencing inflow and infiltration, a condition where surface or ground water migrates into the system through leaks in pipes or manholes.

Elkmont Wastewater Treatment Plant

The District's wastewater treatment plant currently serves the Elkmont campground areas. The plant, constructed in the mid to late 1960s, is an extended aeration activated sludge wastewater treatment process and operates nine (9) months of each year. In accordance with campground operation, the plant is closed during the winter months (December to February). It has a design treatment capacity of 35,000 gallons per day (gpd). Based on historical operating records provided by the Park, average daily flows processed through the plant have been approximately 12,000 gpd during the past three (3) years. However, due to the seasonal nature of the campground that it serves, fluctuations in daily flows are common, with numerous maximum daily flows exceeding 30,000 gpd.

Wastewater enters the plant via a gravity sewer through a comminutor, a piece of mechanical equipment that grinds up larger material as it passes through a coarse screen. After screening, the wastewater flows by gravity into the extended aeration basin for treatment and then to final clarifiers where solids are settled out. Wastewater leaves the final clarifiers and flows through a Micro- Floc tube settler and mixed media tertiary filters. Disinfection of the treated wastewater is accomplished using sodium hypochlorite solution (liquid chlorine bleach). Dechlorination is achieved using sodium sulfide tablets. After dechlorination, treated wastewater is discharged into the Little River at river mile 49.7 via a gravity outfall sewer. The remaining sludge is removed to a sludge holding tank by air- lift pumps and is hauled to the Gatlinburg wastewater treatment plant for final treatment and disposal.

The Elkmont wastewater treatment plant contains a conventional extended aeration activated sludge biological process with tertiary filtration. This is a time- tested treatment process that typically performs very well under a variety of wastewater flow conditions. The extended aeration process has built- in buffering capacity allowing influent flows to be erratic during the course of a day. This allows the treatment plant to receive flows that vary both above and below the 35,000 gallon per day (gpd) design flow for the plant. This treatment flexibility is needed to accommodate the variable diurnal

flow characteristics that result from the campground and those that would result if new wastewater sources are generated in the future.

The hydraulic design capacity of the wastewater treatment plant, which is currently 35,000 gpd, is based on average day flows with the capability to adequately treat much higher daily flows for short periods of time. Since the wastewater treatment plant must react to the flows that are received on a variable basis day- to- day, the hydraulic design capacity is not a permit limit parameter. This allows the plant flow to vary considerably while maintaining adequate biological treatment to meet the Little River discharge parameters.

Monthly Operating Reports for the Elkmont wastewater treatment plant for the years 1998 through 2003 indicate that the average daily flow through the plant is 9,976 gpd. The average daily flow for the years 1998 through 2000 was 7,660 gpd and for the years 2001 through 2003 was 12,291 gpd. The reason for these average day flow variations cannot be determined. As a result, a conservative approach to dealing with wastewater changes would utilize the average flow for the more recent three (3) year period for base average flow conditions.

The Monthly Operating Reports also show several days where the plant flow exceeded 30,000 gpd. Many of these high flow days result from operational issues, such as the recirculation of decanted backwash water and flush valve problems in the campground restrooms. When considering these issues, the peak day flows for wastewater are approximately 30,000 gpd.

Overall, the plant is in good condition and suited for continued use. The plant has consistently operated well within the discharge parameters described in its permit. However, the plant operator has commented that some repair and/or upgrades may be necessary to the existing tertiary filters at the plant. These items may include regular maintenance issues, such as the replacement of the filter media, and/or some electrical/control upgrades to allow the operator improved performance of the filter equipment.

Appalachian Clubhouse and Adjoining Cabins

A gravity sewer system connects the Appalachian Clubhouse and an undetermined number of cabins in the Daisy Town and Society Hill areas to an inactive septic disposal system located in the vicinity of the Appalachian Clubhouse. Because this collection and disposal system was installed and maintained by residents of the cabins, historical information concerning the location and condition of this collection and disposal system is unavailable. However, discussions with a former cabin resident and Park personnel indicate that the gravity sewer collection system was installed in the Daisy Town and Society Hill cabin areas in the early 1980s. This system was constructed in front of the Society Hill cabins. Field observations of the sewer system indicate that it is in fair to good condition. The sewer system has line cleanouts located at cabin service connections. The specific condition of the sewer system cannot be determined without cleaning the sewer line and conducting a visual inspection with a sewer line camera. If the sewer line cannot be rehabilitated and reused, it would have to be replaced. It is not practical at this time to determine the location, capacity and condition of the existing septic disposal system at the Appalachian Clubhouse due to the extensive ground

excavation that would be necessary. For the purposes of this study, the Park has assumed that the existing sewer system would require replacement.

