LOST CREEK
WATERSHED ASSESSMENT

Ocoee/Hiwassee Ranger District
Cherokee National Forest
Polk County, TN
September 2002

INTRODUCTION

The role of this analysis is to compare the desired future condition from the Cherokee National Forest Land and Resource Management Plan (Forest Plan) with the existing ecological conditions identified through field examinations and inventory. Differences between desired future conditions and current conditions are identified as needs within the watershed. These needs will be addressed in several management practices, which would help move the existing conditions closer to those desired. This analysis is not a decision document. It gives the decision-maker a chance to look at all of the possible management practices which will help move the ecosystem toward the desired future condition and determine what will be brought forward and developed into proposed actions. This process provides a chance to look at the complement of forces acting on the ecosystem and plan a holistic strategy of management for the future.

This assessment references the *Upper Conasauga River Watershed Ecosystem Assessment* prepared by the Cherokee National Forest in April 2002. The individual sections of the assessment contain general information about the Southern Appalachians that can be directly applied to the Lost Creek watershed. The "Land Use Effects" section describes the past land uses that shaped the forest into what it is today.

Following are questions that were developed by the Interdisciplinary Team (ID Team) to help guide the analysis:

1. What management opportunities exist for restoration, maintenance, or enhancement of vegetation communities?

2. What aquatic habitats have been degraded by human action or inaction and what possibilities exist to remedy them?

3. What rare or declining species, unique habitats, or cultural resources exist in the area, and what opportunities exist for protection and improvement?

4. Where are non-native species degrading ecosystem health?

5. Who are the neighbors and what are the implications of their proximity to the area?

6. What impact have historical uses had on current ecosystem compositions, structures, and functions?

7. Are there existing watershed problems which require fixing to improve stream, soil, or riparian health?

8. What landscape patterns should be changed to enhance scenery?

9. What are the appropriate nature, amounts, and distribution of; travelways, recreation uses, and special uses in the area?

PUBLIC INVOLVEMENT

On March 7, 2002 an open house was held to give the public an opportunity to provide suggestions for management or information that could be used in the development of the assessment. Approximately 40 individuals responded to a flyer, mailed and posted through out the Lost Creek vicinity or newspaper announcement and attended the open house. (See file) During the meeting attendees were encouraged to put their ideas or concerns in writing rather than just verbal. Nine comments letters were received from individuals/groups, whether they attended the open house or not. The comments received were (See file):

- Develop the Benton McKaye Trail
- Use prescribed burning to address southern pine beetle killed areas
- Create more early successional habitat
- Improve Lost Creek Campground
- Illegal ATV/horseback use is occurring in the area
- List of PETS to address when developing projects (TDEC)
- Consider Hiwassee River and the fact the Lost Creek is the largest most pristine creek feeding the river
- If encouraging recreation in the area (i.e. Benton Mckaye Trail) consider the illegal activities already occurring and how it complicates the management of the area

DESCRIPTION OF THE AREA

A. LOCATION

Lost Creek Watershed is approximately 11,000 acres in size and drains into the Hiwassee River. The watershed is contained in the Blue Ridge Physiographic province. Figure 1 displays the location of the analysis area within the Ocoee/Hiwassee Ranger District of the Cherokee National Forest. The headwaters of this watershed start on Big Frog Mountain, Dry Pond Lead Mountain, Smith Mountain and Brock Mountain. Elevations run from 3,322 feet at Little Frog Lookout, to 800 feet at the mouth of Big Lost Creek on the Hiwassee River.

