CHAPTER 3
Affected Environment

3.1 Introduction

Chapter 3 describes the relevant resources of the areas that could be affected by the alternatives if they were implemented. In conjunction with the description of the No-Action Alternative in Chapter 2 and with the predicted effects of the No-Action Alternative in Chapter 4, this chapter establishes the scientific baselines against which the decisionmaker and the public can compare the effects of all alternatives.

3.2 Meteorology and Air Quality

3.2.1 Windfarm Site Meteorology

Buffalo Mountain Area
The wind energy industry uses numerical ranks from 1 to 7 to classify areas according to their potential wind resource. According to the *Wind Energy Resource Atlas of the United States* (Elliott et al. 1986), the Buffalo Mountain area is ranked in wind power class 3, indicative of fair wind resource potential. Class 3 sites typically have mean wind speeds of 14.3 to 15.7 mph (6.4 to 7.0 meters/second (m/s)) at 164 feet (50 m) above ground.

TVA monitored wind conditions at Windrock Mountain, about a mile south of the Buffalo Mountain Windfarm, for 3 years during the mid-1980s and again during the mid-1990s. Wind conditions have also been monitored at the Buffalo Mountain Windfarm since May, 2000. Average monthly wind speeds at a height of 164 feet (50 m) varied from a low of 9.8 mph (4.4 m/s) in August 2001 to a high of 17.4 mph (7.8 m/s) in February 2001. The predominant winds, in terms of both time and energy, are from the southwest and south-southwest. Based on the results of this monitoring, TVA classifies the wind resource on Buffalo Mountain as high class 3 or low class 4. Class 4 sites typically have mean wind speeds of 15.7 to 16.8 mph (7.0 to 7.5 m/s).

Stone Mountain Area
According to the *Wind Energy Resource Atlas of the United States* (Elliott et al. 1986), the Stone Mountain area is ranked in wind power class 4, indicative of good wind resource potential.

TVA monitored wind conditions on Stone Mountain, at the site of the proposed windfarm, for 3 years during the mid-1980s. Wind conditions have also been monitored at the same site since April 2001. For the period of April through July, average monthly wind speeds at a height of 164 feet (50 m) varied from a low of 13.9 mph (6.2 m/s) in June to a high of 17.2 mph (7.7 m/s) for April. The predominant winds have been from the west, and, to a lesser degree, from the west-northwest, northwest, and south-southeast. Based on the results of this monitoring, TVA estimates that the average wind speed at 214 feet (65 m) above ground level is in the range from 15.0 to 17.2 mph (6.72 to 7.67 m/s), and classifies the mountain as a high class 4 site.

3.2.2 Air Pollutants and Ambient Standards

Air quality in any given region is measured by the concentration of various pollutants in the atmosphere, typically expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is determined by the types and quantities of atmospheric pollutants, surface topography, size of the air basin, and prevailing meteorological conditions.

The EPA has established both primary and secondary National Ambient Air Quality Standards (NAAQS) for certain pollutants under the provisions of the Clean Air Act (CAA). Primary standards define levels of air quality necessary to protect public health with an adequate margin of safety. Secondary standards define levels of air quality necessary to protect the public welfare (i.e., soils, vegetation, and wildlife) from any known or anticipated adverse effects from a criteria air pollutant. The CAA also sets emission limits for certain air pollutants emitted from new or modified major sources based on best demonstrated technologies, and establishes national emissions standards for hazardous air pollutants.

NAAQS are currently established for six air pollutants (known as "criteria air pollutants") including carbon monoxide (CO), nitrogen dioxide, (NO_2), ozone (O_3), sulfur dioxide (SO_2), lead (Pb), and particulate matter equal to or less than 10 microns in aerodynamic diameter (PM_{10}). There are many suspended particles in the atmosphere with aerodynamic diameters larger than 10 microns, collectively referred to as total suspended particulate (TSP).

Although O_3 is considered a criteria air pollutant and is measurable in the atmosphere, it is not often considered as an air pollutant when calculating emissions because O_3 is typically not emitted directly from most emission sources. O_3 is formed in the atmosphere from its precursors, NO_x and volatile organic compounds (VOCs), which are directly emitted from various emission sources. For this reason, NO_x and VOCs are commonly reported in an air emissions inventory instead of O_3.

The CAA requires each state to adopt regulatory requirements necessary to attain the NAAQS. The CAA also allows states to adopt air quality standards that are more stringent than the federal standards. The State of Tennessee has adopted the NAAQS as the Tennessee standards as listed in Table 3-1 (EPA, 2000a). The ozone 8-hour standard and the $PM_{2.5}$ standards are included for information only. The U.S. Supreme Court has remanded these standards to the lower court for further review and analysis. The dispute over the validity of the ozone 8-hour standard and the $PM_{2.5}$ standards may not be resolved for a year or more.

3.2.3 Regional Air Quality

The EPA classifies the air quality within an air quality control region (AQCR) according to whether or not the concentrations of criteria air pollutants in the atmosphere exceed primary or secondary NAAQS. All areas within each AQCR are assigned a designation of either attainment or non-attainment for each criteria air pollutant. An attainment designation indicates that air quality within specific areas of an AQCR is as good as, or better than, NAAQS for individual criteria air pollutants or that the air quality is "unclassified." Unclassified indicates that air quality within an area cannot be classified and is therefore treated as attainment. Non-attainment indicates that the concentration of an individual criteria air pollutant at a specific location exceeds primary or secondary NAAQS. Additionally, an AQCR may include locations such as National Parks and Wilderness Areas, which are designated as Class I Areas. Such areas receive special protection under the Clean Air Act because of the importance of their good air quality.

Table 3-1. United States and Tennessee Ambient Air Quality Standards.

Criteria Pollutant	Averaging Time	Primary NAAQS[a,b,c]	Secondary NAAQS[a,b,d]	Tennessee Standards[a,b]
Carbon Monoxide	8-hour	9 ppm (10,000µg /m^3)	No Standard	9 ppm (10,000µg /m^3)
	1-hour	35 ppm (40,000µg /m^3)	No Standard	35 ppm (40,000µg /m^3)
Lead	Quarterly	1.5 µg /m^3	1.5 µg /m^3	1.5 µg /m^3
Nitrogen Oxides (measured as NO_2)	Annual	0.0543 ppm (100 µg /m^3)	0.0543 ppm (100 µg /m^3)	0.0543 ppm (100 µg /m^3)
Ozone	8-hour	0.08 ppm (157 mg/m^3)	0.08 ppm (157 µg /m^3)	0.08 ppm (157 µg /m^3)
	1-hour	0.12 ppm (235 µg /m^3)	0.12 ppm (235 µg /m^3)	0.12 ppm (235 µg /m^3)
Particulate Matter (measured as PM_{10})	Annual	50 µg /m^3	50 µg /m^3	50 µg /m^3
	24-hour	150 µg /m^3	150 µg /m^3	150 µg /m^3
Particulate Matter (measured as $PM_{2.5}$)	Annual	15 µg /m^3	15 µg /m^3	15 µg /m^3
	24-hour	66 µg /m^3	66 µg /m^3	66 µg /m^3
Sulfur Oxides (measured as SO_2)	Annual	0.03 ppm (80 µg /m^3)	No Standard	0.03 ppm (80 µg /m^3)
	24-hour	0.14 ppm (365 µg /m^3)	No Standard	0.14 ppm (365 µg /m^3)
	3-hour	No Standard	0.50 ppm (1,300 µg /m^3)	No Standard

[a]*National and state standards, other than those based on an annual or quarterly arithmetic mean, are not to be exceeded more than once per year. The ozone standard is attained when the expected number of days per calendar year, with maximum hourly average concentrations above the standard, is less than or equal to one.*

[b]*The NAAQS and Tennessee standards are based on standard temperature and pressure of 25ºC and 760 mm or mercury.*

[c]*National Primary Standards: The levels of air quality necessary to protect public health with an adequate margin of safety. Each state must attain primary standards no later than three years after the state implementation plan is approved by the EPA.*

[d]*National Secondary Standards: The levels of air quality necessary to protect public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain secondary standards within a "reasonable time" after the state implementation plan is approved by the EPA.*

Buffalo Mountain Area

The Buffalo Mountain area is located in Anderson County within the Eastern Tennessee-Southwestern Virginia Interstate AQCR. The EPA has designated air quality within Anderson County as better than NAAQS for SO_2 and TSP and unclassified for CO, NO_2, O_3 (EPA, 2000b). For lead, the entire state of Tennessee is not designated. There are no non-attainment areas in the vicinity of Anderson County. The nearest Class I Area is the Great Smoky Mountains National Park, about 40 miles to the southeast.

The most recent summary of the Air Quality Index for Anderson County shows that, for the year 2000, air quality was considered good on 66 percent of the days and moderate on 34 percent of the days (EPA, 2001a). A good rating indicates that the concentrations of the criteria pollutants on a given day were no more than half the NAAQS concentration. A moderate rating means that the criteria pollutant concentrations were higher than one-half of the NAAQS levels but less than the NAAQS levels. These designations are focused on the health risks of brief exposure to the criteria pollutants.

Stone Mountain Area
The Stone Mountain area in Johnson County is also in the Eastern Tennessee-Southwestern Virginia Interstate AQCR. The EPA has designated air quality within Johnson County as better than NAAQS for SO_2 and TSP and unclassified for CO, NO_2, O_3 (EPA, 2000b). There are no non-attainment areas in the vicinity of Johnson County. The nearest Class I Area is the Linville Gorge Wilderness, about 33 miles south-southwest of Stone Mountain.

Since Johnson County is predominantly rural, it has no air quality monitoring station. However, Sullivan County which is adjacent to and west of Johnson County has a monitoring station with data from the year 2000 revealing that air quality was good 66 percent of the time, moderate 32 percent of the time, and unhealthy 1 percent of the time (EPA, 2001a). The unhealthy rating means that one of more criteria pollutants on a given day exceeded the NAAQS levels.

3.2.4 Baseline Air Emissions

An air emissions inventory is an estimate of total mass emissions of pollutants generated from a source, or sources, over a period of time (typically, one year). Accurate air emissions inventories are needed for estimating the relationship between emissions sources and air quality. Quantities of air pollutants are generally measured in pounds (lb) per year or tons per year (tpy). All emission sources may be categorized as either mobile or stationary emission sources. Stationary emission sources may include boilers, generators, fueling operations, aerospace ground equipment, industrial processes, and burning activities, among others.

Buffalo Mountain Area
Table 3-2 lists Anderson County air emissions for the calendar year 1999 (EPA, 2001b). All the data except for lead emissions are an extract of EPA's National Emission Trends and are based on emission data obtained from State and local agencies. The data for lead is from EPA's National Toxics Inventory which is based on several sources of data (EPA, 2001c). The most recent data for lead is from calendar year 1996. This inventory is an estimate of emissions within the county and includes all permitted stationary emissions, as well as area and mobile emissions. Lead emissions are generally associated with boilers and other sources that burn coal and fuel oil. Since large boilers have controls to reduce emissions, lead emissions tend to be minute. However, they are reported in the inventory.

Stone Mountain Area
Table 3-2 lists Johnson County air emissions for the calendar year 1999 (EPA, 2001b). All the data except for lead emissions are an extract of EPA's National Emission Trends and are based on emission data obtained from State and local agencies. The data for lead is from EPA's National Toxics Inventory which is based on several sources of data (EPA, 2001c). The most recent data for lead is from calendar year 1996. This inventory is an estimate of emissions within the county and includes all permitted stationary emissions, as well as area and mobile emissions. Since there are no large boilers in Johnson County, there are practically no lead emissions.

Table 3-2 Baseline air emissions during 1999 in Anderson and Johnson Counties, Tennessee. All emissions are given in tons per year.

	Tons of Emissions	
Criteria Air Pollutant	Anderson County	Johnson County
CO	29,392	6,029
VOCs[a]	5,004	1,275
NOx	19,755	948
SO2	52,106	245
PM10	4,097	1,056
PM2.5[b]	1,580	457
Pb	0.849	0.0065

[a]*VOCs are not a criteria air pollutant. However, VOCs are reported because as an ozone precursor they are a controlled pollutant.*

[b]*$PM_{2.5}$ emissions are currently not regulated.*

3.3 Socioeconomic Resources

The Buffalo Mountain site is located in the northwestern corner of Anderson County, Tennessee, north of Oliver Springs and near Campbell, Scott, Morgan, and Roane Counties. Two of the potential sites for the Regenesys™ facility are located just outside Anderson County, sub-alternative 2 in Morgan County and sub-alternative 3 in Roane County. The Stone Mountain site is located in the southern part of Johnson County, Tennessee, near Watauga County, North Carolina, and Carter County, Tennessee. All of the potential sites for the Regenesys™ facility are also located in Johnson County. Two metropolitan counties, Sullivan and Washington Counties, Tennessee, are also near this site.

3.3.1 Population

Buffalo Mountain Area

According to the 2000 Census of Population, the population of Anderson County is 71,330, an increase of 4.5 percent over the 1990 population of 68,250. This rate was faster than the growth rate of 1.3 percent from 1980 to 1990, but was well below the rate of increase from 1990 to 2000 for the state (16.7 percent) and the nation (13.2 percent). In 2000, 34.5 percent (24,610 persons) of the population of the county resided in the city of Oak Ridge, which experienced an increase in population of less than 0.3 percent from 1990 to 2000. (The total population of Oak Ridge is 27,387, of which 2,777 are in Roane County). The population of Morgan County, according to the 2000 Census, is 19,757, an increase of 14.2 percent over the 1990 population of 17,300. Roane County had an increase of 9.9 percent, from 47,227 in 1990 to 51,910 in 2000.

Stone Mountain Area

According to the 2000 Census of Population, the population of Johnson County is 17,499, an increase of 27.1 percent over the 1990 population of 13,766. This rate was much faster than the growth rate of only 0.2 percent from 1980 to 1990, and was well above the rate of increase from 1990 to 2000 for the state (16.7 percent) and the nation (13.2 percent). In 2000, only 13.6 percent (2,383 persons) of the population

of the county resided in Mountain City, the only town or city in Johnson County. The population of Mountain City increased almost 9.9 percent from 1990 to 2000.

3.3.2 Housing

Buffalo Mountain Area
As of the 2000 Census of Population, there are a total of 32,451 housing units in Anderson County, of which 2,671 (8.2%) are vacant. About half of the vacant units are in Oak Ridge, with the remainder scattered throughout the county. Nearby counties have higher vacancy rates than does Anderson. In Campbell County, 13.0 percent of housing units (2,402) are vacant; however, 1,024 of these are for seasonal or occasional use, with only 732 for sale or for rent. Roane County has 2,169 vacant units (9.3 percent). Scott County is not considered because most of its population is in areas that are relatively inaccessible from the proposed site. Morgan County has 724 vacant units, a rate of 9.4 percent. All of these rates are about the same or higher than the state rate of 8.5 percent.

Stone Mountain Area
According to the 2000 Census, Johnson County has a total of 1,052 vacant housing units, 13.4 percent of the total number of units. Watauga County has a very high vacancy rate, 28.6 percent or 6,615 units; however, most of these are seasonal or occasional use homes (5,098), with only 681 that are for sale or for rent. The bulk of the available housing in this area is located in Sullivan and Washington Counties. Sullivan has 5,496 vacant housing units, while Washington has 3,584. About 56 percent of these are available for rent or for sale.

3.3.3 Economy

Buffalo Mountain Area
The civilian labor force in Anderson County in 2000 averaged 35,460 persons, with an unemployment rate of 3.6 percent. This unemployment rate was somewhat lower than the statewide rate of 3.9 percent and the national rate of 4.0 percent. Unemployment rates were higher in surrounding counties, with Campbell the highest at 6.3 percent, followed by Morgan at 5.7 and Roane at 4.3 percent. The Anderson County rate was the same as in 1999 while the state rate was slightly lower than the 1999 rate of 4.0 percent. Services is the biggest source of jobs in Anderson County, providing 15,994 jobs, 33.2 percent of the total, in 1999. Manufacturing was next, with 11,942 jobs, 24.8 percent. Wholesale and retail trade provided 7,923 jobs, 16.5 percent, and government 5,094 jobs, 10.6 percent. In Morgan County, government is the biggest source of jobs, providing 1,620 jobs in 1999, 27.4 percent of the total; manufacturing was second, with 1,330 jobs, 22.5 percent of the total, and services was third with 921 jobs, 15.6 percent. In contrast, services provided the most jobs in Roane County with 9,254 jobs, 36.8 percent of the total, while government provided 4,255 jobs, 16.9 percent, and wholesale and retail trade provided 4,126 jobs, 16.4 percent. Per capita personal income in Anderson County in 1999 was $25,181, slightly lower than the state average of $25,548. Manufacturing was the largest contributor to total earnings in Anderson County, with almost 35 percent of the earnings, while services was a close second, with almost 33 percent. Per capita personal income was lower in both Morgan County ($15,153) and Roane County ($21,728) than in Anderson County. In Morgan County, government was the largest contributor to earnings, with almost 34 percent of total earnings, while manufacturing contributed over 29 percent. In Roane County, services contributed over 48 percent, followed by government with almost 17 percent and transportation and public utilities with almost 14 percent.

Stone Mountain Area
The civilian labor force in Johnson County in 2000 averaged 6,540 persons, with an unemployment rate of 7.6 percent. This unemployment rate was much higher than the statewide rate of 3.9 percent and the

national rate of 4.0 percent. Unemployment rates were much lower in surrounding counties, with Watauga the lowest at 1.5 percent, followed by Sullivan at 3.5 and Washington 3.8 percent. The Johnson County rate was down from 9.6 percent in 1999 while the state rate was slightly lower than the 1999 rate of 4.0 percent. Manufacturing is the biggest source of jobs in Johnson County, providing 1,299 jobs, 19.4 percent of the total, in 1999. Wholesale and retail trade provided 1,232 jobs, 18.4 percent, and services 1,109 jobs, 16.6 percent. Per capita personal income in the county in 1999 was $14,666, much lower than the state average of $25,548. Manufacturing was the largest contributor to total earnings in the county, with almost 28 percent of the earnings; other major contributors to earnings were wholesale and retail trade (over 16 percent), government (almost 16 percent), and services (over 15 percent).

3.4 Groundwater & Geological Resources

Buffalo Mountain Area

The proposed facilities lie within both the Cumberland Plateau and the Valley and Ridge physiographic provinces. The Valley and Ridge is characterized by relatively narrow, subparallel ridges and valleys which generally trend northeast. Surface forms of the Cumberland Plateau consist of deep valleys cut into the flat-lying sandstone and shale that underlie the area (DeBuchanne and Richardson, 1956).