An older sewer system was identified that formerly served the Society Hill cabins. This system was constructed under and to the rear of the cabins in very close proximity to Jakes Creek. Visual evidence of this system can be found due to its very shallow depth. Due to the deteriorated physical condition of this existing system and its inability to comply with current regulations, its reuse is not recommended.

The cabins located on Millionaire's Row have indoor plumbing and are served by a community sewer line installed between the cabins. This line has been visually observed in several locations near some of the cabins. The condition of this sewer line is unknown. The final disposal of this wastewater is thought to be through use of a septic system, but this has not been confirmed. No visible signs of potential drain field locations were identified during the field investigation and delivery of this wastewater to other known septic system locations (specifically the Appalachian Clubhouse) via a conventional gravity system would not be practical.

Wonderland Hotel and Adjoining Cabins

Historical records indicate that the Wonderland Hotel and an undetermined number of adjoining cabins are connected to a septic disposal system by gravity sewers. Two (2) septic disposal systems are located along Elkmont Road on the western and southern sides of the Hotel. The specific condition and capacity of the septic systems is unknown and cannot be practically determined at this time due to the extensive ground excavation that would be necessary. Based on the information that is known abut the existing sewer system, the Park is assuming that complete replacement will be necessary to meet all project requirements for the alternatives that require use of the system.

Water Supply and Distribution

Existing Water Supply and Distribution Facilities

The Park operates a water supply and distribution system in the Elkmont Historic District. Currently, a water system consisting of a single well, three water storage tanks, and distribution pipelines serves the campground areas. There is an abandoned water supply system through the Daisy Town and Society Hill cabin areas. This water system consists of two (2) water storage tanks (one (1) wooden and one (1) steel), located above the Kuhlman cabin on the upper end of Society Hill, and a distribution system providing water to the Society Hill and Daisy Town cabins via a water line located adjacent to Jakes Creek and the older abandoned sewer line. Existing pipes indicate that the Wonderland Hotel and neighboring cabins, as well as the cabins in the Millionaire's Row area, were at one time connected to a water distribution system. However, the specifics of those systems are not practical to determine at this time due to the excessive excavation that would be required. Due to the age and deteriorated condition of the portion of the system examined, it is unlikely that any of it could be reused.

Elkmont Water Supply

Currently, the water supply for the Elkmont area is provided by a single well located up Jakes Creek Road, beyond the Society Hill cabins. This well supplies water to the Elkmont campground, four apartments and one residence house. A 5- horsepower

pump delivers well water to three holding tanks located above Jakes Creek Cemetery. The tanks consist of two 27,800- gallon fiberglass tanks and one 45,000- gallon concrete tank, for a total storage capacity of 100,600 gallons. The pump is capable of delivering 60 gallons per minute to the holding tanks. During peak season, approximately 22,240 gallons of water per day is delivered to the campground, apartments and residence house, requiring slightly more than six (6) hours of pumping time.

Elkmont Campground Distribution System

Water is gravity- fed to the campground and residences from the storage tanks via an underground piping system. The piping system consists of a 6- inch diameter water pipe that crosses underneath the Little River and is buried 2 feet below the streambed. An inspection, conducted by the TDEC in 2001, found that the inside of the concrete water storage tank at Jakes Creek Cemetery was deteriorating. Consequently, the inside of the water tank was refinished in May 2002. Other deficiencies noted in the inspection included a major leak of unknown origin and the need for a backflow prevention valve in the equine water trough near the well location. Each of these deficiencies has been addressed. The concrete tank interior and fiberglass tanks were added. These are the only major improvements made to the system since 1993.

Appalachian Clubhouse and Adjoining Cabins

Cabins in the Society Hill, Daisy Town, and Millionaire's Row areas are on a separate water supply and distribution system from the campground system. This system, which has been abandoned since the cabins were vacated, consists of a small dam across Tulip Creek and a steel water storage tank, located at the upper end of the Society Hill area. A water distribution line runs beneath the Society Hill and Daisy Town cabins and to the Appalachian Clubhouse. Since the cabins in the Millionaire's Row area also contained plumbing fixtures and no other visible source of water has been observed, this system may also have served the cabins in the Millionaire's Row area. The actual locations of these water lines cannot be determined without additional historical information or significant subsurface excavation. The current condition of this entire system is questionable, and further evaluation of the system would require significant excavation of the pipelines for visual inspection. Based on the condition of portions of the system that were visible, it was determined that re- use of the existing lines would not feasible.

Wonderland Hotel and Adjoining Cabins

Physical evidence exists that the Wonderland Hotel, Annex, and neighboring cabins were served with running water. This evidence includes the existence of small- diameter PVC water supply lines under the hotel servant's quarters building and at some cabins, and the existence of modern plumbing fixtures in some of the cabins. Determining the details of those services would require historical information or significant subsurface excavation. As with the service to the Appalachian Clubhouse, the current condition of that entire system is questionable and unlikely to be suitable for continued use.