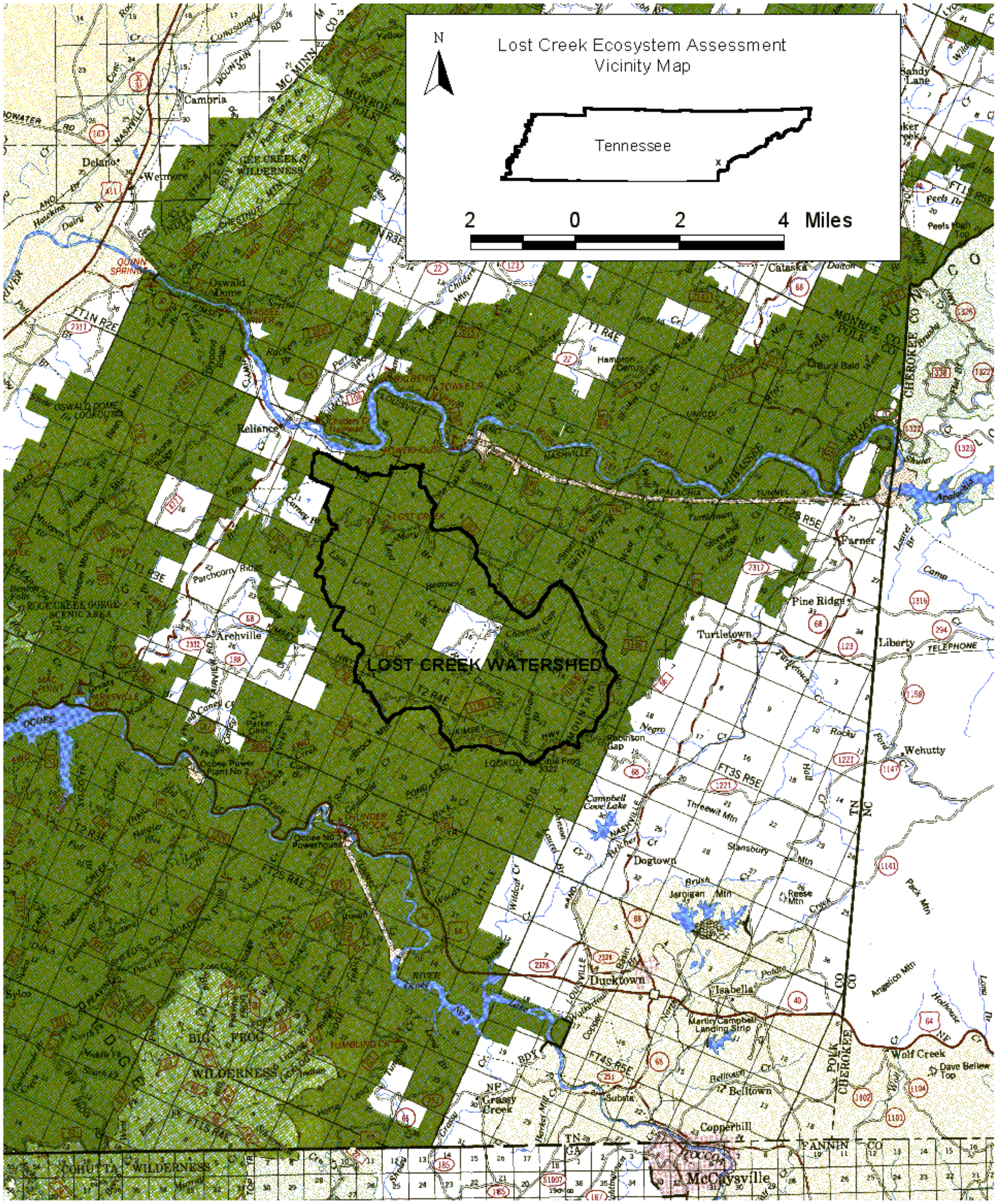

N
Lost Creek Ecosystem Assessment
Vicinity Map
Tennessee
2 0 2 4 Miles
LOST CREEK WATERSHED
Ducktown
Turtletown
Archville
Reliance
Copperhill
McCaysville

FIGURE 1

B. AQUATIC ECOSYSTEMS

Compartments 158, 169, 171, 172, 173, 174, 175, 176, 177 and 178 drain to the Hiwassee River watershed. All of the streams within this watershed lie within the Blue Ridge Physiographic Province. The diversity of stream orders, gradients and elevations (Table 1) results in a variety of fish communities (Table 2).

Table 1. Physical characteristics for streams in Compartments 158, 169, 171, 172, 173, 174, 175, 176, 177 and 178 Hiwassee/Ocoee Ranger District

STREAM	ORDER	GRAD.	MIS*CLASS	MILES	No. of FISH SPECIES
Bearpen Branch #1	3	11.30%	Cool Water	0.60	Unsurveyed
Bearpen Branch #2	3	2.00%	Cool Water	0.60	Unsurveyed
Chestnut Gap Branch	4	6.80%	**Cold Water**	0.90	3
Big Lost Creek #1	5	0.01%	Cool Water	1.10	17
Big Lost Creek #2	5	1.50%	Cool Water	1.50	12
Big Lost Creek #3	5	0.80%	Cool Water	2.30	Unsurveyed
Big Lost Creek #4	5	1.00%	Cool Water	0.80	Unsurveyed
Cold Springs Gap Br.	3	5.70%	**Cold Water**	0.60	Unsurveyed
Jenkins Grave Branch	2	9.30%	**Cold Water**	0.60	Unsurveyed
Little Lost Creek #1	4	2.00%	Cool Water	0.40	Unsurveyed
Little Lost Creek #2	4	3.50%	Cool Water	0.80	3
Little Lost Creek #3	4	2.30%	Cool Water	1.30	7
Little Lost Creek #4	3	1.00%	Cool Water	1.30	2
Mary Branch	3	2.40%	Cool Water	1.28	3
Pace Shanty Branch	3	3.30%	**Cold Water**	0.60	2
Piney Flats Branch #1	4	4.30%	Cool Water	1.10	4
Piney Flats Branch #2	3	2.80%	Cool Water	0.40	4
Puncheon Camp Branch	3	4.30%	Cool Water	0.60	1
Rymer Camp Branch #1	3	7.50%	Cool Water	0.80	3
Rymer Camp Branch #2	2	5.60%	**Cold Water**	0.90	2
Rymer Camp Br., Trib.	3	6.30%	**Cold Water**	0.60	3
Sulpher Springs Branch	4	4.30%	**Cold Water**	1.48	3