Shallow bedrock in the site region ranges in age from Silurian to Lower Cambrian (Figure 3-1). Note that the portion of the map occupied by Pennsylvanian Age rocks (i.e., those with geologic formation abbreviations beginning with "P") lies in the Cumberland Plateau province, whereas the remaining area falls within the Valley and Ridge province. Aquifers currently used in the site locality include (in descending stratigraphic order) the Crooked Fork, Crab Orchard Mountains, and Gizzard Groups (Lower Pennsylvanian Age); the Rome Formation (Lower to Middle Cambrian); and the Conasauga Group (Lower Cambrian).

The Pennsylvanian aquifers generally consist of sandstone, shale, conglomerate, and siltstone with thin interbedded coal seams (Swingle et al., 1966a). Groundwater primarily occurs in rock fractures and bedding planes since these rocks have very limited primary porosity. Aquifers within the Pennsylvanian rocks typically provide small quantities of water to domestic wells and springs in the region. Existing wells in these aquifers are generally less than 100 feet in depth (TDEC, 2001). Groundwater is frequently high in iron and may contain objectionable levels of sulfate.

The Rome Formation is composed of interbedded shale, sandstone, siltstone, and occasionally dolomite. Regional thickness is estimated to be about 2000 feet (Swingle et al., 1966a). Within the site area, siltstone and shale form the bulk of the formation (McMaster, 1963). Groundwater primarily occurs in rock fractures as none of the rock members have significant primary porosity. The Rome Formation is the source of water for several domestic wells and springs in the region (DeBuchanne and Richardson, 1956).

The Conasauga Group consists primarily of calcareous shale interlayered with limestone and siltstone (McMaster, 1963). Regionally, the total thickness of the Conasauga approaches 2000 feet. The formations of the Conasauga Group characteristically underlie valleys between adjacent ridges formed by more resistant shales and dolomites associated with other geologic units. Groundwater occurs in rock fractures some of which are enlarged by dissolution of calcareous minerals present in the rock matrix. The Conasauga is the source of water for several wells in the site vicinity.

The unconsolidated regolith, which mantles bedrock in most areas, consists of alluvial and residual soils. Shallow alluvium occupies stream valleys in the region, and generally consists of lenticular deposits of

sand, clay, and gravel. Because of their limited areal extent and thickness, the alluvial deposits are not used as a source of water supply in the site vicinity. Residual soils are predominantly composed of clay with occasional weathered rock fragments. There are no known wells completed in the residuum in the site area owing to its relatively low permeability. Although the alluvium and residuum are not considered aquifers locally, the relatively large primary porosity of these materials enables storage of infiltrating precipitation that is subsequently transmitted to fractures in the underlying bedrock. The regolith essentially serves as a reservoir of water for the bedrock aquifers, allowing for more sustainable production from these aquifers than would otherwise be possible.

Stone Mountain Area

The proposed facilities lie within the Blue Ridge physiographic province. Shallow bedrock of the area shown on Figure 3-2 includes (in descending stratigraphic order) the Rome Formation of Lower to Middle Cambrian Age; the Shady Dolomite of Lower Cambrian Age; the Basal Clastics Group (BCG) composed of the Erwin, Hampton, and Unicoi Formations, all of Lower Cambrian Age; and undifferentiated Precambrian clastic rocks. These formations have been intensively folded and faulted such that they characteristically outcrop in narrow northeast-trending bands. Among these rock units the aquifers currently used in the site locality include the Rome Formation, Shady Dolomite, and the Basal Clastics Group.

The Rome Formation consists predominantly of shale with thin interbedded siltstone, sandstone, and dolomite having a maximum aggregate thickness of about 1500 feet (Swingle et al., 1966b). Groundwater primarily occurs in rock fractures as none of the rock members have significant primary porosity. Fractures within dolomite layers may be enlarged by dissolution of calcareous minerals present in the rock matrix. The Rome Formation is the source of water for domestic wells in the region and for a public spring operated by Mountain City (DeBuchanne and Richardson, 1956).

The Shady Dolomite largely consists of thick-bedded dolomite with occasional thin limestone and shale layers. Total thickness is on the order of 1150 feet (King et al., 1944). Groundwater in this unit occurs in rock fractures many of which are enlarged by carbonate dissolution. The Shady Dolomite provides water for public and domestic wells in the region.

Rocks of the Basal Clastics Group (BCG) typically form the higher mountainous areas and consist of quartzite, arkose, conglomerate, and shale (King et al., 1944). Total thickness of the BCG exceeds 7000 feet (Swingle et al., 1966b). Because the BCG is generally restricted to mountainous areas, groundwater use is limited mainly to small domestic well supplies.

The unconsolidated regolith, which mantles bedrock in most areas, consists of alluvial and residual soils. Shallow alluvium occupies stream valleys in the region, and generally consists of lenticular deposits of sand, clay, and gravel. Because of their limited areal extent and thickness, the alluvial deposits are not used as a source of water supply in the site vicinity. Residual soils ranging up to 100 feet in thickness are predominantly composed of clay with occasional embedded sand lenses, weathered rock fragments, gravel, and boulders (King et al., 1944). There are no known wells completed in the residuum in the site area owing to its relatively low permeability. Although the alluvium and residuum are not considered

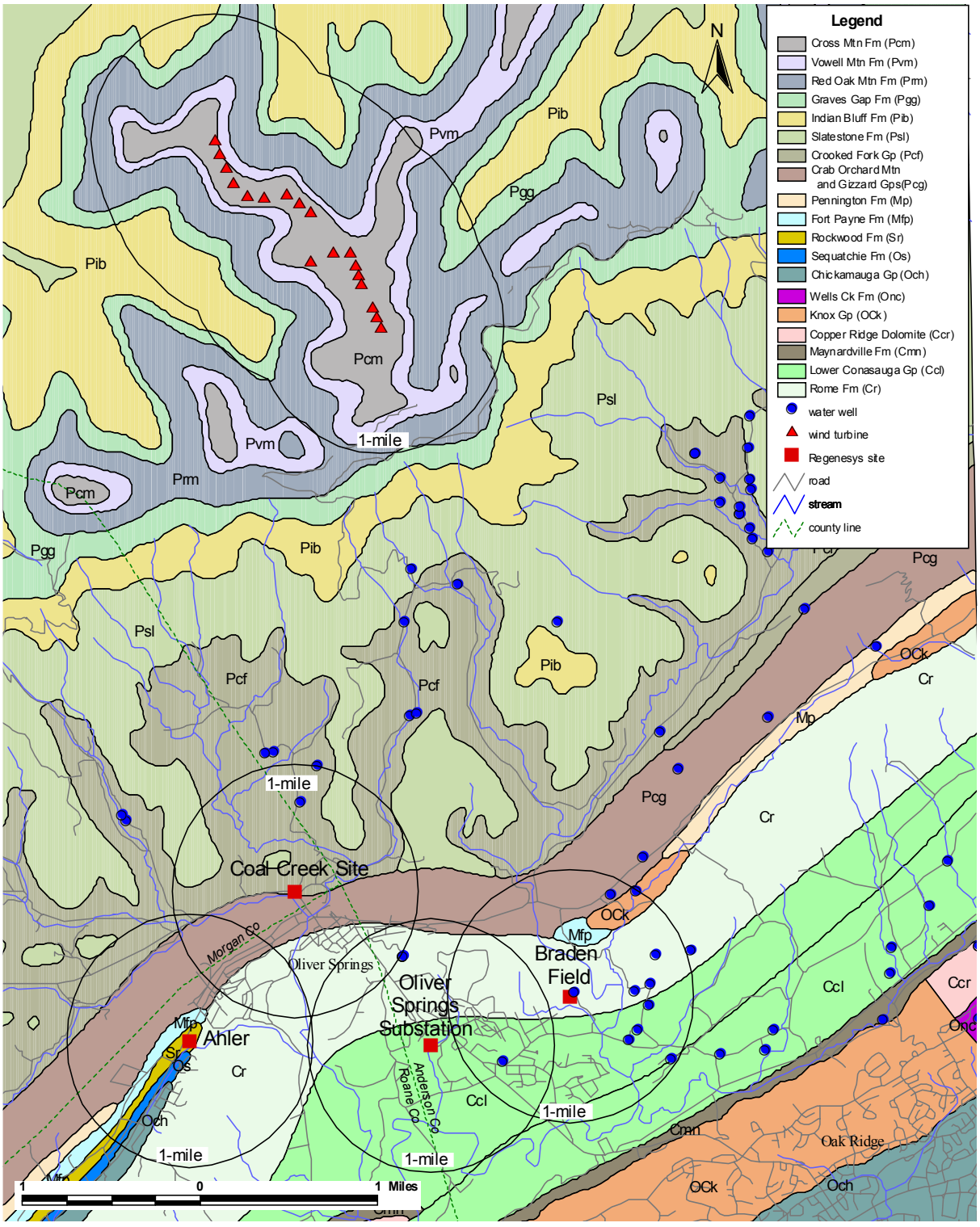

Figure 3-1. Buffalo Mountain Site Map Showing local geology and water wells

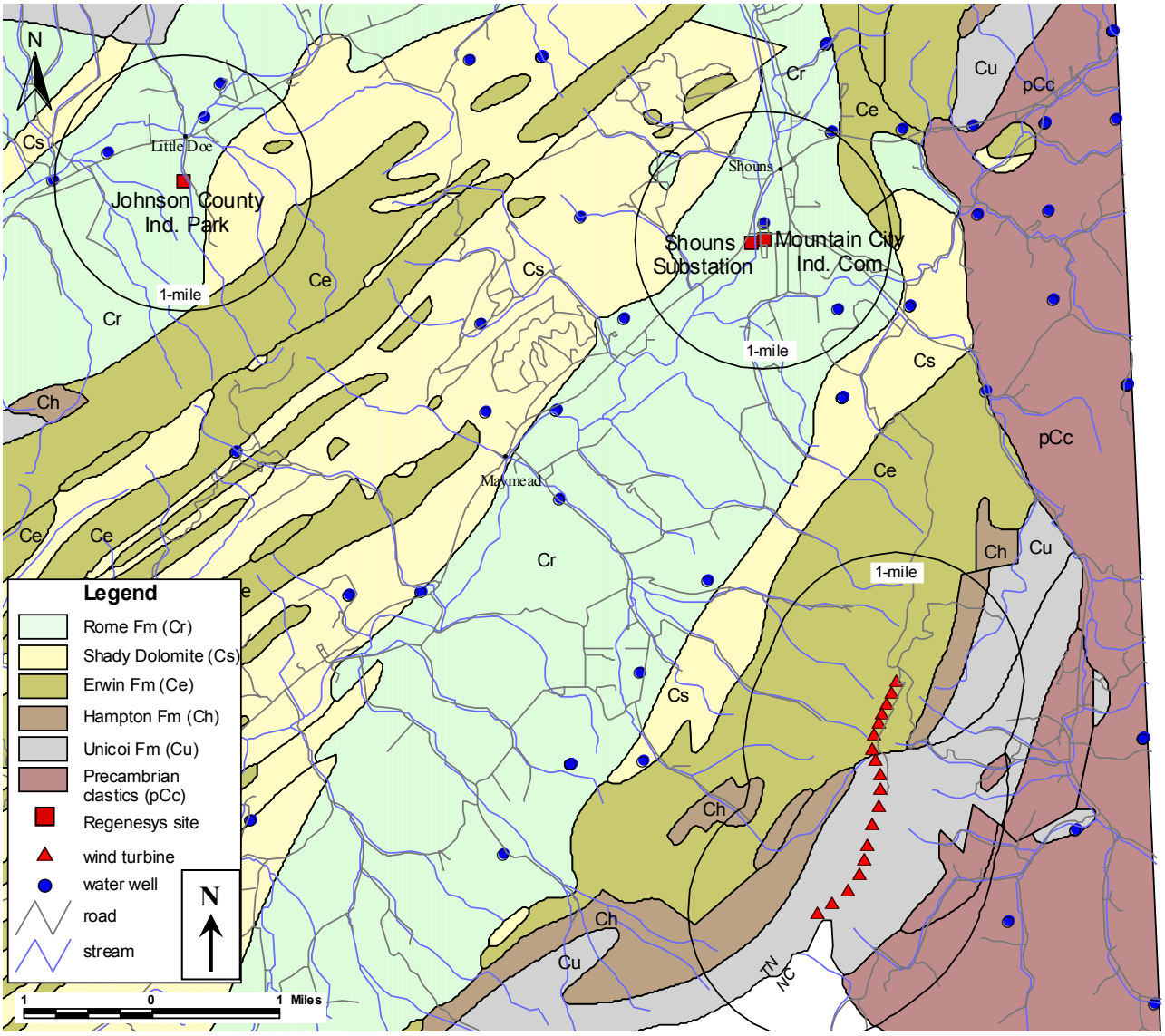

Figure 3-2. Stone Mountain Site Map Showing local geology and water wells

aquifers locally, the relatively large primary porosity of these materials enables storage of infiltrating precipitation that is subsequently transmitted to fractures in the underlying bedrock. The regolith essentially serves as a reservoir of water for the bedrock aquifers, allowing for more sustainable production from these aquifers than would otherwise be possible.

3.5 Wetlands

Buffalo Mountain Area

Buffalo Mountain Windfarm
No wetlands meeting the jurisdictional requirements of Section 404 of the Clean Water Act are found at the proposed windfarm expansion site on Buffalo Mountain in Anderson County, Tennessee. Soils are typically shallow, and well to excessively drained. Existing settling ponds and diversion ditches along the access route to the proposed site are functioning as wetlands in a limited capacity, but none are found within the proposed site. These areas are primarily emergent, herbaceous wetlands that have formed in several small areas of standing water in depressions resulting from mining activities. The primary function of these small wetlands is amphibian habitat, especially during the late winter/early spring breeding season.

Palustrine emergent wetlands were observed at two locations along the existing transmission line right-of-way leading from Buffalo Mountain. An emergent wetland approximately 1/3 acre in size is developing in a seepage area near the intersection of KhoTan Hollow and Little Cow Creek. Soils in that area of are mapped as a Sewanee-Ealy complex, neither of which are considered hydric (although Ealy may include small areas that are poorly drained). Both soils are subject to flooding and have some limitations to their use due to a high water table. The area surrounding this seep is currently used as pasture.

Approximately 0.8 mile south of the KhoTan Hollow and Little Cow Creek intersection, the slope gradient is reduced and the stream bottom widens for 1/4 mile. In this area, a few isolated pockets of emergent wetland are located along Little Cow Creek. Newark is the dominate soil in this section and is considered hydric. It is saturated to within one foot of the surface during the winter and early spring and may flood after rains for a few days duration. Past mining activities have move soil materials around sufficiently to produce slightly elevated (and better drained) areas within this section.

Braden Field Regenesys™ Site
The Braden Field Regenesys™ site is located on a broad floodplain of Poplar Creek. The site is currently used as pasture and includes a few areas which are noticeably wet. However, a field survey verified that no jurisdictional wetlands are found at the proposed Regenesys™ site, nor along the routes of the access road or utility connections.

Coal Creek Regenesys™ Site
The majority of the Coal Creek Regenesys™ site is located on property that Coal Creek Mining and Manufacturing has graded and leveled in the past. Soils adjacent to the graded area are shallow and somewhat excessively drained due in part to the numerous fragments of shale and siltstone. Slopes outside of the graded area range from 20 to 35 percent. A field survey indicates no jurisdictional wetlands occur at the proposed site, or along the routes of the access road or utility connections.

Ahler Regenesys™ Site
The Ahler Regenesys™ site is located on a low stream terrace adjacent to a tributary of Indian Creek. This property has been in agricultural production for some time and is currently used as pasture. The dominate soils have formed in loamy sediments transported from the surrounding hills and mountains.

They are well-drained soils whose flooding frequency ranges from none to rare and are not classified as hydric. Although National Wetland Inventory (NWI) maps do not indicate the presence of jurisdictional wetlands within the proposed site, a field survey did document the existence of a spring-fed wetland on the eastern end of the site. Although wetland vegetation is somewhat obscured by current agricultural practices, wetland hydrology and hydric soil conditions do occur in this area. Flow from the spring is connected to the Indian Creek tributary by way of a diversion ditch adjacent to the railroad.

Oliver Springs Substation Regenesys™ Site
The Oliver Springs Regenesys™ site, including the proposed link to Patterson Road, is predominately gently rolling uplands with a southern exposure. The dominate soils are well-drained, moderately deep, and contain varying amounts of shale fragments throughout. A drainageway dissects the site, beginning north of McGhee Road, entering the site by way of a culvert under the railroad bed. The drainage ultimately extends south, flowing into Poplar Creek. Surface drainage is seasonal, but soil characteristics indicate that subsurface flow occurs frequently. Within a portion of the drainageway, an emergent, herbaceous wetland has formed (PEM1A). This wetland (less than one-fifth of an acre) is concentrated on the north side of the property.

A field survey along the proposed utility connection, indicates a small emergent wetland (<1/4 acre) is located adjacent to the Rite Aid Pharmacy along Highway 61/62 in Oliver Springs. Runoff from two converging drainageways that lead from the surrounding pastures dominate the hydrology at the site. Excess moisture leaving the site enters the culvert system under Highway 61/62.

Stone Mountain Area

Stone Mountain Windfarm
Neither jurisdictional wetlands nor non-jurisdictional wetlands occur along the narrow crest of Stone Mountain. This is due primarily to the shallow and rocky nature of the soils which occupy the crest and surrounding sideslopes. Most soils on Stone Mountain are excessively drained.

Johnson County Industrial Park Regenesys™ Site
The Johnson County Industrial Park site is approximately 10 acres of cleared and graded property. Soils at the site were formed in medium to coarse-textured deposits from quartzite, shale, siltstone, conglomerate and sandstone materials that have been transported, over time, from the surrounding uplands. The soils are all well-drained. NWI maps do not indicate the presence of wetlands in or near the proposed Regenesys™ site, nor in the vicinity of the proposed access road or utility connections.

Shouns Substation Regenesys™ Site
Shouns substation and the proposed Regenesys™ facility site are situated primarily on a low stream terrace of Town Creek. Sequatchie cobbly loam occupies the higher portions of the site and is well-drained, while Hamblen loam is moderately well-drained and is found in lower bottom locations which may experience infrequent flooding. Neither soil is classified as hydric. NWI maps do not indicate the presence of jurisdictional wetlands within the proposed facility site.

Mountain City Industrial Complex Regenesys™ Site
The Mountain City Industrial Complex is located on low terrace and bottomland positions that are similar to the Shouns substation site. The Johnson County Soil Survey indicates that a limited area along the main drainage from the complex is classified as Prader silt loam and is more poorly drained that the other dominate soils within the area. Artificial drainage enhances its utility, but this soil is limited to seasonal crop production. None of the soils within the drainage area are classified as hydric and NWI maps do not indicate the presence of jurisdictional wetlands.

3.6 Floodplains

Buffalo Mountain Area

Buffalo Mountain Windfarm
The Buffalo Mountain windfarm is located on a mountaintop, and no floodplains occur in the vicinity.