***** Management Indicator Species

Within this analysis area, seven reaches have not been surveyed (29% of the total mileage). These streams are not expected to be any more diverse or contain species not already recorded (Table 2) in the watershed. Jenkins Grave Branch and Rymer Camp Branch #2 are probably intermittent channels. Sulpher Springs Branch is aptly named. It contains springs that are very high in sulfur. These springs lower the pH of this stream and may alter the aquatic community down stream to the confluence of Big Lost Creek with the Hiwassee River. The lowered pH levels appear to be natural. No TES aquatic species have been documented anywhere in the watershed.

At least 19 fish species have been documented in Compartments 158, 169, 171, 172, 173, 174, 175, 176, 177 and 178. The status of each of these species on the Cherokee National Forest is discussed below. At least one species expected to be present is, apparently, absent in this watershed. Habitat for the Tennessee dace (Cherokee NF Sensitive species) appears to be

suitable; it may have been extirpated. Other species exhibit sporadic distributions within this watershed. This unusual community structure may be a function of the acid conditions coming from Sulpher Springs Branch and the significant waterfall barrier on Big Lost Creek in the private land in-holding.

Table 2. Populations of fish species in Compartments
158, 169, 171, 172, 173, 174, 175, 176, 177 and 178 Hiwassee Watershed

SPECIES	POPULATIONS IN LOST CREEK WATERSHED	POPULATIONS ON THE FOREST	STATUS ON THE FOREST	TOLERANCE
Mirror shiner	2	5	Uncommon	?
Telescope shiner	1	13	Uncommon	?
Whitetail shiner	1	22	Common	?
Greenside darter	1	23	Common	Intolerant
Redline darter	2	27	Common	?
Smallmouth bass	2	28	Common	Moderate
Snubnose darter	1	30	Common	?
River chub	1	34	Common	Intolerant
Tennessee shiner	1	35	Common	?
Banded sculpin	2	44	Common	Moderate
Rock bass	2	44	Common	Moderate
Longnose dace	3	56	Common	Moderate
Warpaint shiner	2	58	Common	?
Northern hogsucker	3	72	Common	Intolerant
Central stoneroller	3	90	Common	Moderate
Brown trout	3	93	Common	Moderate
Creek chub	13	134	Common	Tolerant
Blacknose dace	14	198	Common	Tolerant
Rainbow trout	12	213	Common	Moderate

Of the 19 species known to occur within this analysis area, none are listed by the Cherokee National Forest as Threatened, Endangered or Sensitive. Two species are considered uncommon (having less than 20 populations on the Forest). The remaining 17 species are considered common on the Forest and throughout their native range.

COMMON SPECIES: The 17 common species all have stable populations both here and within their native ranges; their prognosis for long-term viability under current management is excellent. A few common species appear to have been extirpated from some stream reaches, including: banded sculpin, redline darter and fantail darter. All three of these species are present in the lower reaches of Big Lost Creek but absent above the private property in Chestnut Gap and Sulphur Springs Branches. Their absence in these reaches is probably a reflection of the chronic acidity associated with Sulphur Springs. The long-term effects of the lowered pH are exemplified by the total absence of mussels in the lower reaches of Big Lost Creek. Searches for fresh water mussels have been futile; however, aquatic snails are present but not abundant.

UNCOMMON SPECIES: Two species with fewer than 20 populations on the Forest occur in this watershed. The mirror shiner is a Blue Ridge Province endemic. It has a very small native

range encompassed largely by National Forest lands in the Southern Appalachian Mountains. Stream gradients in excess of 1 to 2 percent may limit the distribution. Mirror shiners could be present in the upper reaches of Big Lost Creek

The telescope shiner is limited to upland streams in the Blue Ridge, Cumberland, and Ozark Provinces. It is common throughout its native range but gradient may restrict its distribution on this Forest.

LISTED SPECIES: While no records of Tennessee dace in this watershed exist, it is indigenous to the Hiwassee River watershed and has been found in both Smith and Ellis Creeks (the watersheds immediately up and down stream of Big Lost Creek). The habitat needs for the Tennessee dace are described, below. At least six reaches could support this species and re-introduction should be considered.

Tennessee dace	*Phoxinus tennesseensis*	Sensitive
Distribution:	Citico creek, Beaverdam Creek, tributaries in the Hiwassee River and Ocoee River watersheds; less than 40 extant populations.	
Habitat:	Small, low gradient, woodland streams associated with undercut banks and debris; feeds on algae, plant root hairs (probably utilizes the associated bacteria) and aquatic insects. Spawning occurs over gravel riffles or the constructed nests of larger minnows.	
Threats:	Unknown	

STREAM MANAGEMENT INDICATOR SPECIES: Based on the fish present, some of the streams appear to be in a degraded condition. Little Lost Creek has both banded sculpins and redline darters well up into the headwaters above significant waterfalls. Both species are absent from Chestnut Gap and Sulphur Springs Banches in Big Lost Creek watershed. Potential MIS for the cool water habitats include: smallmouth bass, redline darter, greenside darter, snubnose darter, warpaint shiner, rock bass and Tennessee Shiner.

Redline darters inhabit swift, shallow riffles over rocky substrates in clear streams varying in size from small creeks to large sized rivers. Food consists insect larvae and microcrustaceans. Eggs are buried in a sandy substrate (Etnier and Starnes, 1993). Redline darters are sensitive to sedimentation.

Warpaint shiners inhabit cool, clear streams with rocky substrate. They are often found in coldwater environs where trout dominate. Food consists largely of aquatic insects and some terrestrial insects. They spawn in association with larger cyprinids (bigeye chub or stoneroller in these streams) utilizing the clean nest substrate constructed by these species (Etnier and Starnes, 1993). Warpaint shiners are not very sensitive to sedimentation or stream warming.

The rock bass is a suitable representative for the fish present in the cool water habitat. Rock bass inhabit small creeks to medium sized rivers and are usually associated with some form of cover. They are sight feeders, preying on crayfish, large invertebrates, and small fish. They spawn in gravel or sand and the male provides protection for the eggs and fry. Because of parental protection, rock bass are not sensitive to sedimentation in their reproduction.

OTHER AQUATIC ENVIRONMENTS MI – WETLANDS AND SEEPS: Amphibians, reptiles and macroinvertebrates, including crayfish, are common in the analysis area. These animals may

occur in the same waters as the fish. They are also found in ephemeral portions of the streams and in ponds. Specific habitat needs for these organisms are quite variable but they have the commonality of requiring standing or running water during a portion of the year.

Wetlands and seeps were selected as the Management Indicator (MI) for these species because they are relatively easy to monitor and they are the most sensitive component in the habitat requirements for these species. Many seeps, including over 40 miles of intermittent stream channels, are present in the analysis area. No ephemeral or permanent ponds are known.

C. TRANSPORTATION SYSTEM

Most of the study area is on Forest Service land, and of the roads assessed in and near the boundary of this study area, most are Forest Systems Roads (FSRs) under the jurisdiction and maintenance of the Forest Service. There is one county road that touches a small part of the western boundary. There are some private roads, the total length and condition of which are unknown, on the private land situated near the center of the study area. The main road through this private land is under the jurisdiction of Polk County but is maintained by the Forest Service under the Co-operative Agreement with the county. Altogether, there are approximately 60 miles of road with less than half open to public traffic. Open road density is in compliance with the Forest Plan for all 3 transportation analysis units (TAUs) involved.

Appendix A is a Road Listing based on data from the Transportation Information System database and Appendix B a table of Findings and Recommendations based on a combination of field observation, information from recent transportation analyses and prior knowledge of the roads and their conditions from which some Possible Management Practices are derived. All roads were not accessible during inventory because of downed trees. Some of the gated roads are maintained all or in part as linear wildlife openings. There currently are several temporary roads constructed by TVA for the powerline construction that will be restored and seeded after the powerline construction is complete. Some inventoried system roads being used by TVA for the powerline construction are being maintained and will be restored by TVA by the end of the project.

Desired Future Conditions

- roads in a condition that meets the purpose for which they are managed
- roads in a condition that reduces their impacts to the watershed

D. VEGETATION RESOURCES

Disturbance Regimes

Approximately 68 percent of the forested land in the Lost Creek Watershed is over 70 years old. Communities of older trees are often killed by periodic disturbances, such as pathogens (diseases), insects or a combination of factors.

Southern pine beetle is likely to be a threat in this watershed for several more years. The older shortleaf and Virginia pine stands present in the watershed can trigger a southern pine beetle outbreak if the trees are slow growing, unthinned, or otherwise have reduced vigor or health.

A sleet storm in December 1998 caused moderate to severe damage in some stands in the watershed. Pine and hardwood trees alike were affected. Damage includes wind throw, and breakage.

Approximately 444 acres were regenerated in the last ten years. These stands have been reestablished in hardwoods, pines and mixed stands.