Braden Field Regenesys™ Site
The Braden Airport site is located on the west side of the Oak Ridge Airpark within the 100-year floodplain of Poplar Creek at about Poplar Creek mile 20.8 in Anderson County, Tennessee. The 100-year floodplain for Poplar Creek at mile 20.8 would be the area below elevation 790.0. The 500-year (or Critical Action) flood elevation for Poplar Creek at mile 20.8 would be elevation 792.5 feet.

Coal Creek Regenesys™ Site
The Coal Creek site is located north of Highways 62 opposite Middle Creek mile 0.4 in Morgan County, Tennessee. The site is located outside of the 100-year floodplain.

Ahler Property Regenesys™ Site
The Ahler Property site is located east of a small unnamed tributary to Indian Creek in Roane County, Tennessee. A portion of the site may be located within the approximate 100-year floodplain of the creek. There are no computed flood elevations at this location.

Oliver Springs Substation Regenesys™ Site
The Oliver Springs Substation site is located south of the L&N Railroad and west of an unnamed tributary to Poplar Creek in Oliver Springs, Tennessee. The site is located outside of the 100-year floodplain.

Stone Mountain Area

Stone Mountain Windfarm
The proposed windfarm site is located on a mountaintop, and no floodplains occur in the vicinity.

Johnson County Industrial Park Regenesys™ Site
The Johnson County Industrial Park site is located south of Highway 67 between two small tributaries to Doe Creek in Johnson County, Tennessee. The site is located outside of the 100-year floodplain.

Shouns Substation Regenesys™ Site
The Shouns Substation site is located southeast of Highway 167 about 0.7 mile south of its intersection with U.S. Highway 421 at about Town Creek mile 0.8. The site is located to the west of the creek within the approximate 100-year floodplain of Town Creek. There are no computed flood elevations at this location.

Mountain City Industrial Complex Regenesys™ Site
This site is located in the existing industrial park at about Town Creek mile 0.8. The site is east of the creek within the approximate 100-year floodplain of Town Creek. There are no computed flood elevations at this location.

3.7 Managed Areas and Ecologically Significant Sites

Buffalo Mountain Area

Buffalo Mountain Windfarm
The proposed windfarm is located within 5 miles of three Managed Areas. The Cumberland Forest Public Hunting Area (PHA) is located approximately 0.4 miles northwest of the project site. Frozen Head State Natural Area is located 4 miles west of the proposed project site. The proposed Smoky Mountain section of the Cumberland Trail State Park lies approximately 3.0 to 5.0 miles west and northwest of the proposed project site.

Cumberland Forest PHA is a mostly forested area of 80,000 acres owned by International Paper. PHAs are managed through a cooperative agreement between land holding companies and the Tennessee Wildlife Resources Agency (TWRA). TWRA is presently attempting to purchase the area and establish it as a Wildlife Management Area (Franz, 2002). Forest lands owned by International Paper are managed to provide lumber, paper, clean water, improve wildlife habitats and to create recreational opportunities for the public. The access road from Highway 116 to the windfarm site passes through the Cumberland Forest.

Frozen Head State Natural Area is a 12,000 acre component of the Tennessee State Park System and a Designated State Natural Area. It features one of the highest peaks in the Cumberland Mountains, the top of which is often shrouded in ice or snow. It contains rich upland hardwood forests and an abundance of spring wildflowers. The area supports important breeding populations of several neotropical migrant bird species and provides habitat for many rare species. It has an extensive network of hiking trails, and vistas along some of these trails offer views of large portions of the surrounding Cumberland Mountains.

The Cumberland Trail State Park is a proposed 220 mile hiking and backpacking trail extending from Cumberland Gap on the Tennessee, Virginia, Kentucky border to the Tennessee River Gorge on the Tennessee, Alabama, and Georgia border. Several hiking trail segments, totaling more than 110 miles, are now completed and ready to hike. An additional 183 miles of trails are in the detailed planning stage, with 10 miles currently under construction. The route of the proposed Smoky Mountain segment of the Trail, in the vicinity of the proposed windfarm site, runs from existing trails within Frozen Head State Park north along the crest of Smoky Mountain in the vicinity of the Anderson-Cumberland County line to the headwaters of Straight Fork Creek and continues down into the Straight Fork drainage to connect with the Cumberland Mountain segment to the northeast. The proposed corridor for the Smoky Mountain segment of the Cumberland Trail lies approximately 3-5 miles northwest of the proposed windfarm site.

Braden Field Regenesys™ Site
The Braden Field Regenesys™ site, the site access road, and associated utility connections are not located within or immediately adjacent to any Managed Areas or Ecologically Significant Sites. There are three Managed Areas within five miles of this site. The East Fork Ridge Protection Planning Site (PPS) is located 2.6 miles southeast of Braden Field. The Oak Ridge Barrens Preserve is located 4.4 miles east of Braden Field. The Oak Ridge National Laboratory (ORNL) is located 4.5 miles from Braden Field.

East Fork Ridge PPS is an outstanding example of mature mixed mesophytic forest, with a high diversity of native tree, shrub and herbaceous species. Second growth oak-hickory forests dominate the crest and south-facing slopes, while steep north-facing slopes support dense mountain laurel thickets and large beech trees. PPSs are identified by the Tennessee Protection Planning Committee, a cooperative effort of federal, state and private land managers and individuals knowledgeable about the biota of the state.

Oak Ridge Barrens Preserve, situated within the City of Oak Ridge on public property, contains a small cedar barrens. This uncommon remnant of the tallgrass prairie, which was once much more widespread across the state, provides habitat for a population of the rare prairie goldenrod (*Solidago ptarmicoides*). The site is also registered with the Tennessee Department of Environment and Conservation (TDEC) as a State Natural Area.

The ORNL Reservation, overseen by the U.S. Department of Energy (DOE), includes the Oak Ridge National Environmental Research Park (NERP), a Potential Natural National Landmark (PNNL), and a State Wildlife Management Area (WMA). Activities on the Oak Ridge NERP focus on achieving environmental goals defined by several federal policy acts concerning energy and the environment. Diverse terrestrial and aquatic ecosystems are studied extensively to develop methods for assessing, monitoring, and predicting environmental impacts of proposed and ongoing energy projects, as well as evaluating methods to minimize those impacts. TWRA administers special shotgun, muzzleloader, and archery deer hunts, as well as wild turkey hunts on 30,000 acres of DOE lands on ORNL designated a State WMA.

ORNL lands have been recognized as a PNNL for several distinct ecological communities including cedar-pine glades and barrens, cedar-hardwood thickets and forest stands, oak forests, mixed mesophytic stands, hemlock stands, white pine stands and wetlands. The National Natural Landmark (NNL) program was established in the 1970s by the U.S. National Park Service to identify nationally significant examples of ecologically pristine or near pristine landscapes. These lands, while meeting the criteria for listing, have not to date been registered as a NNL.

Coal Creek Regenesys™ Site
The Coal Creek Property Regenesys™ site, the site access road, and the associated utility connections are not located within or immediately adjacent to any Managed Areas or Ecologically Significant Sites. The Cumberland Forest is located 4.1 miles west of the Coal Creek site. ORNL is located 4.3 miles south of the Coal Creek site. The East Fork Ridge PPS is located 4.9 miles southeast of the Coal Creek site.

The Cumberland Forest is the largest of the University of Tennessee's Forestry Experiment Stations, facilitating several large-scale forest management research and demonstration projects. The station is also the site of some of the earliest stripmine reclamation projects in Tennessee.

Ahler Property Regenesys™ Site
The Ahler Property Regenesys™ site, the site access road, and associated utility connections are not located within or immediately adjacent to any Managed Areas or Ecologically Significant Sites. ORNL is located 3.3 miles south of the Ahler Property. The Cumberland Forest is located 3.6 miles west of the Ahler Property. The East Fork Ridge PPS is located 4.7 miles southeast of the Ahler Property.

Oliver Springs Substation Regenesys™ Site
The Oliver Springs Substation Regenesys™ site, the site access road, and associated utility connections are not located within or immediately adjacent to any Managed Areas or Ecologically Significant Sites. ORNL is located 2.9 miles south of the Oliver Springs substation. The East Fork Ridge PPS is located 3.1 miles southeast of the Oliver Springs substation.

Each of the proposed transmission line connection routes associated with the various Regenesys™ sites, excluding Braden Field, would be built in existing transmission line ROWs. All of these routes lie within five miles of six Managed Areas and/or Ecologically Significant Sites. These sites have all been previously discussed. There are no routes associated with Braden Field.

The Cumberland Forest PHA is located approximately 1.0 mile north of the transmission line route at the windfarm site, while the Cumberland Trail is 3.0 to 5.0 miles northwest of this locale. All of the Regenesys™ sites, except for the Braden Field site, would utilize this section of proposed transmission line. The Cumberland Forest is situated closest to the Coalfield substation. ORNL lies nearest (2.4 miles south) to the Ahler Property site. The other Managed Areas that are located over three miles from any section of proposed route are the East Fork Ridge PPS (3.1 miles southeast of the Oliver Springs substation) and Frozen Head State Natural Area (4.5 miles northwest of the Coal Creek substation).

Stone Mountain Area

Stone Mountain Windfarm
Although the sites of the proposed windfarm, associated substation, and electrical connection are privately owned, they are located within the proclamation boundary of the Cherokee National Forest. Lands in North Carolina near the southern end of the proposed windfarm are also privately owned, and are within the proclamation boundary of the Pisgah National Forest. There are no other Managed Areas or Ecologically Significant Sites within five miles of the project site. The Appalachian National Scenic Trail runs the length of Iron Mountain, over 10 miles west of Stone Mountain.

National forests are managed by the U.S. Forest Service (USFS) for multiple uses including forest products, recreation, and water quality. Hiking, camping, hunting, fishing, driving for pleasure, horseback riding, swimming, boating, and whitewater sports are popular activities on both the Cherokee and Pisgah National Forests.

The proclamation boundary of each national forest outlines areas which the USFS could purchase for inclusion in the national forest. The proclamation boundaries were first delineated in the legislation that established the national forest, and do not necessarily denote lands that the USFS is actively trying to acquire. The nearest USFS-owned land in the Cherokee National Forest is about 2.5 miles southwest of the windfarm site (Stelick, 2001). The nearest USFS-owned land in Pisgah National Forest is about 15 miles to the south of the windfarm site (Compton, 2001).

The Appalachian National Scenic Trail is a 2,144-mile public footpath that crosses Appalachian Mountain ridgelines from Maine to Georgia. Over 96 percent of the Trail is protected by federal or state ownership or by purchased rights-of-way. The goal of the National Park Service is to maintain the Trail environment as a place to hike, backpack, and enjoy the Appalachian mountains and wildlands, while conserving the natural, scenic, historical, and cultural resources of the Park.

Johnson County Industrial Park Regenesys™ Site
The Johnson County Industrial Park Regenesys™ site and its access road and utility connections, like the windfarm site, are located within the proclamation boundary for the Cherokee National Forest, but are not on USFS-owned land (Stelick, 2001). The closest USFS tract is 1.2 miles northwest of the site. There is one additional Managed Area within five miles of Johnson County Industrial Park. Doe Mountain State WMA is located 0.3 miles south of Johnson County Industrial Park. Doe Mountain WMA covers 8,300 acres of privately-owned lands. Hunting, which generally follows the statewide seasons, is administered by TWRA.

Shouns Substation Regenesys™ Site
The Shouns Substation Regenesys™ site and its access road and utility connections, like the windfarm site, are located within the proclamation boundary for the Cherokee National Forest, but are not on USFS-owned land (Stelick, 2001). The nearest USFS tract is 5 miles northeast of the project site. There is one

additional Managed Area within five miles of the Shouns substation. Doe Mountain WMA is located 1.3 miles west of the Shouns substation.

Mountain City Industrial Complex Regenesys™ Site
The Mountain City Industrial Complex Regenesys™ site and its access road and utility connections, like the windfarm site, are located within the proclamation boundary for the Cherokee National Forest, but are not on USFS-owned land (Stelick, 2001). The nearest USFS tract is 5 miles northeast of the project site. There is one additional Managed Area within five miles of the Mountain City Industrial Complex. Doe Mountain WMA is located 1.3 miles west of the Mountain City Industrial Complex.

No transmission line connections were reviewed for this Alternative.

3.8 Cultural Resources

3.8.1 Archaeology

Buffalo Mountain Area

Buffalo Mountain Windfarm
The archaeological resources of the New River Mountains section of the Cumberland Plateau, within which Buffalo Mountain is situated, are poorly understood. Few formal archaeological studies have been conducted anywhere in the New River Mountains (Hoyal, 2001). Because of the highly dissected nature and steep slopes covering most of this physiographic area there are few areas that would have been suitable for prehistoric habitation or use. Generally, for prehistoric habitation, locations having a slope of less than 15 percent would have been suitable, although rock overhangs (rockshelters) on the mountain slopes would also have been valued locations for taking shelter from the elements either as temporary camps or as seasonal residences.

In all likelihood the summit and slopes of Buffalo Mountain were used to some extent by prehistoric Native Americans because there are few environments that have not produced evidence of aboriginal use. The probability that the summit of Buffalo Mountain was used prehistorically is directly related to the resources that could have been obtained there that were not more readily available elsewhere. These could have been either mineral or biological resources. The most important mineral resource for native populations was chert from which a large array of tools and weapons were manufactured. Chert is not an abundant resource on the summits of the New River Mountains. Biological resources could have been a major attraction for the area. However without the availability of evidence of particular species in an archaeological context, it is difficult to determine what species were exploited because the ecological environment has been altered so radically since prehistoric times.

The proposed windfarm site at the summit of Buffalo Mountain has been severely disturbed by strip mining for coal during the twentieth century. Extensive timber removal in the late nineteenth and early twentieth centuries also had an impact on the preservation of archaeological sites. Massive sheet erosion of the thin mountain soils resulted from unregulated timber cutting, effectively destroying the matrix within which archaeological sites would have formed. A few "carrot tops," small summit areas that have not been strip mined, may contain intact archaeological remains.

TVA conducted an archaeological survey of the Buffalo Mountain windfarm corridor in January and February 2002. Although two isolated finds of historic artifacts and one isolated find of prehistoric material were identified, none of these is considered eligible for listing in the National Register of

Historic Places. Therefore there are no significant archaeological resources within the Buffalo Mountain windfarm site.

There may be archaeological resources within the widened transmission line right-of-way from the windfarm site into Oliver Springs. An archaeological survey will need to be conducted in areas of the ROW that have a high probability of containing archaeological sites such as valley bottoms.

Braden Field Regenesys™ Site
This site is on the alluvial terraces of Poplar Creek. Such settings have a very high potential to contain archaeological resources. The only apparent disturbance of this site has been agriculture which is considered to be a minor disturbance of alluvial settings. TVA conducted an archaeological survey of the Braden Field site in January and February 2002. No archaeological resources were identified on this site. All transmission lines associated with this site are within the area surveyed.

Oliver Springs Substation Regenesys™ Site
TVA conducted an archaeological survey of the Oliver Springs substation site and identified no archaeological resources at this location (Wild and Holland, 2002). The transmission line to the Regenesys™ site is on existing right-of-way which is previously disturbed and passes through much urban development. Therefore, no significant archaeological resources are expected to occur within this right-of-way.

Ahler Property Regenesys™ Site
TVA conducted an archaeological survey of the Ahler property and identified no archaeological resources on this tract (Wild and Holland, 2002). The transmission line to the Regenesys™ site and from the Regenesys™ site to the power grid is on existing, previously disturbed right-of-way paralleling S.R. 61. Therefore, no significant archaeological resources are expected to occur within this right-of-way.

Coal Creek Coal Co. Regenesys™ Site
Most of this tract is a former strip mine bench. The remainder of the tract consists of steep slopes (Wild and Holland, 2002). Because of the previous disturbance and slope gradient, only a visual surface reconnaissance was conducted on this parcel. No archaeological resources were identified at this site. The transmission line to the Regenesys™ site and from the Regenesys™ site to the power grid is on existing, previously disturbed right-of-way. Therefore, no significant archaeological resources are expected to occur within this right-of-way.

Stone Mountain Area

Stone Mountain Windfarm
The proposed Stone Mountain Windfarm site is located in the Ridge and Valley province. Within this province, the most extensive prehistoric use of the landscape occurred in the valley bottoms. However, there were undoubtedly resources on the ridge summits that were important to prehistoric human populations. In general, archaeological evidence of such use would be restricted to areas having a slope of less than 15 percent. In particular, ridge saddles and spurs are places where concentrated activity would have generated a recognizable archaeological record. A few rock overhangs occur along the summit of the mountain. Such features would have been suitable for temporary and/or intermittent shelter for prehistoric Native Americans.

Historic maps of the study area depict grassy balds or meadows along the crest of Stone Mountain within the study area. These maps also show a dwelling and barn within one grassy opening that probably represent a shepherd's cabin. This cabin site is outside the footprint of the windfarm site. At present, it is

unknown whether the meadows are of natural or cultural origin. In the mythology of the Cherokee Indian tribe such balds were the residences of certain spirits (Clauss, 2001). If these areas were cleared historically for livestock pasture, they represent a rare form of historic agricultural landscape, i.e., mountaintop summer pasture.

Although some recent disturbance has occurred on Stone Mountain from the construction of roads for communications tower and subdivision development, most of the mountain crest is relatively intact and therefore has good potential to have preserved archaeological sites related to prehistoric and historic utilization of mountaintop environments. TVA conducted an archaeological survey of the windfarm site in February and March 2002 (Ahlman, 2002). No archaeological resources were identified within the windfarm site.

Johnson County Industrial Park Regenesys™ Site
An archaeological survey of Johnson County Industrial Park was conducted in 1980 prior to development of any industrial sites (Cridlebaugh, 1980). One archaeological site was identified during the survey at the north end of the industrial park near Highway 67. This resource is outside the area of potential effect of the proposed Regenesys™ facility. The Regenesys™ site at the Industrial Park has been completely altered by land disturbance while being graded for industrial use. No archaeological resources are present on this site or would otherwise be affected by development of this site.

Shouns Substation Regenesys™ Site
This site is on the alluvial terraces of Town Creek near its confluence with Roan Creek. Such locations have a very high probability of containing archaeological resources. The only prior disturbance of this site has been cultivation which is generally regarded to be a minor disturbance in alluvial soil settings. TVA conducted an archaeological survey of this site in February and March 2002 (Ahlman, 2002). One prehistoric archaeological site, 40JN187, was identified on this parcel. The survey results indicate that 40JN187 is potentially eligible for listing in the National Register of Historic Places (NRHP). If this parcel is given further consideration for development of the Regenesys™ facility, additional evaluation of the archaeological resource will need to be done to determine its NRHP eligibility status.