Approximately 151 acres is currently planned for harvest in compartments 172 and 174. Analysis for that activity is included in the Mary Branch EA. The decision for this activity was signed in September, 1998.

Various ecosystem management activities such regeneration, thinning, prescribed burning and release treatments may be necessary within the project area to maintain ecosystem health.

Biodiversity

The Lost Creek Watershed contains a considerable variety of tree species, as well as numerous shrubs, forbs, and grasses. Overstory and midstory species include black oak, white oak, chestnut oak, scarlet oak, southern red oak, northern red oak, yellow poplar, sourwood, shortleaf pine, Virginia pine, white pine, red maple, black gum, hickories (sp.), black locust, beech, persimmon, walnut, sugar maple, white ash, and sweet gum. Understory species include white pine, dogwood, rhododendron, mountain laurel, beech, sugar maple, red maple, sassafras, serviceberry, devils walking stick, huckleberry, American holly, poison ivy, greenbrier, wild grape, the oak species and hickory species.

The Lost Creek Watershed is in Management Area 15. Forest Plan standards and guidelines require maintaining between 6 and 15 percent of the suitable lands in the 0-10 year age class to provide early seral habitat for wildlife. In the year 2000 there was 5 percent of the suitable forest in the 0-10 year age class. By the year 2005 there will be 3 percent of the suitable age class in the 0-10 year age class.

Late seral habitat is fairly abundant in the Lost Creek watershed with about 68 percent of the suitable acres over 70 years old. The quantity of this habitat will increase over the planning period.

Mast producing hardwoods are abundant in the project area. Approximately 41 percent of the suitable acres in the watershed are in oak or mixed oak stands older than 70 years of age.

What management opportunities exist for restoration, maintenance, or enhancement of vegetative communities?

The use of prescribed fire may be an important tool for community restoration in the watershed, particularly in the southern yellow pine and yellow pine/hardwood communities. Years of fire suppression on the landscape have allowed fire intolerant species such as Virginia pine (*Pinus virginiana*) and eastern white pine (*Pinus strobus*) to invade and become established in areas where they otherwise would not occur. The careful reintroduction of fire into some of these areas may prove to be an effective mechanism to restore natural communities and enhance native biodiversity. Careful monitoring of these activities will substantiate effects and lead to better land management decisions within the watershed.

What rare or declining species, unique habitats, or cultural resources exist in the area, and what opportunities exist for protection and improvement?

No systematic surveys for rare plant species were conducted for this assessment. Known sites for Threatened, Endangered, and sensitive plant species are the result of previous surveys and chance encounters, and do not infer that the entire area has been surveyed. Known locations are often represented as a "dot" on a map and do not necessarily portray the precise extent or location of the species. That being said, no federally listed (Threatened or Endangered) plant species are known to occur within the Lost Creek Watershed and only three Regional Forester's sensitive species (hairy blueberry, pigmy pipes, and ash-leaved bushpea) have known sites within the watershed. The diversity of elevations, aspects, landforms, and associated vegetative communities certainly provide numerous habitats to support rare plant species and it would be expected that many new locations would be found for several species if systematic surveys were conducted within appropriate habitats.

The three sensitive species currently known to occur in the watershed occupy habitats that were probably somewhat maintained by fire under historic disturbance regimes. These are usually, dry, pine or pine/hardwood dominated sites on south or west facing slopes or ridges. The reintroduction of fire into these types of sites may enhance habitat for these species.

Unique habitats may include wetlands, seeps, springs, riparian areas, cliffs, rock outcrops, and areas underlain by mafic or calcareous soils. These habitats often support unique species assemblages and should be protected from resource damage. Botanical surveys prior to any habitat altering activities will aid in the identification and protection of these areas.

Where are non-native species degrading ecosystem health?

Non-native, invasive plant species have the potential to cause serious resource damage to natural communities. No systematic surveys for invasive plant species were conducted for this assessment. Known sites for invasive plant species are the result of previous surveys and chance encounters, and do not infer that the entire area has been surveyed. As sites for these species are found, it is imperative that they be prioritized in degree of threat to natural communities, to ensure a wise use of limited funds and manpower to address the problem. Instead of treating invasive plants on the basis of simple acreage assessments and targets, risk assessment to

determine threats to natural communities should consider issues such as proximity to TES species or other sensitive features, potential for rapid spread, and ability to achieve effective control.

Ecological Communities

The following is a brief description of the ecological communities within the Lost Creek Watershed analysis area, a summary of how various disturbances affect them and management implications for ecosystem restoration, maintenance, and enhancement.

Conifer Northern Hardwood Forest
(Continuous Inventory of Stand Conditions [CISC] Forest Types 3,4,5,8, and 17)

There are 806 acres of this community type in the analysis area. Approximately 2 percent of this acreage is in the 0-10 year age class with the majority of the type (54 percent in the 11-30 year age class and no identified possible old growth.

This ecological community includes three subtypes:

Hemlock-northern hardwood forest where eastern hemlock predominates with associates of beech birch and maple;

White pine-northern hardwood forest where dryer site conditions and historical fire patterns have affected species composition including associates of northern red oak, red maple, and white ash; and

Red spruce-northern hardwood forest found at the highest of all elevations not occupied by montane and allied spruce and spruce-fir types.

Of the three subtypes, only the white pine-northern hardwood forest community occurs in significant acreage in the upper Lost Creek analysis area. Eastern white pine appears to respond readily to disturbance and is often a successional tree. Fire appears to play a role in maintaining the white pine-northern hardwood subtype. White pine dominance in some areas is thought to be the result of various disturbances in predominantly oak forests. But white pine also shows the ability to increase in the understory of oak-dominated stands in the absence of disturbance. The white pine-northern hardwood forest tends to exhibit even-aged stand structures due to the greater likelihood of catastrophic (stand-initiating) events related to the landforms and elevations where they occur. Snow, ice, and wind can be damaging, particularly if root disease is already present. This type is common in Georgia, the Carolinas, and Tennessee and is somewhat less common in Virginia and West Virginia. It grades to mixed mesophytic hardwoods, mesic oak, and xeric oak forests. The soils in the forest are usually quite acid. Species diversity is low.

White pine sometimes forms pure stands, but often is mixed with hemlock along streams and with oaks *(Quercus rubra, Q. alba, Q. velutina, and Q. coccinia)* on upland slopes. The shrub layer may be dense and dominated by *Rhododendron spp., Vaccinium spp. and Gaylussacia* spp. Herbaceous cover is usually sparse or absent. White pine may share dominance in the low to

intermediate-elevation forests, or hemlock may be associated with mesophytic hardwoods, particularly yellow poplar *(Liriodendron tulipifera).* Shrub layers are typically ericaceous, with Rhododendron maximum, and doghobble *(Leucothoe jontanesiana),* and laurel *(Kalmia latifolia)* being very common. The herb layer may include partridge-berry *(Mitchella repens),* round leaved violet *(Viola rotundifolia),* foamflower *(Tiarella cordifolia),* Christmas fern *(Polystichum acrostichoides),* intermediate wood fern (Dryopteris intermedia), and New York fern *(Thelypteris noveboracensis).*

Mixed Mesophytic Forest (CISC Forest Types 9, 41, 50, and 56)

There are 2,621 acres of this community type in the analysis area. There is no 0-10 year age class and the majority of the type (75 percent) is in the 71-100 year age class. Four hundred fifty five acres are 101 years of age or older, however, no stands have been identified as possible old growth.

These forests are among the most biologically diverse ecosystems in the United States. On acidic soils, main canopy components are numerous and include yellow poplar *(Liriodendron tulipifera),* sweet birch *(Betula lenta),* red maple *(Acer rubrum),* and eastern hemlock *(Tsuga canadensis)* with rhododendron maximum, and doghobble *(Leucothoe fontanesiana)* dominating the shrub layer. On less acidic soils, basswood *(Tilia americana),* northern red oak *(Quercus rubra), black cherry (Prunus serotina),* buckeye *(Aesculusflava),* and Carolina silverbell *(Halesia tetraptera)* are also canopy species. The herb layer may be sparse and contain a relatively few species such as galax (*Galax urceolalta),* partridge-berry *(Mitchella repens),* trailing arbutus *(Epigea repens),* and New York fern *(Thelypteris noveboracensis).* On less acidic, sometimes circumneutral soils, a large number of mesophytic tree species may be found. Yellow poplar *(Liriodendron tulipifera),* basswood *(Tilia americana* var. *heterophylla),* black birch *(Betula lenta),* cucumber tree *(Magnolia acuminata),* black cherry *(Prunus serotina),* white ash *(Fraxinus americana),* American beech *(Fagus grandifolia),* red oak *(Quercus rubra),* bitternut hickory (*Carya cordiformis)* and silverbell *(Halesia tetraptera [carolina])* occur in various mixtures. On the "richest" sites, sugar maple *(Acer saccharum)* and buckeye *(Aesculusflava)* are usually present *(A.flava and T. americana are indicator species for mixed mesophytic forests).* The shrub and small tree layer may include dogwood *(Comusflorida),* eastern hop hombeam *(Carpinus carolinia),* umbrella magnolia *(Magnolia tripetala),* Fraser magnolia *(M.fraseri),* ironwood *(Ostrya virginiana),* mountain maple *(Acer spicatum),* striped maple *(A. pennsylvnicum),* wild hydrangea *(Hydrangea arborescens),* spicebush *(Lindera benzoin),* sweet betsy *(Calycanthusfloridus),* and alternate leaf dogwood *(Comus altemafolia).* The herb layer is typically extremely diverse and would include black cohosh *(Cimicifuga racemosa), wake robin (Trillium erectum),* blue cohosh *(Caulophylum thalictroides),* jewel-weed *(Impatienspallida),* wood nettle *(Laportea canadensis),* maidenhair fern *(Adiatum pedatum),* hepatica *(Hepatica acutiloba),* wild ginger *(Asarum canadense),* foamflower *(Tiarella cordifolia),* baneberry *(Actea pacchypoda),* intermediate wood fern *(Dryopteris intennedia),* jack-in-the-pulpit *(Arisema triphylum),* May-apple *(Podophyllum peltatum), squirrel corn (Dicentra canadensis),* bleeding heart *(D. cucullaria)* and many other mesic herbs (SAMAB 1996, USDA 1997).