Mountain City Industrial Complex Regenesys™ Site
This site is in an almost identical setting as the Shouns Substation site on the opposite side of Town Creek. This site also has a high probability of containing archaeological resources. TVA conducted an archaeological survey of this site in February and March 2002 (Ahlman, 2002). One archaeological site, 40JN188, was identified on this parcel. However, because of the low density of artifacts and disturbance from plowing, this site is not considered eligible for listing in the NRHP.

3.8.2 Historic Structures

Buffalo Mountain Area

Buffalo Mountain Windfarm
The Buffalo Mountain windfarm is in a remote mountainous area with a minimum of existing structures anywhere in the nearby viewshed. This was once an active coal mining area, both deep mining and strip mining. However very little remains of the equipment, buildings and housing that supported the former industry, and much of the top of Buffalo Mountain has been strip mined. Potentially historic coal mining features remain down the south face of Windrock Mountain under of the crest of the steep sloped mountain. There are no communities within 4.5 miles of the windfarm site. There probably are very few, if any, structures eligible for listing on the National Register of Historic Places in this 4.5 mile radius viewshed.

One significant eligible site is a formerly secret Air Force Base built for the protection of the Oak Ridge facility during World War II. The ruins of its radar installations and concrete block structures still remain on a portion of Cross Mountain known as Flag Top, about eight miles north of the wind farm. The base itself with housing and facility buildings is down the east side of the mountain at Slagstone, about nine miles from Buffalo Mountain. The surviving buildings have been privately owned residences since the late 1960s. Further down into the valley and to the east is the historic coal town of Briceville, also about nine miles from Buffalo Mountain.

Braden Field Regenesys™ Site
This site is in the Poplar Creek floodplain and close to the base of a ridge. There are few residential structures in the immediate area. No structures over 50 years old appear to be in the visual impact area.

Coal Creek Regenesys™ Site
This site is on a former strip mine shelf and is screened from the highway by foreground trees. No structures over 50 years old appear to be in the visual impact area. The transmission line interconnect to either the Coalfield or Oliver Springs substation is along existing right-of-ways for existing lines.

Ahler Property Regenesys™ Site
This site will be in view from Highway 61 through this valley of rural residential development. Directly across from the site up the other side of the valley is a historic farm house and barn; there could be other potentially eligible historic structures along Highway 61. The transmission line from the turbines to this facility is along existing right-of-ways for existing lines. The transmission line interconnect to either the Coalfield or Oliver Springs substation is also along existing right-of-ways for existing lines.

Oliver Springs Substation Regenesys™ Site
This area is wooded rolling terrain with extensive residential development along the surrounding roadways. There is a nearby frame farmhouse on the knoll overlooking Patterson Circle and a brick house on Mcghee Street which are over 50 years old and could be eligible for listing on the National Register of Historic Places. The transmission line from the turbines to this facility is along existing right-of-ways for existing lines.

Stone Mountain Area

Stone Mountain Windfarm
The proposed Stone Mountain Windfarm is close to settlement areas, and there are extensive open views of the windfarm site from the broad valleys on both sides of Stone Mountain. The surrounding valleys

are an early settlement area with many existing historic farms and communities. Many of these historic sites are within two miles of the proposed windfarm. There is a relatively high density of rural settlement with many structures over 50 years old, and many of these structures are probably eligible for listing on the National Register of Historic Places.

Johnson County Industrial Park Regenesys™ Site
This site is in the historic Doe Creek Valley, an early settlement area. The overall setting is a rural scenic mountain valley, with small farms and residential sites, many of which are historic houses, clustered along Route 67. The proposed Regenesys™ site is near a state prison and an industrial park containing several single story metal sided industrial structures. There are historic houses within the visual impact area of the site.

Shouns Substation Regenesys™ Site
This site is in the historic Roan Creek Valley, an early settlement area. The overall setting is a rural scenic mountain valley, with small farms and residential sites, some of which are historic houses, clustered along Route 167. The proposed Regenesys™ site is adjacent to this small substation and in a pasture along Town Creek. There are historic houses within the visual impact area of the site.

Mountain City Industrial Complex Regenesys™ Site
The above description of the Shouns Substation Regenesys™ site also applies to this site. The proposed access road to this site would be through a residential development, and there is an adjacent relatively small single story metal clad industrial building.

3.9 Terrestrial Ecology

3.9.1 Vegetation

Buffalo Mountain Area
The Buffalo Mountain windfarm is located within the Cumberland Mountain Section of the Appalachian Plateau Physiographic Province (Fenneman, 1938). Both the topography and natural vegetation of this site have been modified extensively by prior mining activities. Buffalo Mountain consists primarily of forested ridges that are isolated from lower slopes by benches and sandstone and shale highwalls, both created by surface mining activities. The average elevation of the site is about 3300 feet.

Botanically, the project lands occur in the Cumberland Mountains Section of the Mixed Mesophytic Forest Region (Braun, 1950). This area is characterized by a mosaic of plant communities, the location and composition of which vary greatly with altitude, aspect, degree of slope exposure and moisture. Broadly defined, the Buffalo Mountain site can be categorized in terms of four vegetation types: mixed deciduous forest, mixed evergreen-deciduous forest, reclaimed strip-mine vegetation, and emergent herbaceous wetlands.

Two types of mixed deciduous forests occur at the Buffalo Mountain site: mixed mesophytic, and Appalachian oak forests. Mixed mesophytic forests occur on the wetter slopes, whereas Appalachian oak forests characterize the drier ridges and south slopes. The canopy and sub-canopy of the mixed mesophytic forests are relatively diverse, and include species such as tuliptree, red, sugar and striped maple, white ash, beech, basswood, black cherry, sourwood, cucumber magnolia, flowering dogwood and redbud. Appalachian oak forests are characterized by a predominance of oak species including chestnut, northern red, scarlet, and white oaks. A dense groundcover of New York fern is also present among the drier site forests and along roadsides.

Mixed evergreen-deciduous forests are distinguished by the presence of white and shortleaf pines in the canopy, and eastern redcedars in the sub-canopy. These forests occur on the drier ridges, and are increasingly common over shallow soils along the edges of sandstone bluffs.

Reclaimed strip-mine areas are dominated by species planted during mine reclamation; representative species include black locust, autumn olive, fescue, and sericea lespedeza. Both autumn olive and sericea lespedeza are invasive exotic species that have been formally recognized as threats to native plant communities by the Tennessee Exotic Pest Plant Council (TNEPPC, 2001). The reclaimed areas also support a variety of native and introduced herbaceous species including sunflowers, goldenrod, coreopsis, bidens, partridge pea, red clover, wild pink, and broom sedge, as well as beard, panic and greasy grasses. Areas exhibiting more advanced stages of succession are typically distinguished by the presence of eastern redcedar, Virginia pine, tuliptree, and red maple.
Emergent, herbaceous wetlands have formed in several small areas of standing water that appear to be depressions resulting from mining activities. These wetlands are characterized by stands of wool rush, spike rush, sedges, water plantain, and extensive mats of both sphagnum and hair cap mosses.

Occasional evidence of prior logging is indicated by a thinner forest canopy, fallen logs and decaying tree stumps. The understory in these areas is typically comprised of weedy species, including some nearly impenetrable thickets of blackberry and cat-brier. Other species typical of these disturbed areas include pokeweed, goldenrod, bidens, coreopsis, and various asters. The invasive exotics, Japanese honeysuckle and Nepalgrass, both included in the TNEPPC invasive plant list, are also present in these areas.

No uncommon plant communities or otherwise sensitive plant habitats were observed during field surveys spanning 50 to 100 feet of the projected centerline for wind turbine locations, the project substation, or along the windfarm access road. However, depending on the final locations of these project components, additional field surveys may be required to fully characterize the vegetation that would be affected by this Alternative.

Each of the proposed transmission line connections occurs along existing transmission lines corridors with an average maintained ROW width of 15m (50ft). Upgrades to these existing transmission line corridors would include ROW expansion to a maximum width of 30m (100ft). The existing transmission line ROWs are actively maintained in an early successional state by agricultural practices or road and transmission line ROW maintenance. With the exception of pastures and residential lawns, these areas support a variety of native and non-native plant species such as fescue, broomsedge, goldenrod, bidens, blackberry, and Japanese honeysuckle.
The vegetation along the proposed transmission line connection leading from Buffalo Mountain to Oliver Springs is similar to that described above for the proposed Buffalo Mountain windfarm site, in the sense that many of the plant communities present have been modified by previous mining activities. The proposed transmission line upgrades and associated ROW expansion would require the removal of some mixed deciduous and mixed deciduous-evergreen forest immediately adjacent to the existing transmission line corridor. The composition of these forested areas is similar to those described above for the Buffalo Mountain windfarm site, with the exception of a small section of mixed deciduous-hemlock woods which occur along the banks of Little Cow Creek as it travels along Windrock Road.

Each of the four proposed Regenesys™ sites has been previously disturbed by prior land use activities, to the extent that the dominant vegetation present consists of herbaceous and woody early successional plant species. The Braden Field site is currently maintained in pastures. The Coal Creek site has been disturbed by prior mining activities, and consists of open fields dominated by broomsedge and dense thickets of blackberry, Japanese honeysuckle, and mimosa. A young (estimated age less than 15 years)

stand of pine and young to mid-aged (estimated age 30-40 years) mixed deciduous-pine woods characterize the back-lying perimeter of the Coal Creek site. The Ahler site consists of an open field that is maintained by regular mowing, and a thin strip of woody riparian vegetation along a creek which forms the southern boundary of the site. The Oliver Springs substation consists of an existing transmission line ROW that is bordered by young mixed deciduous-pine woods and a small woodlot containing standing dead pine trees. No uncommon plant communities or otherwise sensitive plant habitats were observed during field surveys of the proposed Regenesys™ sites.

All of the transmission line connections leading from Oliver Springs to each of the four proposed Regenesys™ sites are along existing transmission line corridors, and the majority of these corridors occur along existing road ROWs. The transmission line connection from Braden Field crosses pasture, early successional vegetation consisting of blackberry and multi-flora rose thickets, and a forested floodplain before connecting to an existing 161-kV line. The connection from the Coal Creek site crosses an emergent herbaceous wetland, riparian woods, and upland mixed deciduous-evergreen forests en route to the Coalfield substation. The connection from the Ahler Site crosses early successional vegetation associated with agriculture and existing road easements, as well as residential and commercial developments. The connection from the Oliver Springs substation would cross residential and commercial properties, as well as patches of deciduous and pine woodlands along the Highway 61 and along the railroad tracks adjacent to the substation.

Review of the NatureServe database of ecological communities (version 1.5, August 2001) reveals that none of the plant communities on the projected easement for the Buffalo Mountain windfarm site, the four proposed Regenesys™ sites, or the proposed transmission line connections are currently considered globally critically imperiled (G1) or globally imperiled (G2), ranks indicating the greatest degree of global rarity. Furthermore, no plant communities considered to be otherwise uncommon or sensitive were observed on any of these proposed project lands.

Stone Mountain Area

The proposed Stone Mountain site occurs in the Southern Section of the Blue Ridge Physiographic Province as described by Fenneman (1938). Botanically, this site occurs in the Southern Appalachians Section of the Oak-Chestnut Forest Region (Braun, 1950). Historically, forests of this region were comprised of various oak species and American chestnut (which has since been decimated by a fungal blight). With the loss of mature chestnut from these forests, there has been an increase in dominance of various trees, including oaks, hickories, hemlock, tuliptree, pines, basswood and yellow buckeye.
The average elevation of the Stone Mountain site is about 4400 feet, and the highest point in the area of the proposed windfarm is 4560 feet. Broadly defined, the Stone Mountain site can be characterized in terms of three vegetation types: mixed deciduous forests, mixed evergreen-deciduous forests, and perennial herbaceous vegetation.

The majority of the Stone Mountain site is forested. The forests are all second growth and show evidence of logging. The majority of the trees are in the pole and small sawtimber size classes. The forests are primarily mixed deciduous, and may be more specifically described as either Appalachian oak or mixed mesophytic forests. The canopy species are similar to those observed at Buffalo Mountain except that yellow birch, a high elevation tree absent from Buffalo Mountain, is common at Stone Mountain. Heath shrubs such as rosebay rhododendron and mountain laurel are far more prevalent, especially along the north-facing slopes at Stone Mountain. Hawthorn, which was not observed at the Buffalo Mountain site, is also frequent in the shrub layer at Stone Mountain.

The remaining forests are mixed evergreen-deciduous forests. These forests typically occur on drier ridge sites and south slopes, and are characterized by the presence of white, shortleaf, and Table Mountain pine

in the canopy. Eastern hemlock occurs on the richer, north-facing slopes. Fraser fir is also present at the northern end of the Stone Mountain site (see Section 3.2.9.1, Threatened and Endangered Species - Vegetation, below).

Perennial herbaceous vegetation, consisting primarily of native and invasive weed species, is present in cleared areas at the northern end of the site, along roadsides, and at the radio tower. This vegetation is comprised primarily of weed species such as broomsedge, plantain, dock and various asters. Thickets of blackberry and cat-brier also typify the edges of these cleared areas.

Exposed rock outcrops are scattered along the ridge top. The vegetation of these outcrops is characterized by patches of species such as sedges, resurrection fern, lichen, and several mosses. No uncommon plant communities or otherwise sensitive plant habitats were observed during field surveys spanning 50 to 100 feet of the projected centerline for wind turbine locations, the project substation, or along potential windfarm access roads. However, depending on the final locations of these project components, additional field surveys may be required to fully characterize the vegetation that would be affected by this Alternative.

The proposed transmission line connection leading from the proposed Stone Mountain windfarm site consists of an existing transmission line corridor with an average maintained ROW width of 15m (50ft). The vegetation in this existing transmission line ROW consists of early successional species and scattered woody vegetation, including mountain laurel as well as saplings and/or stump sprouts of rhododendron, red maple, sweet gum, and various oak species. Upgrades to this existing transmission line corridor would include ROW expansion to a maximum width of 30m (100ft). This ROW expansion would affect some mixed deciduous and mixed deciduous-evergreen forests which occur immediately adjacent to the existing transmission line corridor as it descends Stone Mountain, before it joins with existing roads along Sandy Creek. The composition of these forests is generally similar to the mixed mesophytic forests described above for the Stone Mountain windfarm site. No uncommon plant communities or otherwise sensitive plant habitats are present in the forests that would be affected by the proposed ROW expansion. Once the existing transmission line corridor intersects Sandy Road, it crosses primarily early successional vegetation associated with pastures, residential lawns, and road ROWs. However, the exact route leading from the town of Sandy to Shouns substation was not inspected in association with this alternative, because it was not known at the time of field surveys.
The three proposed Regenesys™ sites at Mountain City Industrial Complex, Shouns Substation, and at Johnson County Industrial Park have been previously disturbed, to the extent that no natural plant communities remain. These sites consist of an agricultural field, a mowed, maintained field, and a graded lot, respectively. No uncommon plant communities or otherwise sensitive plant habitats are present on these sites.

Review of the NatureServe database of ecological communities (version 1.5, August 2001) revealed that none of the plant communities on the projected easement for the Stone Mountain windfarm site, the project substation, or the proposed Regenesys™ sites are currently considered globally critically imperiled (G1) or globally imperiled (G2), ranks indicating the greatest degree of global rarity. Furthermore, no plant communities considered to be otherwise uncommon or sensitive were observed. In particular, no grassy balds or heath balds were observed in the areas inspected.

3.9.2 Wildlife

The following sections describe wildlife habitat conditions and wildlife populations in the Buffalo Mountain area and in the Stone Mountain area. Because of the potential impacts of windfarm operations on bird and bats, these species groups are then described in more detail for each windfarm site.

Buffalo Mountain Area
A large percentage of this site has been altered previously by logging or mining activities, and the site is dominated by young and middle-aged forests. Some small woodlots containing mature trees still exist on Buffalo Mountain. Mixed deciduous forests provide nesting habitat for birds such as red-eyed vireo, downy woodpecker, Carolina wren, and eastern tufted titmouse. Common mammals found in this habitat include eastern chipmunk, eastern gray squirrel, and raccoon. Reptiles and amphibians occurring here would include fence lizard, black rat snake, timber rattlesnake and spring peeper.

Several open areas, consisting mostly of early successional vegetation, occur along Buffalo Mountain as a result of mine reclamation activities. These areas provide nesting habitat for birds such as song sparrow, eastern towhee, eastern wild turkey, and mourning dove. Reptiles and amphibians occurring here include black racer, black rat snake, and American toad. Mammals such as cottontail rabbit, coyote, and white-tailed deer are common in these habitats.

The topography of the surrounding area has been altered significantly. Countour mining operations have left benches bordered by high walls which isolate forested ridgetops from other forested habitats. Emergent wetlands that contain mosses and some woody vegetation have formed in small depressions, providing breeding sites for a variety of amphibians and often provide sources of water for other species of wildlife. Although these wetlands are a result of previous habitat disturbances, they are beneficial for numerous species of wildlife.

Due to previous disturbance, most of the site provides wildlife habitat that ranges from marginal to low quality. The diversity of animal life on this site is relatively low, compared to nearby undisturbed lands. Wildlife habitats that occur on these sites simulate habitats that are common in other areas in the region. Thus, terrestrial wildlife species found in the project area are generally common and have widespread distributions. No uncommon wildlife communities or habitats were observed on the sites during field investigations.

Each of the proposed transmission line connection routes would be built along existing transmission line corridors. Each of the existing transmission lines occur along existing maintained rights-of-ways that are 15-m (50-ft) wide. Therefore, approximately 15-m of clearing adjacent to the existing right-of-way might be required to upgrade each line. The existing rights-of-ways have many similarities in that they occur largely within habitats that have previously disturbed by land use activities such as development or agriculture. Animals found in these habitats are those that are often found in edge habitats or urban environments. Resident mammal species include white-tailed deer, woodchuck, and opossum. Nesting birds include northern mockingbird, eastern bluebird, house finch, and rock dove. Reptiles and amphibians found in these habitats include gray rat snake, American toad, upland chorus frog, and red spotted newt.

The wildlife habitats along the existing transmission line connection from Buffalo Mountain to Oliver Springs can be described as similar to those on the proposed windfarm site itself. These habitats have been heavily disturbed by previously mining activities. One small, isolated emergent wetland was identified along the existing transmission line corridor. This wetland was likely created as a result of mining activities. The existing transmission line also cross a wetland complex as it travels along

Windrock Road. Although the habitats affected by mining activities offer relatively low quality habitat, wetlands within these habitats may be used by a variety of wildlife including amphibians, reptiles, birds, and mammals.

Each of the proposed Regenesys™ sites have been previously disturbed by land use activities and provide marginal wildlife habitat. The Braden field site largely consists of maintained field, although it does contain a small woodlot. This area has been previously impacted by cattle grazing. The Coal Creek site has been impacted by mining or other earth moving activities and contains early successional habitat with some woody vegetation. The Ahler is site can be described as a maintained open field with some woody vegetation. Much of the Oliver Springs substation site has been plowed and is comprised of early successional vegetation in a powerline right-of-way. Use of this area would also involve the removal of a woodlot that contains standing dead pine trees. Wildlife habitats that occur each of the sites are common throughout the region. Thus, terrestrial wildlife species found in these areas are expected to be common and are expected to have widespread distributions. In general, wildlife found in the vicinity of these sites includes species commonly found in early successional habitats and in young and middle-aged forests.