Stand structures tend toward uneven-aged or all-aged. Stand histories reflect the heavy logging of high-value species just prior to Federal ownership.

Historically, these forests were probably the most exploited of all ecological communities in the Southern Appalachians due to the variety of high-value tree species growing in them and the productivity of soils typically found in cove types. At the time of acquisition, most, if not all, stands had been heavily logged, grazed, and/or farmed.

Apart from anthropogenic causes, gap-phase regeneration accounts for much of the natural stand regeneration with less frequent large-scale disturbances also creating openings. Canopy turnover rates associated with gap-phase regeneration varies from 0.4 to 2.0 percent annually and averaging 1 percent of the land surface per year (Lorimer, 1980; Runkle, 1982 and 1991; Runkle and Yetter, 1987; SAMAB, 1996). Although mixed mesophytic types generally occur on more protected sites, rates of disturbance related to large-scale events could be similar to those for the northern hardwood forest. Natural disturbance events (wind, ice and native biotic agents) and their effects on this community are fairly well understood and documented in scientific literature. Some effects (such as harvest cutting) and the role of fire are not as well understood however. Fire probably would have occurred less frequently in protected cove landforms, and when it did occur would have been less intense. High site productivity would tend to ameliorate the effects of fire with rapid regrowth, particularly in the herbaceous vegetation layer.

Dry-Mesic Oak Forest (CISC Forest Types 53,54, and 55)

There are 1,963 acres of this community type in the analysis area. Less than 1 percent of this acreage is in the 0-10 year age class. There are 1,417 acres in the 71-100 year age class and 222 acres with stand ages 101 years or older. No acres have been identified as possible old growth.

Species composition of this forest varies greatly due to its wide distribution. Mesic types occurs from low to high elevations on dry (sub-) mesic sites, frequently on linear or convex landforms on north and east facing slopes or at high elevations, and sometimes on concave landforms on southerly and westerly aspects. At low to moderate elevations, major overstory species include chestnut oak *(Quercus montana),* northern red oak *(Q. rubra),* black oak *(Q. velutina),* white oak *(Q. alba),* other oaks, hickories *(Carya spp.), red maple (Acer rubrum),* and yellow poplar *(Liriodendron tulipifera).* Shortleaf pine *(Pinus echinata)* and eastern white pine *(Pinus strobus)* may occur as a mixture, with overstory coverage of less than 25 percent.

Accessory tree and scrub species include dogwood *(Comusflorida),* witch hazel *(Hammamilis virginana),* sourwood *(Oxydendron arborea),* serviceberry *(Amelanchier arborea),* and silverbell *(Halesia carolina).* Herb layers vary from sparse to dense, some ericaceous cover, and some with mesophytic herbs. American chestnut was a major species in this forest community up until the 1930s when a blight severely reduced the species as an overstory component.

Most current stands resulted from heavy logging in the early 1900s, open-range livestock grazing, and frequent burning. Current stand structures are largely even-aged or two- aged. Older two-aged stands found on national forests today are largely the result of high-grading at the turn

of the century. This practice removed the best trees (size and species) and left the sub/unmerchantable trees.

Mesic oak forests grade into mesophytic cove hardwoods, white pine/hemlock/hardwoods, and xeric oak forests at low to moderate elevations. Many (if not most) current oak stands have non-oak cohorts in their understories. This is particularly true of medium to good sites (greater than site index 60). Accumulation of oak reproduction under the parent stand is one of the most important aspects of the regeneration ecology of oaks (Thomas and Dessecker, 1997). This accumulation of small oaks is called "oak advance reproduction." The presence or absence of oak advance reproduction along with seedlings and stump sprouts determine the composition of the next stand.