The transmission line connection from Braden Field would cross maintained pasture, early successional habitat, and a forested floodplain before connecting to the existing 161-kV line. The transmission line connection from the Coal Creek Site would cross a forested wetland just north of the Coalfield Substation. Land use along this route includes maintained lawns, housing, and road frontage. Forested areas along this route occur in patches of coniferous and deciduous woodlands. The transmission line connection from the Ahler Site would occur within residential and otherwise developed properties, including road frontage. With the exception of some edge habitats, the existing routes and proposed extensions offer very limited wildlife habitat. The transmission line connection from the Oliver Springs Substation would occur within residential and otherwise developed properties. Forested areas along this route occur in patches of deciduous and pine woodlands along the Highway 61 and along the railroad tracks adjacent to the substation.

Wildlife habitats that occur along each of the potential transmission line connection corridors are common throughout the region. Thus, terrestrial wildlife species found in these areas are expected to be common and are expected to have widespread distributions. In general, wildlife found in the vicinity of these transmission lines include species commonly found in early successional habitats and in young and middle-aged forests.

Bird Populations

Bird populations at the potential windfarm sites were surveyed using standardized point counts during the summer and winter, by line transect counts during the fall, and by fixed point hawk watches during the fall. Information recorded during these surveys included the names of species observed, their numbers and activities, the height and direction of flying birds, and weather conditions. General bird observations were also recorded incidental to these and other studies on the sites.

Eighty-four species were recorded on Buffalo Mountain (Appendix B). The following paragraphs describe the status of major groups of birds.

Passerines

Passerines include birds commonly known as songbirds or perching birds. The group includes flycatchers, swallows, crows, vireos, thrushes, warblers, tanagers, buntings, sparrows, and blackbirds. Although they are not technically classified as passerines, woodpeckers are discussed with the passerines in this assessment.

Passerine Breeding and Wintering Populations - The most common passerines nesting on the site are, in decreasing order of abundance, the indigo bunting, chestnut-sided warbler, eastern towhee, red-eyed vireo, cedar waxwing, ovenbird, and field sparrow. These species are typical of the mix of old fields, shrubby areas, and forest found on the site, and are all relatively common in the region. Two species listed as In Need of Management in Tennessee, the golden-winged warbler and the cerulean warbler, are also present on the site. These species are described in more detail in the Endangered and Threatened Species section. Common passerines wintering on the site are the field sparrow, white-throated sparrow, song sparrow, dark-eyed junco, eastern towhee, Carolina chickadee, tufted titmouse, golden-crowned kinglet, and American crow.

Passerines present during the nesting and/or wintering season which were observed flying above tree canopy height were the horned lark, northern rough-winged swallow, American crow, cedar waxwing, and American goldfinch. The waxwing and goldfinch rarely flew as high as the 98 to 147 foot lower limit of the turbine rotor-swept area. The lark, swallow, and crow were more frequently observed above this height.

Migrant Passerine Use - Large numbers of passerines are known to migrate through the Cumberland Mountains and the adjacent Ridge and Valley. These birds primarily migrate at night. They usually migrate at heights of a few hundred to a few thousand feet above ground level, with the majority below 1000 feet (Kerlinger and Moore 1989). Changing weather conditions and terrain features may cause them to fly lower. They are also within turbine rotor height as they take off in the evening shortly after dark and land later in the night or early in the morning shortly after daylight, some passerines, especially wood warblers, may fly some distance at low altitudes before settling to feed and rest (Hall and Bell 1981).

While in flight, migrating passerines generally move over a broad front with little deviation along terrain features (Bingham et al., 1982). In areas of complex topography with prominent mountains or ridges rising above adjacent lowlands, migrants may concentrate over ridge crests (Williams et al. 2001). They may also pass over mountain tops at low altitudes.

Results of counts conducted during the fall suggest that use of Buffalo Mountain by migrant passerines is moderate. The most common migrant birds observed were the Tennessee warbler, red-eyed vireo, palm warbler, magnolia warbler, black-throated green warbler, scarlet tanager, and indigo bunting.

Diurnal Raptors

Diurnal raptors include vultures, hawks, falcons, and related birds of prey that are active during the day.

Diurnal Raptor Breeding and Wintering Populations - Raptors present in the area throughout the year are the turkey vulture, red-tailed hawk, red-shouldered hawk, and Cooper's hawk. Broad-winged hawks are present from spring into early fall. All of these species periodically fly at or above turbine rotor-swept heights. This behavior is common in the turkey vulture, red-tailed hawk, and red-shouldered hawk, and uncommon in the Cooper's hawk.

Migrant Diurnal Raptor Use - Censuses of migrating diurnal raptors were conducted at Buffalo Mountain during the second half of September, 2001, the normal peak of raptor migration. Total daily counts of all raptors ranged from 63 to 192, and broad-winged hawks accounted for 59 to 92% of all raptors. Buffalo Mountain is oriented northwest to southeast, perpendicular to the prominent axis of Walden Ridge 5 miles to the east. The heading of most migrating raptors under northwest, west, and southwest winds was generally south to west, across the axis of Buffalo Mountain. About 92% of the birds crossing Buffalo Mountain did so at an altitude higher than turbine blades. Many of these birds approached from the northeast at a lower elevation and circled to gain altitude over the northeast face of Buffalo Mountain. Many of the birds which crossed below maximum turbine height did so by crossing over dips in the crest of the mountain; some American kestrels and northern harriers crossed in this manner.

Compared to results of hawk censuses conducted during the same time period at other, well-known hawk migration observation stations in the southern Appalachians (BirdSource 2001), relatively low numbers of hawks migrate over Buffalo Mountain. Except for Walden Ridge a few miles to the east, and Cumberland and Pine Mountains several miles to the northeast, the mountains in the vicinity are not uniformly oriented, and this may disperse raptors passing through the area.

Other Birds

Suitable habitat for waterfowl and wading birds such as herons or egrets does not occur on or in the vicinity of Buffalo Mountain. A few small, shallow, semi-permanent ponds near the existing wind turbines provide some habitat for shorebirds, although no shorebirds were observed on the site. Waterfowl, wading birds, and shorebirds likely migrate through the area. The site is on the eastern edge of the main migration corridor for the eastern population of sandhill cranes.

Chimney swifts regularly occur over Buffalo Mountain during the summer and fall, and often forage at turbine rotor heights. Wild turkeys are common throughout the year, and mourning doves are present during the summer but uncommon.

Bat Populations

During the spring, summer, and fall of 2001, bat activity at the existing Buffalo Mountain windfarm was monitored using Anabat systems that detected and recorded bat echo-location calls, and by occasional use of nets to capture flying bats. The main Anabat system was set up about 165 ft east of the middle turbine, near the base of a brushy slope. Its microphone faced away from the turbine and towards one of two nearby, shallow, semi-permanent ponds. A second Anabat system was operated during the fall a short distance west of the north-most turbine. The nets used to capture bats were located adjacent to and spanning the ponds. During the bird carcass searches described above in Section 4.8.2, searchers also looked for dead bats.

The bat surveys confirmed the presence of seven species of bats (Table 3-3). The red bat was the most frequently encountered species. The level of bat activity, as measured by the number of vocalizations per night recorded by the Anabat systems, varied throughout the summer and fall, with series of nights with little or no bat activity followed by series of nights with moderate to heavy activity. Little bat activity was recorded after mid-October.

Table 3-3. Bat species recorded at the Buffalo Mountain Windfarm.

Common Name	Scientific Name	Mode of Detection		
		Anabat	Netting	Carcass search
Big brown bat	*Eptesicus fuscus*	x	-	x
Silver-haired bat	*Lasionycteris noctivagans*	-	-	x
Red bat	*Lasiurus borealis*	x	x	x
Hoary bat	*Lasiurus cinereus*	x	x	x
Little brown myotis	*Myotis lucifugus*	x	x	-
Eastern long-eared myotis	*Myotis septentrionalis*	x	-	-
Eastern pipistrelle	*Pipistrellus subflavus*	x	-	x

All of these bats will roost in trees, either in foliage, or under tree bark, during the summer. The eastern pipistrelle, big brown bat, eastern long-eared myotis, and little brown myotis also roost in buildings, rock crevices, or mines, all of which occur in the Buffalo Mountain area.

Stone Mountain Area

The proposed windfarm site is predominately comprised of young and middle-aged deciduous forests with some open areas. Portions of the site have been disturbed by fire and timber harvest, and some standing dead trees and stumps are present. Ricketts *et al*. (1999) report that a large proportion of the habitat in the Appalachian/Blue Ridge Region has been previously altered.

The site provides important habitat for terrestrial animals, because it is located at a high elevation within the Blue Ridge Mountains. The site is very rocky with ground cover comprised of fallen logs, a thin layer of organic matter, and woody debris. Rock outcrops range from ground-level to about 10 feet in height; however, most of the rocks are low to the ground and occur in layers under the leaf litter. These characters combine with moist soils, cool temperatures, mosses, ferns, and other ground-level vegetation to form a microclimate unique to the region.

Mixed deciduous forests, interspersed with a few open areas, provide habitat for several wildlife species. Common reptile and amphibians that occur on the site include American toad, eastern box turtle, northern copperhead, and worm snake. The breeding bird community of the region is dominated by neotropical migrants (Ricketts *et al*., 1999). Birds that nest on this site include ovenbird, blue headed vireo, ruffed grouse, chestnut-sided warbler, and dark-eyed junco. Tree cavities on the site provide habitat for bats, raccoons, and squirrels. Mammals common to the area include white-tailed deer, eastern gray squirrel, raccoon, northern long-eared bat, and white-footed mouse. The region is known to support isolated occurrences of land snails, spiders, and salamanders (Ricketts *et al*., 1999).

The proposed Regenesys™ sites at Mountain City Industrial Complex, Shouns Substation, and at Johnson County Industrial Park have been previously disturbed and provide very limited wildlife habitat. The sites are described as agricultural use, maintained field, and graded lot, respectively.

No transmission line connections were reviewed for this alternative.

Bird Populations

Bird populations at the potential windfarm site were surveyed using standardized point counts during the summer and winter, by line transect counts during the fall, and by fixed point hawk watches during the fall. Information recorded during these surveys included the names of species observed, their numbers and activities, the height and direction of flying birds, and weather conditions. General bird observations were also recorded incidental to these and other studies on the sites.

Seventy-three bird species were recorded on Stone Mountain (Appendix B). The following paragraphs describe the status of major groups of birds.

Passerines

Passerines include birds commonly known as songbirds or perching birds. They include flycatchers, swallows, crows, vireos, thrushes, warblers, tanagers, buntings, sparrows, and blackbirds. Although they are not technically classified as passerines, woodpeckers are discussed with the passerines in this assessment.

Passerine Breeding and Wintering Populations - The most common passerines nesting on the site are, in decreasing order of abundance, the indigo bunting, red-eyed vireo, dark-eyed junco, blue-headed vireo, American robin, scarlet tanager, chestnut-sided warbler, cedar waxwing, eastern towhee, and ovenbird. All of these species are relatively common in the region. Most of the site is forested, and this is reflected in the high rankings of birds occupying mid-aged to mature forest such as the red-eyed and blue-headed vireos, scarlet tanager, and ovenbird. Uncommon species present during the nesting season included the yellow-bellied sapsucker and common raven. These species are described in more detail in the Endangered and Threatened Species section. Common passerines wintering on the site are the dark-eyed junco, Carolina chickadee, tufted titmouse, golden-crowned kinglet, American crow, pileated woodpecker, and hairy woodpecker.

Passerines present during the nesting and/or wintering season which were observed flying above tree canopy height were the pileated woodpecker, American crow, common raven, cedar waxwing, and American goldfinch. Only the crow and raven were regularly observed at heights above the 98 to 147 foot lower limit of the turbine rotor-swept area.

Migrant Passerine Use - Large numbers of passerines are known to migrate through the southern Blue Ridge Mountains and the adjacent Ridge and Valley. The general pattern of this migration is the same as that described above for Buffalo Mountain. Because Stone Mountain rises prominently above the surrounding terrain, many nocturnal migrants probably fly over the crest at relatively low altitudes. Results of counts conducted during the fall suggest that use of Stone Mountain by migrant passerines is heavy. The most common migrant birds observed were the Tennessee warbler, black-throated blue warbler, blackburnian warbler, rose-breasted grosbeak, Cape May warbler, black-throated green warbler, scarlet tanager, magnolia warbler, and blue-headed vireo. On two days in late September 2001, large waves totaling hundreds of warblers were observed rapidly moving along the mountain at low elevations shortly after daylight.

Diurnal Raptors

Diurnal raptors include vultures, hawks, falcons, and related birds of prey that are active during

Diurnal Raptor Breeding and Wintering Populations - Raptors present in the area throughout the year are the turkey vulture, black vulture, red-tailed hawk, and Cooper's hawk. Broad-winged hawks are present from spring into early fall. All of these species periodically fly at heights at or above turbine rotor-swept heights. This behavior is common in the two vultures and the red-tailed hawk, and uncommon in the Cooper's hawk.

Migrant Diurnal Raptor Use - In eastern North America, migrating raptors frequently follow ridges during the fall. Censuses of migrating diurnal raptors were conducted at Stone Mountain during the second half of September, 2001, the normal peak of raptor migration. Total daily counts of all raptors ranged from 37 to 182, and broad-winged hawks accounted for 65 to 96% of all raptors. The heading of almost all of the birds was southwest to south-southwest, parallel to the axis of Stone Mountain. On days

with wind predominantly from the northeast, 86 % of the raptors flew over the crest of Stone Mountain. The remaining birds either flew along the side of the mountain or crossed over the north end of the mountain. Of the birds flying over the crest, about 97% were above maximum turbine rotor height. Most of the remaining raptors were within turbine rotor-swept height.

On days with winds from the northwest, west, southwest, or south, about 87% of migrating raptors flew along the side of the mountain. The rest flew over the crest of the mountain, and only about 12% of these birds (2% of all raptors observed) were below maximum turbine rotor height.

Compared to results of hawk censuses conducted during the same time period at other, well-known hawk migration observation stations in the southern Appalachians (BirdSource 2001), relatively low numbers of hawks migrate over Stone Mountain.

Other Birds

Suitable habitat for waterfowl, wading birds such as herons or egrets, and shorebirds does not occur on or in the immediate vicinity of the proposed windfarm sites on Stone Mountain. Suitable habitat for these birds does occur at the eastern end of Watauga Lake, 6 to 9 miles to the west. Some of these birds also likely migrate through the area. The main migration corridor for sandhill cranes is far to the west over the Cumberland Plateau.

Chimney swifts regularly occur over Stone Mountain during the summer and fall, and often forage at turbine rotor heights. Ruffed grouse and wild turkeys are common throughout the year, and mourning doves are fairly common during the summer.

Bat Populations

A bat survey using an Anabat system was conducted at Stone Mountain for three nights in mid-August, 2001. No bats were detected during this survey. Because of the variation in bat use of an area and the limited area covered by this survey, the results of this survey are not conclusive. Based on their geographical ranges and habitat preferences, all of the bats found at the Buffalo Mountain site could also occur at Stone Mountain. In addition, the eastern big-eared bat, described in Section 3.9.2, could occur at Stone Mountain.

3.10 Aquatic Ecology

Buffalo Mountain Area

Buffalo Mountain Windfarm

Aquatic life in streams that would receive runoff from the windfarm site is typical of area streams. Drainage from the mountain top is to either the New River watershed to the northwest or the Poplar Creek watershed to the southeast. Local aquatic life has been impacted previously by siltation and water quality degradation associated with surface mining. Most of the water courses in the immediate vicinity of the site are wet weather conveyances that do not support aquatic life. A few small ponds created during surface mining operations occur along the crest of Buffalo Mountain. Some of these ponds hold water most of the year and are occupied by a variety of aquatic insects as well as larval and adult frogs, toads, and salamanders. Much of the transmission line corridor from the windfarm site down Windrock Mountain to the vicinity of the Regenesys sites runs along Little Cow Creek, a tributary to Indian Creek.

Braden Field Regenesys™ Site
The Braden Field site is adjacent to Poplar Creek. TVA has sampled Poplar Creek at Highway 62 (about 2.0 miles downstream of this site) twice. In July, 1996, twenty-five fish species were collected. The fish community rated "poor/fair," compared to the fish assemblage that would be expected to occur in a similar size stream in the same ecoregion under optimum environmental conditions. The benthic animal community, as represented by abundance and diversity of mayfly, stonefly, and caddisfly larvae, and the proportion of the sample represented by aquatic invertebrate species considered tolerant of degraded conditions, rated "fair." In April, 1999, the fish assemblage rated "fair," with twenty-eight species collected, and the benthic animal population again rated "fair." Because of the proximity of existing transmission lines, extensive new connections would not be needed at this site.

Coal Creek Property Regenesys™ Site
The Coal Creek Property site is on a previously-disturbed, relatively flat, area on a hillside. Streams are not present on the site. Drainage is to nearby Geise Creek (which TVA has not sampled), which enters Indian Creek at mile 3.8 (Indian Creek enters Poplar Creek at mile 14.3). Transmission line connections would lie in the watersheds of either Geise Creek (to the Coalfield substation) or Indian Creek and Poplar Creek (to the Oliver Springs substation).

Ahler Property Regenesys™ Site
The Ahler Property site is adjacent to an unnamed tributary that enters Indian Creek at mile 2.5 (Indian Creek enters Poplar Creek at mile 14.3). TVA sampled Indian Creek at mile 4.2 in April and May, 1996; twelve fish species were collected (the fish community was not rated for that sample). The benthic animal community, as represented by abundance and diversity of mayfly, stonefly, and caddisfly larvae, and the proportion of the sample represented by aquatic invertebrate species considered tolerant of degraded conditions, rated "good." A large spring emerges in the mowed field at this site; substrate is soil and small gravel with aquatic vegetation present. A surface drainage which may be spring fed also crosses the field. Transmission line connections to the site and the Coalfield substation would lie in the watersheds of unnamed tributaries to Indian Creek and in the Geise Creek watershed.

Oliver Springs Substation Regenesys™ Site
This site is located at approximately mile 0.6 of an unnamed tributary that enters Poplar Creek at mile 16.3, which is about 2.0 miles below the site on Poplar Creek (at Highway 62) where TVA has sampled twice. In July, 1996, twenty-five fish species were collected. The fish community rated "poor/fair," compared to the fish assemblage that would be expected to occur in a similar size stream in the same ecoregion under optimum environmental conditions. The benthic animal community, as represented by abundance and diversity of mayfly, stonefly, and caddisfly larvae, and the proportion of the sample represented by aquatic invertebrate species considered tolerant of degraded conditions, rated "fair." In April, 1999, the fish assemblage rated "fair," with twenty-eight species collected, and the benthic animal population again rated "fair." Transmission line connections to this site would lie in the watersheds of Indian Creek and Poplar Creek.

Stone Mountain Area

Stone Mountain Windfarm
Water courses in the immediate vicinity of the windfarm site are wet weather conveyances that do not support aquatic life. Runoff from the site would enter Bulldog Creek (a tributary to Roan Creek) or Roan Creek to the southeast side of the mountain, or Furnace Creek or Big Sandy Creek (tributaries to Vaught Creek) to the northwest side of the mountain. All of these creeks are tributaries to Roan Creek. TVA has sampled Roan Creek several times in recent years at three sites. The fish community ratings have ranged from "poor" with 17 species collected at mile 7.2 in June, 1996, to "fair/good" with 26 species collected

at mile 18.5 in June, 2000. Fish species diversity has been generally higher at the uppermost two sites (miles 13.9 and 18.5). The benthic animal community has rated "fair" or "good" in all samples. Roan Creek is managed by the Tennessee Wildlife Resources Agency (TWRA) as a put-grow-take trout fishery. Transmission line connections from the windfarm site to the Shouns Substation and Mountain City Industrial Complex Rengenesys™ sites would lie along Big Sandy Creek, Vaught Creek, Roan Creek, and Town Creek.

Johnson County Industrial Park Regenesys™ Site
Runoff from this site would enter Doe Creek at about mile 10.0. TVA sampled Doe Creek at mile 1.6 in June, 1994. The fish community rated "fair" with ten species collected, and the benthic community also rated "fair." Doe Creek is probably Tennessee's most productive wild trout stream, representing an extremely valuable fishery resource (TWRA, 2000).

Shouns Substation Regenesys™ Site
Runoff from this site would enter Town Creek, a tributary to nearby Roan Creek. TVA sampled Town Creek at mile 1.2 (about 0.6 miles upstream of the proposed site) in June, 1995, when the fish community rated "fair," with eleven species collected. The benthic community rated "fair." Mile 1.2 was again sampled in April, 2000, when the fish community rated "fair" with fifteen species collected. At that time, the benthic community rated "good."

Mountain City Industrial Complex Regenesys™ Site
Runoff from this site would also enter Town Creek very near the Shouns Substation Site.

3.11 Threatened and Endangered Species

3.11.1 Threatened and Endangered Plants

A review of the TVA Regional Natural Heritage Project database indicated that numerous plant species listed as endangered, threatened, or otherwise considered rare have been reported from the vicinity of each site. Federally listed and state-listed plant species reported from within five miles of the proposed windfarms and associated facilities, and federally listed plant species reported from the respective counties in which these facilities occur, are presented in Table 3-4. Additional occurrences of state-listed species reported from these counties are presented in Appendix C. These species lists formed the basis for the field surveys conducted in 2001.

Buffalo Mountain Area
This site has a low potential to provide suitable habitat for rare plant species due to the extent of habitat disturbance associated with previous mining activities. However, the mixed deciduous forests and emergent herbaceous wetlands do have the potential to provide suitable habitat for some of the state-listed species reported from the surrounding area (see Table 3-4 and Appendix C). No occurrences of federally listed or state-listed plant species were observed during field surveys spanning 50 to 100 feet of the centerline of likely wind turbine locations.

Selection of this Alternative would require additional project-related activities including electrical connections, construction of an on-site substation, and a transmission line connecting the on-site substation to the nearby Roane-Braytown 161-kV line. At the time of this review, the precise locations of these activities were unknown, but were expected to involve areas within the larger area inspected for the siting of the wind

turbines. As stated above, no federally listed or state-listed plants were identified in these areas during field surveys.

No occurrences of federally listed or state-listed plant species were observed during field inspections of any of the four proposed Regenesys™ sites associated with this Alternative.

No occurrences of federally listed or state-listed plant species were observed during field inspections along the proposed transmission line connections associated with the Buffalo Mountain windfarm facility, or any of the proposed Regenesys™ sites associated with this Alternative.

Stone Mountain Area
No federally listed plant species were observed at the Stone Mountain windfarm site. The five federally listed plants reported from the vicinity of Stone Mountain typically occur at or above 4500 feet in elevation, in association with grass balds, heath balds, and/or mountain rock outcrops and crevices (Table 3-4). The maximum elevation of the Stone Mountain site is 4560 feet, and grass and heath balds are not present.

A small stand of 50 to 75 Fraser fir (*Abies fraseri*) trees occurs on the crest of Stone Mountain at the northern end of the proposed wind turbine locations, and additional fir trees occur in the forest understory at the northeast upper slope, near the upper end of Stone Mountain Road. This species is state-listed in Tennessee as threatened, is currently a candidate for listing in North Carolina, and is ranked G2 - Imperiled by The Nature Conservancy (NatureServe, 2001). It typically occurs above 5000 feet in southern Appalachian spruce-fir forests. This species was planted approximately 30 to 35 years ago at

Table 3-4. State-listed and federally listed plant species reported from within five miles of the proposed windfarms and associated facilities, and federally listed plant species reported from the respective counties.

Common Name	Scientific Name	Federal Status	TN State Status	NC State Status	Buffalo Mtn.[2]	Stone Mtn.[3]
American cranberry	*Vaccinium macrocarpon*	--	T[1]	CAND		•
American Hart's tongue fern	*Asplenium scolopendrium* var. *americanum*	T**	E			•
American manna-grass	*Glyceria grandis*	--	E-P	--		•
Blazing star*	*Liatris helleri*	T**	--	T-SC		•
Blue ridge goldenrod	*Solidago spithamaea*	T**	E	E		•
Canada lily	*Lilium canadense*	--	T	--	•	
Ginseng	*Panax quinquefolius*	--	S-CE	--	•	
Goldenrod*	*Solidago ptarmicoides*	--	E	--	•	
Goldenseal	*Hydrastis canadensis*	--	S-CE	E-SC	•	
Large-tooth aspen	*Populus grandidentata*	--	SPCO	--	•	
Meehan mint	*Meehania cordata*	--	T	--		•
Mountain bluet	*Hedyotis purpurea* var. *montana*	E**	E	E		•
Pale green orchis	*Platanthera flava* var. *herbiola*	--	T	--	•	
Pale St. John-wort	*Hypericum ellipticum*	--	E	--		•
Pink lady-slipper	*Cypripedium acaule*	--	E-CE	--	•	
Spreading avens	*Geum radiatum*	E**	E	E-SC		•
Tall Larkspur	*Delphinium exaltatum*	--	E	E-SC	•	
Tower mustard	*Arabis glabra*	--	T	CAND		•
White beakrush	*Rhyncospora alba*	--	E-P	CAND		•
Witch-alder	*Fothergilla major*	--	T	CAND	•	

[1] Status Abbreviations: E = Endangered; E-CE = Endangered, Commercially Exploited; E-P = Endangered, possibly extirpated; E-SC = Endangered, propagated material can be traded or sold under specific regulation; T = Threatened; T-SC = Threatened, propagated material can be traded or sold under specific regulation; SPCO = Special Concern; S-CE = Special Concern, Commercially Exploited; CAND = Candidate for listing.

[2] Anderson County, Tennessee

[3] Johnson County, Tennessee and Watauga County, North Carolina.

** This species does not have a unique common name; the common name listed is routinely applied to more than one member of this genus.*

*** This federally listed plant species has been reported from outside of a five mile radius of the project site, but within the respective county (or counties) in which the site occurs.*

about 4200 to 4400 feet elevation on Stone Mountain, and was probably meant to be a Christmas tree plantation and/or source of foliage for wreath making.

With the exception of the planted Fraser fir trees mentioned above, no occurrences of federally listed or state-listed plant species were observed during field surveys spanning 50 to 100 feet of the centerline of likely wind turbine locations.

No occurrences of federally listed or state-listed plant species were observed during field inspections along the proposed transmission line connection associated with the Stone Mountain windfarm facility. No transmission line connections to the proposed Regenesys™ sites were surveyed in association with this Alternative.

3.11.2 Threatened and Endangered Terrestrial Animals

The likely presence of federally listed and state-listed terrestrial animals in the vicinity of the windfarm, Regenesys™ Sites and their associated utility connections was determined by reviewing existing information for the areas and by conducting field surveys. Table 3-5 lists the species previously reported in the Buffalo Mountain and Stone Mountain areas (TVA Regional Natural Heritage Project database records).

Based on the natural history, geographic range, documented records and suitable habitat present for federally and state-listed terrestrial animals, many of the species in Table 3-6 are not likely to occur on or directly adjacent to any of the proposed sites. These species and their habitats are discussed below:

Eastern hellbenders inhabit large, clear, fast-flowing streams that contain large flat rocks and logs. This habitat does not exist on either Buffalo or Stone Mountain. Bog turtles occur in bogs, swamps, and meadows that contain clear slow-moving streams with muddy bottoms. Preferred vegetation in these areas includes sphagnum moss and adequate cover in the form of grasses. These habitats do not exist on Stone Mountain but are reported from valleys nearby. Bald eagles nest near reservoirs, rivers, swamps and large lakes where they forage. None of these habitats are located near the project area. Red-cockaded woodpeckers are found in mature to old growth pine forests of the south that contain an open midstory and dense groundcover. Due to the midstory structure, forest stand age and composition, and lack of prescribed fire, no forest stands suitable for this species occur on the project area. Swainson's warblers can be found nesting in forests containing dense undergrowth and may be associated with ravines. In the eastern part of the state, this bird is most often associated with hemlock/rhododendron habitat where a dense understory prevails. Carolina northern flying squirrels are found primarily in mature spruce-fir and in mixed conifer hardwood forests where tree nesting cavities and available food in the form of nuts, seeds, fruits, insects, fungi and lichens are found. They are restricted to higher elevations in the Blue Ridge Mountains. Gray bats are colonial bats which roost and form maternity colonies in caves located along rivers and reservoirs over which they feed.

Buffalo Mountain Area
Four of the animals listed in Table 3-5 were observed at the Buffalo Mountain windfarm site during field investigations. These were the golden-winged warbler, cerulean warbler, Cooper's hawk, and peregrine falcon.

Several pairs of golden-winged warblers occur in the vicinity of the existing Buffalo Mountain windfarm and proposed expansion area. This species typically occupies second-growth areas consisting of a mixture of clumps of shrubs, scattered trees, grassy ground cover, and a forested edge (Nicholson, 1997). This habitat is often found on reclaimed surface mines in the Cumberland Mountains. The breeding range

for this species covers the Great Lakes Region and the much of the Appalachian Mountain Chain. In Tennessee, this bird occurs primarily in the Cumberland Mountains and Cumberland Plateau.

Table 3-5. State-listed and federally listed terrestrial animals reported from within three miles of the proposed windfarm sites, Regenesys™ sites and their associated utility connections, and federally listed terrestrial animals reported from the respective counties.

Common Name	Scientific Name	Federal Status	TN State Status	NC State Status	Buffalo Mtn.	Stone Mtn.
Amphibians						
Eastern hellbender	*Cryptobranchus alleganiensis*		INM[1]	SPCO		•
Weller's salamander	*Plethodon welleri*		INM	SPCO		•
Reptiles						
Bog turtle	*Clemmys muhlenbergii*	T	T	T		•
Birds						
Bald eagle	*Haliaeetus leucocephalus*	T	INM		•	
Cerulean warbler	*Dendroica cerulea*		INM		•	
Common raven	*Corvus corax*		T	STUN		•
Cooper's hawk	*Accipter cooperi*		INM	SPCO	•	•
Golden-winged warbler	*Vermivora chrysoptera*		INM		•	
Peregrine falcon	*Falco peregrinus*		E	E	•	•
Red-cockaded woodpecker	*Picoides borealis*	E	EXT		•	
Swainson's warbler	*Limnothlypis swainsonii*		INM		•	
Yellow-bellied sapsucker	*Sphyrapicus varius*		INM	STUN		•
Mammals						
Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	E	E	E		•
Gray bat	*Myotis grisescens*	E	E	E	•	
Indiana bat	*Myotis sodalis*	E	E	E	•	

[1] *Status Abbreviations: SPCO - Special Concern, INM - In Need of Management, STUN - Status Undetermined; EXT - Extirpated, E - Endangered, T – Threatened*

The breeding range of the cerulean warbler covers a large portion of the eastern United States. This warbler is most abundant in the Cumberland Plateau where it nests in mature, moist deciduous forests. These areas are often on hilly, steep slopes and are characterized by a sparse understory. This bird has also been reported from previously-disturbed areas, like Buffalo Mountain, that have been influenced by mining or timber harvest activities and contain reverted middle-aged forests with some mature trees. The cerulean warbler is fairly common summer resident in the vicinity of the Buffalo Mountain windfarm. A small portion of the forest in the proposed windfarm expansion area is mature enough to support this species.

Cooper's hawks nest in both pine and deciduous woodlands and forest edge habitats. The breeding range of this bird covers most of Tennessee and the United States. Suitable habitat for this bird occurs on the site and it is likely present in the area throughout the year.

The peregrine falcon is a rare migrant through the Buffalo Mountain area. One individual was observed during fall hawk watches. This bird often nests on cliff ledges with overhangs (Nicholson, 1997). Although this bird's range covers a broad geographic area, only a few nesting occurrences of this species have been documented in the Tennessee in recent years. No suitable nesting habitat for this species occurs in the vicinity of the proposed windfarm, and there are no occupied nest sites reported in the vicinity.

Although they have not been reported from the site, potential habitat for two additional species occurs on the site. These are the four-toed salamander (*Hemidactylium scutatum*) and Indiana bat. The site contains small wetlands created by mining and reclamation activities. Some of these wetlands contain mosses and herbaceous vegetation and occur near forests, characteristics of habitat for four-toed salamanders. Secondary roads along the ridgetops of the site where waterholes have formed under a forested setting provide potential foraging habitat for Indiana bats. Indiana bats are colonial bats which hibernate in caves and can be found under loose bark of dead or damaged trees in riparian and upland forests during summer months. Roosting habitat for this species was not identified on the project site, and preliminary bat surveys did not indicate the presence of this species.

A field visit to the proposed Regenesy™ sites (Braden Field, Coal Creek, Ahler Property and Oliver Springs Substation) was conducted to investigate the potential occurrence of protected terrestrial animals and their habitat. No protected terrestrial animals or their habitats were encountered. Due to the amount of previous land disturbance on the sites, no protected terrestrial animals are expected to occur there.

A field visit to the proposed transmission lines was conducted to investigate the potential occurrence of protected terrestrial animals and their habitat. Although there is a high level on land disturbance along each of the existing lines, three protected species may find suitable habit on the on the Buffalo Mountain transmission line connection: four toed salamander, cerulean warbler, and golden-winged warbler. Four toed salamanders may occur in or near wetlands along the route and in or near the wetland located just north of the Coalfield Substation. In order to avoid potential impacts to this salamander, Best Management and Best Construction practices will be implemented during construction activities. The cerulean warbler may find suitable habitat in forests adjacent to the existing Buffalo Mountain transmission line. Likewise, the golden-winged warbler may nest in early successional habitat along this line. No protected terrestrial animals are expected to occur along the Braden Field connection, Ahler Property connection, and along the Oliver Springs Substation route.

Stone Mountain Area

The following five protected terrestrial animals were observed on the Stone Mountain windfarm site: Weller's salamander, Cooper's hawk, peregrine falcon, common raven and yellow-bellied sapsucker.

Weller's salamanders are typically found at high elevations in moist deciduous and spruce -fir forests beneath logs, leaf litter or loose rock. This salamander is restricted to the Blue Ridge Mountains of Tennessee, North Carolina and Virginia. This species was found in several locations within the area of the proposed windfarm, and appears to be fairly common. It has also been reported from further south on Stone Mountain and on nearby Doe Mountain.

Cooper's hawks nest in both pine and deciduous woodlands and forest edge habitats. The breeding range of this bird covers most of Tennessee and the United States. Suitable habitat for this bird occurs on the site and it is likely present in the area throughout the year.

The peregrine falcon is a rare migrant through the Stone Mountain area. One individual was observed during fall hawk watches. This bird often nests on cliff ledges with overhangs (Nicholson, 1997). Although this bird's range covers a broad geographic area, only a few nesting occurrences of this species have been documented in the Blue Ridge mountains in recent years. No suitable nesting habitat for this species occurs in the vicinity of the proposed windfarm, and there are no known occupied nest sites nearby.

Common ravens were observed regularly during the summer and fall at Stone Mountain. Common ravens are most common in the western United States and Canadian Provinces. Ravens nest in the mountainous regions of northeast Tennessee along cliff ledges with overhanging rock or in coniferous trees (Nicholson, 1997). Common ravens range widely, and the birds present at Stone Mountain likely nested elsewhere, as no suitable cliff nest habitat occurs in the vicinity of the potential windfarm site. Ravens may forage or roost on Stone Mountain.

Yellow-bellied sapsuckers were also observed on the site during field investigations. This woodpecker nests in both dead and live trees in high-elevation deciduous forests with an open canopy. This site is currently one of only three known nesting localities for yellow-bellied sapsuckers in Tennessee. This woodpecker's breeding range covers a broad geographic area that includes much of the southern portions of the Canadian Provinces and the northeastern U.S. However, it is considered a rare nesting bird in Tennessee, because it has limited breeding range in the Southern Appalachians. Suitable habitat for this species occurs on a large portion of the southern end of the windfarm site.

Although they have not been reported from areas within three miles of the Stone Mountain site, four mammals and one bird, listed as In Need of Management in Tennessee, may find suitable habitat there. Common shrews (*Sorex cinereus*) occur in a variety of habitats including among rocks and logs in moist woodlands, marshy areas, bogs, and open fields. Smoky shrews (*Sorex fumeus*) can be found in moist woodlands with ample rocks, leaf litter and decaying logs and in grassy areas along streams. Southeastern shrews (*Sorex longirostris*) occur in a variety of habitats, but are typically associated with moist woodlands or wetlands where rotting logs and leaf litter occur. Hollow trees on the site provide potential habitat for eastern big-eared bats (*Corynorhinus rafinesquii*). This bat occurs in mature forested areas near water and forms maternity colonies in hollow trees, abandoned buildings and sandstone bluffs. Preliminary bat surveys did not record the presence of this species.

Additionally, one federally listed species, the Indiana bat, may forage on the site. Waterholes in the old jeep along the forested crest of the mountain provide potential foraging habitat for Indiana bats. Suitable roosting habitat for this bat was not observed on the project site, and preliminary bat surveys did not record the presence of this species. Although the elevation of the windfarm site, 4100 - 4500 feet, is above the altitudinal range of known summer colonies of the Indiana bat in the Southern Appalachians, the species could fly over Stone Mountain during its spring or fall migrations.

A small amount of potential habitat for the golden-winged warbler occurs at the north end of the proposed Stone Mountain windfarm site. This bird typically occupies second-growth areas consisting of a mixture of clumps of shrubs, scattered trees, grassy ground cover, and a forested edge (Nicholson, 1997). The species was not observed there during summer surveys, and there are no reports of it from the surrounding area.

The proposed Regenesys™ sites at Mountain City Industrial Complex, Shouns Substation, and at Johnson County Industrial Park have been disturbed previously and provide very limited wildlife habitat. The sites can be described as an agricultural plot, a maintained field, and a graded lot, respectively. Therefore, no protected terrestrial animals are expected to occur on these sites.

No transmission line connections were reviewed for this alternative.

3.11.3 Threatened and Endangered Aquatic Animals

Buffalo Mountain Area
The Buffalo Mountain windfarm is located on the divide between the Clinch River watershed and the New River watershed. Several Federally listed mussels are historically known from the Clinch River system in Anderson and Roane Counties, but none are currently known or likely to inhabit streams in the Poplar Creek drainage, which drains part of the windfarm site and the potential Regenesys™ sites. The Tennessee dace (*Phoxinus tennesseensis*), listed as In Need of Management by the Tennessee Wildlife Resources Agency (TWRA), is the only listed species recently reported from the Poplar Creek system. It could occur in the vicinity of the Braden Field Regenesys™ site.

Two listed fish species, the ashy darter (*Etheostoma cinereum*), listed as Threatened by TWRA, and the emerald darter (*Etheostoma baileyi*), listed as In Need of Management by TWRA, are known to occur in streams in the New River system in Anderson and Campbell Counties.

Stone Mountain Area
No federally listed or state-listed aquatic animal species are known from the vicinity of any of the facilities proposed for development in the Stone Mountain area.

3.12 Visual Resources

Buffalo Mountain Area

Buffalo Mountain Windfarm
The visual character surrounding the site is a landscape of narrow valleys and steep wooded mountains, with wide spread evidence of previous strip-mining. Mining activities have altered the natural contour and skyline of the mountains by creating various benches, knobs, and areas without trees that form unnatural ridgetop profiles. Reclamation vegetation has become stabilized and trees are beginning to fill some areas where forest cover was removed. The ridgetop project site has a similar visual character. It is located along the Patterson Mountain section of Buffalo Mountain, and runs generally northward on the ridge about 2 miles. There are several re-contoured areas and the vegetation is mostly grass and young trees, except a few spots where the woodland remains undisturbed. Three wind turbines are currently located near the south end of the ridge. An existing transmission line corridor with laced towers parallels the ridge on the west, crosses it just north of the turbines, then parallels the east side. A smaller line on wood poles runs from the turbines down the mountain along Windrock Road and around Tupperville to join another line at S. R. 62. A meteorological tower is located north of the crossing, and there are a few communications towers at the south end of the ridge, including a television transmitter tower about 1000 feet tall. A gravel access road begins at Windrock Road below near Union Valley Church, and climbs to the top through a series of switch-backs. The ridge elevation averages 3300 feet, about 2500 feet above the valleys nearby.

Windrock and Buffalo Mountains provide the dominant visual background for the city of Oak Ridge where the mine-altered ridge tops are generally visible from distances of 8 miles or more. The scenic attractiveness is common and scenic integrity is moderate. The transmission line ROW on the mountainside can be seen from Oak Ridge and along Highway 62 to Oliver Springs. The existing turbines are visible from several locations around the Oak Ridge area, generally at distances of 9 miles or more. At this distance they appear relatively small, and are hardly noticeable due to the visual congestion of urban development seen in middleground views of 4 miles or less. These views include communications towers, storage tanks and other features located on the lower ridges around the city.

These mountain ridges also provide the dominant background visible from a number of small surrounding communities. They can be seen at distances of 6 miles or more from Kelly Town to Clinton to the southeast, and at distances of 4 miles or less from Fork Mountain to Rosedale along Highway 116 to the northwest. The existing turbines are visible from relatively few points in these areas due to the arrangement of steep ridges and valleys. The project site is visible from the fire tower in Frozen Head State Natural Area and occasionally from ridgetop trails. The distance from Frozen Head to the site is about 6 miles.

Braden Field Regenesys™ Site
The visual character is a level rural valley about 900 feet wide, surrounded by steep wooded ridges on 3 sides and opening to the south along a paved rural road. The scenic attractiveness is common and scenic integrity is moderate. The valley is primarily an open grass area bisected by Poplar Creek, with pasture on the north end and a transmission line corridor through the deciduous woodland along the east side. A grass airstrip runs up the center with about 2 dozen low hanger sheds on the east side. A gravel access road runs north from the paved road and then along the west side of the hanger sheds. The proposed site lies along the west edge of the valley near the hangers. An electrical connection route would extend from this location across the site to the existing transmission line, possibly underground. The site can be seen from several residences along Donovan Road and briefly by motorists on Dutch Valley Road to the north. It is also visible from a residence and sparse traffic on Airport Road to the south.

Coal Creek Regenesys™ Site
The visual character is a relatively narrow rural highway corridor with sparse commercial development, located between two steep wooded ridges about 300 feet high. A tree-lined creek parallels SR 62 along the south side. The site is a terrace cut in the hillside by former strip mine activity, and is located about 50 feet above the highway on the north side. It is a gently sloping terrace with a steep wooded slope down to the road and a rocky wooded slope along the north edge. The area is covered with a mix of meadow grass, brush, and small trees. A gravel road provides access from a used car lot bordering the west side, and a few small businesses border the site on the east. A construction company is located across the road with a few pieces of related equipment stored on each side. Scenic attractiveness is minimal while scenic integrity is moderate. The access drive and part of the site are visible to eastbound traffic, while the trees and elevation difference obscure most views from the westbound traffic. There may also be incidental views from a few homes east of the small commercial area.
An electrical connection from this site would follow one of two routes as described in Chapter 2. Option 1 follows an existing line west to the Coalfield substation, and the route is visible to motorists and a few residents along a 2 mile section of SR 62. Option 2 follows an existing line southeast for about 2 miles to the Oliver Springs substation. This route and other utility lines are visible from the mixed development and traffic along a 4-lane section SR 62.

Ahler Property Regenesys™ Site
The visual character of the area is a linear open valley with scattered residential development, located between two wooded ridges. The eastern ridge rises gently about 250 feet above the valley, while the western ridge rises steeply about 500 feet with occasional rock outcrops. A railroad line and wooded creek run along the east side of the valley and SR 61 runs near the middle. The valley is primarily grass lawns and horse pastures, with relatively large 1 and 2 story homes set back from the road. Several groups of homes and a church are located nearby to the north. A wooden pole transmission line crosses the valley at a small concrete plant just south of the site. The proposed site lies between the two lane highway and railroad track, with a home on the north side. It is a gently sloping open grass field with a small pond in the middle and a few trees along the south edge. Scenic integrity of the pastoral area is moderately low and scenic attractiveness is common. The site can be seen from the surrounding residences, churches, and passing traffic on the highway.

An electrical connection route from this site would follow an existing line as described in Chapter 2. Several other utility lines are located along this route on each side of SR 61. The route is visible from homes, churches, and other development along the highway, as well as by passing motorists.

Oliver Springs Substation Regenesys™ Site
The visual character is a predominantly wooded rural residential area with rolling well-dissected topography. The gently sloping site spans a low-lying drainway, and the cover is mostly deciduous woodland. A railroad track forms the northern side of the site and the small substation is located on the opposite side of the tracks. The substation has a moderately low amount of night security lighting. A variety of homes are scattered around the site and a transmission line ROW angles across it. Scenic integrity is moderately low and scenic attractiveness is common. The site is visible from a few surrounding homes to the north and west, two local streets, and briefly from the Strutt Street railroad bridge to the west.

An electrical connection from this site would follow about the same route as described for the Coal Creek Option 2, along with a short connector to the substation as described in Chapter 2. The route has the same public visibility along the highway, and is also seen from several homes around the substation.

Stone Mountain Area

Stone Mountain Windfarm
The visual character surrounding the site is a rural landscape of steep linear ridges and gently sloping pastoral valleys. The ridges have a natural undisturbed appearance with very little man-made alteration and generally no visible structures. The project site has a similar character. It runs about 2 miles along the top of Stone Mountain where the ridge and side slopes are predominately covered with small rock outcrops and woodland. A narrow paved access road begins at U. S. Highway 421 on the east side near Evergreen Baptist Church. It climbs to the north end of the site through a series of switch-backs, and runs about a half mile on top to reach a couple meteorological and communications towers. A small power line comes up from the west side and follows the road to the towers. A narrow jeep trail continues south along the top. The ridge elevation averages 4400 feet MSL, about 2000 feet above the valley on the west side and 1400 feet above the east side.

The visual character of the western valley is predominantly agricultural. Development density and visual congestion is somewhat greater at the north end near U.S. Highway 421, where some other housing, small industries, and a textile plant are located. State Highway 167 runs along the broad linear valley on the west side, and the county airport is located near the central open area. The rural landscape is a mix of pasture and woodlands separated by tree-lined fence rows and wooded creek bottoms. It has gently

rolling terrain with small streams and mildly dissected uplands. The tranquil scenic countryside includes scattered farmsteads, ponds, sparse residential development, occasional churches, and a variety of historic structures. Most buildings are two stories or less and are visible among but not above the trees, as is a relatively new transmission line. No communication towers, storage tanks or similar tall structures can be seen on or above the surrounding wooded ridgetops. The landscape is relatively dark at night, except for the light of occasional motorists and scattered homes. The sky is relatively dark except for a somewhat brighter glow in the direction of Johnson City and Mountain City. The lowlands east of Stone Mountain have a similar pastoral character with a much narrower valley, steeper terrain, and more heavily dissected hills.

Stone Mountain provides a visually dominant backdrop for the attractive rural landscape and is visible from most of the western valley. The scenic mountain has a natural profile and undisturbed appearance that is seen in the middleground views of residents and motorists up to four miles away. A narrow powerline clearing is the only visible alteration and is hardly noticeable on the mountainside. Scenic attractiveness is moderately distinct and scenic integrity is high. The ridge top is visible from the Appalachian Trail over 10 miles away, and from the Iron Mountain Trail about 9 1/2 miles away. From the eastern side the ridge top is visible at distances of 2 miles or less by residents and motorists along the valley corridor of Highway 421, a state-designated scenic highway. Similar views can be seen as close as 2/3 of a mile by residents and motorists along County Route 2460.

Johnson County Industrial Park Regenesys™ Site
The visual character is a small rural industrial area on a moderately sloping hillside along Highway 67 in an open pastoral valley. The scenic attractiveness is minimal and scenic integrity is low. The area is bordered by a few homes and mobile home park to the north, wooded ridges and Doe Mountain to the east, a prison facility to the south and a mixed residential area across the road to the west. The graded site lies midway up the slope behind 1 and 2 story industrial buildings and below an adjacent storage tank. The top of the tank is about 60 feet above the site. The entire tank and earth slope below it can be seen in the foreground from the highway and residential area.

Shouns Substation Regenesys™ Site
The visual character is a predominately open agricultural area at the edge of a broad pastoral valley. The location is bordered by a small substation and mixed housing to the north, a couple hillside homes and Highway 167 to the west, a large farmstead to the south, and corn fields across the Town Creek to the east with Stone Mountain in the background. Scenic attractiveness is common and scenic integrity is moderate. The site is a level grassy field with the tree-lined creek on the east side and scattered homes beyond. A transmission line runs along the east side to the substation, which has moderately low night lighting. The site can be seen from the surrounding homes, farmsteads, and by passing motorists on Highway 167.

Mountain City Industrial Complex Regenesys™ Site
The visual character is similar to the Shouns Substation site on the west side of Town Creek. Scenic attractiveness is minimal and scenic integrity is moderately low. This site is a corn field at the south end of a small industrial area. It is bordered by mixed housing and 1 story light industrial buildings to the north, the tree-lined creek and farmstead structures to the west, and several homes on a local road along Roan Creek to the south. A textile plant is located to the east with large, broadly-horizonal light-colored buildings and storage tanks that visibly contrast with the surrounding area. The site can be seen from the surrounding homes, farmsteads, and by motorists on the nearby roads.

3.13 Noise

At high levels noise can cause hearing loss, at moderate levels noise can interfere with communication, disrupt sleep, and cause stress, and at low levels noise can cause annoyance. Noise is measured in decibels (dB), a logarithmic unit, so an increase of 3 dB is just noticeable and an increase of 10 dB is perceived as a doubling of sound level. Because not all noise frequencies are perceptible to the human ear, A-weighted decibels (dBA), which filter out sound in frequencies above and below human hearing, were used for this assessment.

Both the Environmental Protection Agency (EPA) and the Department of Housing and Urban Development (HUD) have established noise guidelines. EPA guidelines are based on an equivalent sound level day/night (DNL) which is a 24-hour average sound level with 10 dB added to hours between 10 p.m. and 7 a.m. since people are more sensitive to nighttime noise. EPA recommends a guideline of DNL less than 55 dBA to protect the health and well-being of the public with an adequate margin of safety. HUD guidelines use an upper limit DNL of 65 dBA for acceptable residential development and an upper limit DNL of 75 dBA for acceptable commercial development. TVA generally uses the EPA guideline of 55 dBA DNL at the nearest residence and 65 dBA at the property line in industrial areas to assess the noise impact of a project. In addition, TVA gives consideration to the Federal Interagency Committee on Noise (FICON, 1992) recommendation that a 3 dB increase indicates possible impact, requiring further analysis when the existing DNL is 65 dBA or less.

Annoyance from noise is highly subjective. The Federal Interagency Committee on Noise (FICON, 1992) used population surveys to correlate annoyance and noise exposure. Table 3-6 estimates the percentage of residential population that would be highly annoyed from a range of background noise and the average community reaction description that would be expected.

Table 3-6. Estimated Annoyance from Background Noise (FICON, 1992).

DNL (dBA)	Percent Highly Annoyed	Average Community Reaction
75 & above	37	Very severe
70	25	Severe
65	15	Significant
60	9	Moderate
55 & below	4	Slight

Buffalo Mountain Area

Buffalo Mountain Windfarm

The site of the proposed Buffalo Mountain windfarm expansion is located on a ridge top in an isolated industrial setting on an old strip mine. There are already three wind turbines operating at this site. Although no sound measurements were taken, background noise when the turbines are not operating is expected to be approximately 40 dBA during the day and 30 dBA at night. This is typical of a very quiet rural environment. When the wind turbines are operating, noise levels are expected to be approximately 100 dBA at the base of a turbine, but only about 53 dBA 328 feet (100 meters) from the source and 37 dBA at 0.25 mile (402 meters) from the source. There are no sensitive noise receptors near the windfarm.

Braden Field Regenesys™ Site
This site is located in a rural setting with residential and agricultural land use. It is immediately adjacent to an airport with infrequent take-offs and landings of small private aircraft. No measurements were taken, but background DNL was estimated to be 50 dBA based on the population density of the area (Committee on Hearing, Bioacoustics and Biomechanics, 1977). This would be a daytime average of 50 dBA and a nighttime average of 40 dBA. The closest sensitive noise receptor is a home approximately 600 feet (183 meters) from the proposed site.

Coal Creek Regenesys™ Site
This site is located in a rural setting with residential and commercial land use. No measurements were taken, but background noise was estimated to be 50 dBA based on the population density of the area. This would be a daytime average of 50 dBA and a nighttime average of 40 dBA. The closest sensitive noise receptor is a home located approximately 300 feet (91 meters) from the proposed site. There are also businesses, including a hardware store and a used car lot, approximately 150 feet (46 meters) from the proposed site.

Ahler Property Regenesys™ Site
This site is located in a rural setting with residential and agricultural land use. No measurements were taken, but background noise was estimated to be 50 dBA based on the population density of the area. This would be a daytime average of 50 dBA and a nighttime average of 40 dBA. The closest sensitive noise receptor is a home located approximately 300 feet (91 meters) from the proposed site.

Oliver Springs Substation Regenesys™ Site
This site is located in a rural setting with residential and agricultural land use. No measurements were taken, but background noise was estimated to be 50 dBA based on the population density of the area. This would be a daytime average of 50 dBA and a nighttime average of 40 dBA. The closest sensitive noise receptor is a home located approximately 75 feet (23 meters) from the proposed site.

Stone Mountain Area

Stone Mountain Windfarm
The proposed windfarm site is located on a ridge top in a rural setting with some nearby residential land use. No measurements were taken, but background DNL was estimated to be 40 dBA based on the population density of the area. This would be a daytime average of 40 dBA and a nighttime average of 30 dBA. This is typical of a very quiet rural environment. The closest sensitive noise receptor is a home approximately one-half mile (0.8 km) from the site.

Johnson County Industrial Park Regenesys™ Site
This site is located in an industrial area surrounded by rural residential and agricultural land use. No measurements were taken, but background DNL was estimated to be 40 dBA based on the population density of the area. This would be a daytime average of 40 dBA and a nighttime average of 30. The closest sensitive noise receptor is a home approximately 450 feet (137 meters) from the proposed site.

Shouns Substation Regenesys™ Site
This site is also located in an industrial area surrounded by rural residential and agricultural land use. No measurements were taken, but background DNL was estimated to be 42 dBA based on the population density of the area. This would be a daytime average of 43 dBA and a nighttime average of 33. The closest sensitive noise receptor is a home approximately 150 feet (46 meters) from the proposed site.

Mountain City Industrial Complex Regenesys™ Site
This site is also located in an industrial area surrounded by rural residential and agricultural land use. No measurements were taken, but background DNL was estimated to be 42 dBA based on the population density of the area. This would be a daytime average of 43 dBA and a nighttime average of 33. The closest sensitive noise receptor is a home approximately 150 feet (46 meters) from the proposed site.

3.14 Solid and Hazardous Waste Management

3.14.1 Solid Waste

Buffalo Mountain Area
The town of Oliver Springs, Tennessee has a population of approximately 3,300 people. Solid waste collection occurs 4 days per week and the cumulative amount is then transferred once per week to Chestnut Ridge Landfill, in Heiskell, Tennessee (Collins, 2001). Chestnut Ridge Landfill has 35 years remaining on its operating permit. The remaining capacity available over the 35 year period is 16.8 million tons. The current average daily input is approximately 1,800 tons per day (Owen, 2001).

Stone Mountain Area
Solid Waste collection in Mountain City, Tennessee, is provided by four to five private haulers who contract with local residents and businesses on a yearly basis. The haulers collect the waste and deposit it at the Johnson County Solid Waste Transfer Station located in the Johnson County Industrial Park. One to two semi trailers of solid waste are removed from the transfer station per day, by Waste Management, Inc., contracted by Johnson County to provide this service (Sluder, 2001). The ultimate destination for the collected waste is the Iris Glenn Environmental Center in Johnson City, Tennessee. This landfill has 20 years remaining on its operating permit and a remaining available capacity of 7.7 million tons. The average daily input into this facility is approximately 1,400 tons per day (Boggs, 2001).

3.14.2 Hazardous Waste

Hazardous materials (HMs) are those substances defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. Section 9601, et. seq.), as amended by the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 300-372), and the Toxic Substances Control Act (TSCA) (15 U.S.C. Section 2601, et seq.). The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. 6901, et seq.), which was further amended by the Hazardous and Solid Waste Amendments (HSWA), defines hazardous wastes. In general, both hazardous materials and wastes include substances that, because of their quantity, concentration, physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare or to the environment when released or otherwise improperly managed (TVA, 2001).

RCRA Subtitle C (40 CFR Parts 260 through 270) regulations are administered by the EPA and are applicable to the management of hazardous wastes. Hazardous waste (HW) must be handled, stored, transported, disposed, or recycled in accordance with these regulations.

3.15 Land Use

Buffalo Mountain Area

Buffalo Mountain Windfarm
The windfarm site is in a rural, unincorporated part of Anderson County, Tennessee. Three wind turbines already exist on the site, and the primary land uses of the surrounding area are forest management and coal mining. Several communications towers are located 0.5 to 1 mile south of the windfarm site. There are presently no zoning regulations governing land use on Buffalo Mountain. No prime farmland occurs in the vicinity of the windfarm.

Braden Field Regenesys™ Site
The Braden Field site is in a rural, unincorporated part of Anderson County, Tennessee, just outside the Oliver Springs city limits. The site is adjacent to a small airport, and primary land uses in the surrounding area are residential and agricultural. There are presently no zoning regulations governing land use on this site. Soils on the site are classified in the Soil Survey of Anderson County, Tennessee, as Newark variant loam, 0 to 3 percent slopes, and are considered to be prime farmland.

Coal Creek Regenesys™ Site
The Coal Creek site is in an unincorporated part of Morgan County, Tennessee, on the edge of Oliver Springs. Primary land uses in the surrounding area are commercial and forestry. There are presently no zoning regulations governing land use on this site, and the site is not classified as prime farmland.

Ahler Property Regenesys™ Site
The Ahler site is in an unincorporated part of Roane County on the outskirts of Oliver Springs. Current land use on the site is agricultural, and primary land uses in the surrounding area are agricultural, rural residential, and commercial/industrial. Much of the site is classified as prime farmland.

Oliver Springs Substation Regenesys™ Site
The Oliver Springs Substation site is in an unincorporated part of Anderson County, Tennessee, just outside the Oliver Springs city limits. The site is mostly forested and adjoins a railroad track. The primary land use in the surrounding area is rural residential. There are presently no zoning regulations governing land use on this site, and the site is not classified as prime farmland.

Stone Mountain Area

Stone Mountain Windfarm
The windfarm site is in a rural, unincorporated part of Johnson County, Tennessee. The primary land use is forest management. Several rural residences and small farms occur at the base of Stone Mountain; on the east side of the mountain, some of these residences are within half a mile of the proposed windfarm site. Parts of Stone Mountain about 3 miles south of the windfarm site, near Locust Gap, are being developed as the Cherokee Cove camp and retreat center, and as resort/second home/retirement communities. No prime farmland occurs on the windfarm site.

There are presently no zoning regulations governing land use on Stone Mountain. The Tennessee Legislature, at the request of Johnson County, passed an act in 1996 governing development on mountain tops in Johnson County. This act is entitled the "Mountain Ridge Protection Act of Johnson County" (House Bill 3314), and requires the County to file with the Board of County Commissioners and the Register of Deeds a map identifying the "crests of protected mountain ridges." Under the act, "crest of a protected mountain ridge" is defined as the uppermost line of a mountain or chain of mountains from

which the land falls away on at least two sides to a lower elevation, having an elevation of at least 3000 feet, and having an elevation at least 500 feet above the elevation of an adjacent valley floor (§ 2(a)). No buildings may protrude more than 35 feet above the crest of a protected mountain ridge. TVA understands that a map identifying these crests has so far not been filed with the Board of County Commissioners or the Register of Deeds (Sluder, 2001). The restrictions of the Act apply only to "buildings" and specifically do not apply to "equipment used for the transmission of electricity, communications, or other public utilities" (§ 3). The Act, therefore, would likely not apply to the construction on Stone Mountain of a facility such as a windfarm designed for use as a public utility generating wind power. TVA's interpretation of the Act as a law not applying to windmills is supported by the County, as on February 21, 2002, the Johnson County Board of Commissioners approved a resolution stating that the ridge law, in their opinion, does not preclude the proposed windfarm (Sluder, 2002).

The North Carolina Mountain Ridge Protection Act of 1983 (N.C. Gen. Stat. §§ 113A-205 et seq. (1999)) prohibits the construction of buildings or structures over 40 feet tall on protected mountain ridges in North Carolina. As per the comments on the draft EA submitted by the North Carolina Attorney General, the Act would apply to structures such as wind turbines located in North Carolina. While a portion of Stone Mountain south of the proposed windfarm site is on the Tennessee-North Carolina border, none of the proposed activities would be in North Carolina. TVA recognizes that some of the visual impact of the Stone Mountain alternative would be experienced in North Carolina. At this juncture, TVA's preferred alternative is the Buffalo mountain site. If the Stone Mountain site is given consideration for the location of a windfarm in the future, TVA will be mindful of North Carolina's policies in this area.

Johnson County Industrial Park Regenesys™ Site
This site is in a rural industrial park, and the site has already been graded in anticipation of industrial development. The primary land uses in the surrounding area are agricultural and rural residential. There are presently no zoning regulations governing land use on this site. None of the site is classified as prime farmland.

Shouns Substation Regenesys™ Site
This site is on the edge of Mountain City, adjacent to an electrical substation. The primary land uses in the surrounding area are agricultural and residential. There are presently no zoning regulations governing land use on this site. The lower portion of the site, occupied by the Hamblen loam soil, is classified as prime farmland.

Mountain City Industrial Complex Regenesys™ Site
This site is in a small industrial park on the edge of Mountain City. A few small industrial facilities occur elsewhere in the industrial park, and the proposed site is presently farmed. The primary land uses in the surrounding area are agricultural and residential. There are presently no zoning regulations governing land use on this site. Soils on the site include Hamblen loam, Whitwell silt loam, and Prader silt loam. All of these soils are considered to be prime farmland.

3.16 Transportation

Buffalo Mountain Area

Buffalo Mountain Windfarm
The Buffalo Mountain Windfarm is located outside Oliver Springs, Tennessee in Anderson County. The site is accessible via a 9-mile long gravel roadway which intersects with State Route 116 about half a mile north of the community of Rosedale. State Route 116 intersects with State Route 62 about 8 miles west of Oliver Springs at Petros. State Route 62 and State Route 116 are two-lane routes which travel through some small communities toward the site. The general alignment of these roads is curvy and hilly. State Route 62 is a higher quality route with better alignment and average traveling speeds of 45-55 mph. State Route 116 becomes very curvy and hilly just north of Brushy Mountain State Prison as the road crosses a ridge. There are limited to no shoulders and steep side slopes in this area. The gravel roadway to the site was previously utilized for hauling coal and for construction deliveries for the existing windfarm. Rutting is evident along this roadway and additional upgrading would be required in areas for access to the site.

The latest available 1999 Average Daily Traffic (ADT) counts in close proximity to the site indicate approximately 6,570 vehicles per day (vpd) on State Route 62 just south of State Route 116 and 210 vpd on State Route 116 (TDOT 1999).

Braden Field Regenesys™ Site
This site is located northwest of Oak Ridge, Tennessee and south of the Buffalo Mountain windfarm site. Access to the site is from State Route 61/62 to Airport Road. Airport road runs northeast about a mile to a gravel roadway, which is the entrance to the air strip. This road would be widened and paved to provide for site access. The site is located on the back side of the airplane hangers. State Route 61/62 is a four-lane divided highway in the vicinity of the site. Airport Road is a fairly narrow paved roadway which travels through a residential area. Traveling speeds are approximately 25 mph on this roadway. A CSX Railroad crosses Airport Road without any automated signalization.

The latest available 1999 ADT counts in close proximity to the site indicate approximately 22,250 vpd on State Route 61/62 just north of Airport Road and 750 vpd on Airport/Batley Road (TDOT 1999).

Coal Creek Site
This Regenesys™ site is located in Morgan County just north of the Oliver Springs, Tennessee city limits, west of Oak Ridge and south of the Buffalo Mountain Wind farm site. Accessibility to the site is from State Route 62 to an existing gravel access road located directly off SR 62. This existing gravel road, which passes through portions of a used car dealership, would be upgraded to provide access to the site. State Route 62 is a high-quality two-lane highway with good shoulder width and traveling speeds in the vicinity of the site.

The latest available 1999 ADT counts in close proximity to the site indicate approximately 8,580 vpd on State Route 62 just west of the site.

Ahler Property
This Regenesys™ site is located in Roane County, approximately two miles southwest of Oliver Springs, Tennessee and south of the Buffalo Mountain Wind farm site. Accessibility to the site is from State Route 61 to an existing gravel roadway. The site is bound by this roadway, a cement plant, a Norfolk Southern mainline railroad and the highway. A new access road of less than ½ mile long would be constructed to provide direct access to the site from SR 61. State Route 61 is a high quality two-lane highway with good traveling speeds and good shoulder width in the vicinity of the site.

The latest available 1999 ADT counts in close proximity to the site indicate approximately 7,660 vpd on State Route 61 near the site.

Oliver Springs Substation
This Regenesys™ site is located in Anderson County approximately 1 mile southeast of Oliver Springs, Tennessee, west of Oak Ridge, and south of the Buffalo Mountain Wind farm site. Accessibility to the site is from State Route 61/62 and south on Strutt Street approximately 3/4 mile. There is currently no direct access to the site; however, access from Strutt Street could be via McGhee Road or Patterson Circle Road by means of a short access road of less than 300 yards. Both of these roads are fairly narrow roadways with poor alignment and low traveling speeds through residential areas. Access from McGhee Road would be adjacent to the Oliver Springs Substation and would require a mainline Norfolk Southern track crossing. Access from Patterson Circle would require an access road in close proximity to residences; however, this access road would not require a track crossing as Strutt Street crosses over the mainline by bridge. State Route 61/62 is a four-lane divided highway in the vicinity of the site with speed limits of approximately 40-45 mph.

The latest available 1999 ADT counts in close proximity to the site indicate approximately 22,250 vpd on State Route 61/62.

Stone Mountain Area

Stone Mountain Windfarm
The windfarm site is located 7-9 miles south of Mountain City, Tennessee in Johnson County. The site is accessible via U. S. Highway 421 approximately 7 miles southeast of Mountain City to either Grover Reece Road (which turns into Stone Mountain Road) or Bulldog Road. These roadways are located about half a mile apart on US 421. Both of these paved roads approach Stone Mountain from the east. The Grover Reece Road/Stone Mountain Road access road is approximately 3 miles to the site from US 421, whereas the Bulldog Road is approximately 4 miles from US 421 to the site. Generally, the Bulldog Road access is flatter, except for a portion of unpaved roadway between State Line Gap and Vaught Gap, where the grade is approximately 12% over ¾ mile. Access to the site via Bulldog Road would require major upgrading of this portion of road where the pavement ends and a trail exists. Either alternate route chosen would require some upgrading to meet minimum requirements for transport of excessively heavy loads. A severe switchback and small bridge at Bulldog Creek would also require upgrading for transport of heavy vehicles if this route is chosen. U. S. Highway 421 is a high quality two-lane route in the vicinity of the site with good traveling speeds of approximately 55 mph in the vicinity of the site. Both of these alternate routes are very curvy and extremely steep.

The latest available 1999 ADT counts in close proximity to the site indicate approximately 5,090 vpd on U. S. Highway 421 and 560 vpd on Bulldog Road (TDOT 1999). There are no available traffic counts on Grover Reece Road.

Johnson County Industrial Park Regenesys™ Site
This Regenesys™ site is located southwest of Mountain City, Tennessee and northwest of the Stone Mountain windfarm site. Access to the site is via State Route 67 approximately 6 miles south of Mountain City to Pedro Shouns Road. State Route 67 is a high to mid-quality two lane route with traveling speeds of 45-55 mph. From Route 67, Pedro Shouns Road south runs about a mile to the Johnson County Industrial Park. Pedro Shouns is a paved two-lane road which passes a few residences. A new paved access road would be constructed to the site from Pedro Shouns Road.

The latest available 1999 ADT counts in close proximity to the site indicate approximately 5,670 vpd on State Route 67 (TDOT 1999). There are no available traffic counts on Pedro Shouns Road.

Shouns Substation Regenesys™ Site
This Regenesys™ site is located south of Mountain City, Tennessee and north of the Stone Mountain windfarm site. The site is located along State Route 167, or Forge Creek Road, about a mile west of U.S. Highway 421. U.S. Highway 421 is high quality four-lane divided highway. Forge Creek Road is a high-quality two-lane route which travels through a residential area with traveling speeds of 35 mph; south of the site speeds increase to 45 mph. The gravel access road to the substation would be extended, widened and paved about half a mile to the site.

The latest available 1999 ADT counts in close proximity to the site indicate approximately 13,750 vpd on U.S. Highway 421 just north of State Route 167 and 4,030 vpd on State Route 167 (TDOT 1999).

Mountain City Industrial Complex Regenesys™ Site
This Regenesys™ site is located south of Mountain City, Tennessee and north of the Stone Mountain windfarm site. Road access to the site is off of Dotson Lane, which intersects with State Route 167, or Forge Creek Road, a little less than a mile south of the juction of Route 167 and U.S. Highway 421. Industrial Drive, which provides road access to the industrial complex, intersects Dotson Lane about 300 feet from Route 167. U.S. Highway 421 is high quality four-lane divided highway in the vicinity of the site. Forge Creek Road is a high-quality two-lane route which travels through a residential area with traveling speeds of 35 mph; further south speeds increase to 45 mph. An access road would be required from Industrial Drive to the site.

The latest available 1999 ADT counts in close proximity to the site indicate approximately 13,750 vpd on U.S. Highway 421 just north of State Route 167 and 4,030 vpd on State Route 167 (TDOT 1999).

3.17 Environmental Justice

Buffalo Mountain Area
The Buffalo Mountain Windfarm is located in Census Tract 207 in Anderson County, Tennessee. Under sub-alternative 1, the Regenesys™ facility would be in Anderson County, Census Tract 210; under sub-alternative 2, it would be in Morgan County, Census Tract 1104; under sub-alternative 3, in Roane County, Census Tract 309; and under sub-alternative 4, in Anderson County, Census Tract 210. The minority population of Anderson County, according to the 2000 Census of Population, is 5,206, or 7.3 percent of the total population; the minority population of Morgan County is 741, or 3.8 percent of the total, and in Roane County, 2,711, or 5.2 percent. All of these are well below the state average of 20.8 percent. The minority population in Census Tract 207 is 2.2 percent; in Census Tract 210, 3.8 percent; in Census Tract 1104 in Morgan County, 1.4 percent; and in Census Tract 309 in Roane County, 3.6 percent. All of these are below their respective county levels and well below the state average.

The poverty rate in Anderson County in 1998, as estimated by the U. S. Bureau of the Census, was 13.1 percent, the same as the state average. Morgan County was higher, at 19.2 percent, and Roane slightly higher, at 13.8 percent. Recent estimates are not available for subcounty areas. However, the 1990 Census of Population showed poverty rates of 28.8 percent in Census Tract 207 and 18.4 percent in Tract 210, compared to a rate of 14.3 percent for Anderson County and 15.7 percent for the state. For Census Tract 1104 in Morgan County, the rate was 19.2 percent, compared to a Morgan County rate of 20.2; the rate in Census Tract 309 in Roane County was 15.3, compared to a Roane County rate of 16.0.

Stone Mountain Area
The Stone Mountain windfarm site is located in Census Tract 9563 and near Tract 9564 in Johnson County, Tennessee; the first of the three alternative locations for the Regenesys™ facility is in Census Tract 9561 in Johnson County, while the other two are in Tract 9563 in Johnson County. The minority population of Johnson County, according to the 2000 Census of Population, is 738, or 4.2 percent of the total population. This is well below the state average of 20.8 percent. The minority population in Census Tract 9563 is 2.6 percent; in Tract 9564, 2.2 percent; and Tract 9561, 10.9 percent. All of these rates are well below the state average.

The poverty rate in Johnson County in 1998, as estimated by the U. S. Bureau of the Census, was 21.0 percent, higher than the state average of 13.1. Recent estimates are not available for subcounty areas. However, the 1990 Census of Population showed poverty rates of 28.4 percent in Census Tract 9563, 27.8 percent in Tract 9564, and 28.6 percent in Tract 9561. These are all about the same as the rate of 28.5 percent for Johnson County, but much higher than the rate of 15.7 percent for the state.

3.18 Water Supply & Wastewater

Buffalo Mountain Area
Oliver Springs Water Treatment Plant supplies water for the city of Oliver Springs. This plant has a design capacity of 0.8 million gallons per day (mgd) and treats water pulled from a local spring known as Bacon Springs. The city plans to renovate the treatment plan and double its capacity in the near future, and in 2000, unsuccessfully applied for a grant from the Appalachian Regional Commission to fund this work. The city intends to reapply for this funding. In addition, the city of Oliver Springs has been approved to purchase water from the Anderson County Utility Board should the need arise. The current usage rate for Oliver Springs is 0.353 mgd. (Collins, 2001)

The Oliver Springs Wastewater Treatment Plant treats wastewater for the town of Oliver Springs. This plant has a design capacity of 0.75 mgd and a current usage rate of 0.3 mgd. The permitted discharge from this facility flows into Poplar Creek. Due to line infiltration, high rain events triple the amount of wastewater flowing to the plant. Corrective measures are currently underway to curtail this problem.

Stone Mountain Area
Mountain City currently operates two water supply facilities, Silver Lake Water Plant and Rambo Springs Water Plant. Combined, these plants have a design capacity of 1.7 mgd. An expansion plant, Doe Valley Water Plant, will be completed in January of 2002 and will supply an additional 0.5 mgd giving the city's distribution system a total design capacity of 2.2 mgd.

The city facilities treat water obtained from Silver Lake and from local springs. One spring known as the George Lowe Spring flows at a rate of 4.5 mgd from which the city is permitted to take 0.5 mgd. Plans are to increase this permitted rate as the city's demand grows. Mountain City's current usage rate is 0.44 mgd (Reece, 2001).

Wastewater for Mountain City is treated by the Mountain City Wastewater Plant. This mechanical plant has a design capacity of 1.3 mgd and a current operating usage of 0.7 mgd. It discharges into Town Creek which eventually flows into Watauga Lake. During periods of rain, sewer flow to the plant increases due to damaged lines and cross connections with the storm water system. However, measures are currently being taken to correct this problem.