Recurrent fire promotes the accumulation of oak reproduction by eliminating or reducing the number of fire-sensitive understory competitors. Oak reproduction is well adapted to surviving fire because of the concentration of dormant buds near the root collar .The frequency of fire is important in the disturbance regime for this community type. Declines of oak forests throughout much of the East are often attributed to reduced fire frequency and fire suppression. Fire return intervals range from 10 to 20 years. The dry sites on which this community occurs are conducive to recurring, low-intensity surface fires thought to have been quite common prior to European settlement. These fires helped maintain the oak component by eliminating fire-sensitive competitors and stimulating oak regeneration. Conversely, fire-exclusion, as practiced over the past six decades, has resulted in heavy leaf litter accumulations not at equilibrium with decay rates that are somewhat retarded due to the high tannin levels (resistant to decay) found in oak leaves. Reinstituting fire as a disturbance agent into the ecosystem may require considerable care to avoid damaging heat buildups.

Other natural disturbance agents, such as wind and ice, can create canopy openings that release reproduction. Natural disturbance rates for this type might be similar to other communities and range from 1 percent to as high as 10 percent per year based current stand structure, species composition, and the presence or absence of oak decline and/or gypsy moth.

The forest is expected to be a part of the generally infested area for gypsy moth during the next 20 to 30 years. With, or without active management, accelerated oak mortality can be expected over much of the forest in the next two decades. Stands vulnerable or already affected by oak decline that are repeatedly defoliated by gypsy moth may experience heavy mortality. Forest wide replacement of oak forests to other forest types during the next 50 years seems inevitable. There will undoubtedly be an accompanying decline in hard mast availability with increases in snags and downed woody debris. Other forest health threats include wildfire hazards associated with increased mortality.

There are a number of exotic species that can become a problem on sites normally dominated by this community. Kudzu *(Pueria lobata)* control should be apriority wherever patches are found. Asiatic bittersweet *(Celatrus orbiculatis),* autumn olive *(Elaegnus umbellata),* Nepalgrass *(Microstegium vimineum),* royal paulownia *(Paulownia tomentosa)* and Japanese honeysuckle *(Lonicerajaponica)* could become problems and should be controlled wherever practical. Other

opportunities to control exotic species should be assessed and prioritized during project-level planning.

Dry and Xeric Oak Forest (CISC Forest Types 51,52, 59, 60, and 99)

There are 833 acres of this community type in the analysis area. None of this acreage is in the 0-10 year age class. There are 644 acres in the 71-90 year age class and 145 acres with stand ages 91 years or older. No acres have been identified as possible old growth.

This community is very similar to the dry-mesic community except that this type usually occurs on very dry, infertile uplands, and steep, south facing slopes of rock outcrops. Scarlet oak *(Q. coccinea),* chestnut oak *(Q. montana),* other oaks *(Quercus spp.),* hickories *(Carya spp.),* red maple *(Acer rubrum),* yellow poplar *(Liriodendron tulipifera), shortleaf pine (Pinus echinata),* eastern white pine *(Pinus strobus)* and table-mountain pine *(Pinus pungens)* may occur as a mixture, with an overstory coverage of less than 25 percent. On xeric sites shrub layers of mountain laurel *(Kalmia latifolia),* blueberry *(Vaccinium spp.),* and other ericaceous species are common. Herbaceous cover is generally sparse or absent. Xeric oak forests grade primarily into mesic oak forests, oak-pine communities, and pine communities. Stand disturbance dynamics, structure, and the role of fire in regeneration along with the management implications associated with oak regeneration ecology are similar to those described for the dry-mesic oak type. Landform and slope position can result in relatively intense fires in this type. Xeric oak stands tend to have advance oak reproduction in understories and can be an edaphic climax type. These stands are more resistant to long-term change associated with natural disturbance. They do however sustain relatively high natural disturbance rates (1 to 10 percent) due to factors closely associated with abiotic events (wind, drought, landslides, etc.), on adverse sites and the individual tree silvics of canopy species that are more short-lived; for example, scarlet oak and Virginia pine components. Average canopy turnover rates are relatively short compared to other types and might range from 100 to 125 years.

Xeric Pine and Pine-Oak Forest (CISC Forest Types 15, 16, 20, 33, 38 and 39)

These communities are generally found on south-facing aspects, steeper slopes, and shallow soils. There are 3,110 acres of this community type in the analysis area. Approximately 5 per cent of this acreage is in the 0-10 year age class. Forty two percent of this community type (1,294 acres) is in the 11-40 year age class and 1,416 acres with stand ages 71- 90. No acres have been tentatively identified as possible old growth

Principal overstory species include pitch, Virginia, shortleaf, eastern white, and table-mountain pine. Hardwood overstory components include various oaks (scarlet oak, chestnut oak, post oak, southern red oak, and blackjack oak) along with hickory. Other canopy species frequently found include sourwood *(Acer rubrum),* red maple *(Oxydendron arborea),* sassafras *(Sassafras albidum),* and blackgum *(Nyssa sylvatica).* The shrub layer is typically ericaceous, with mountain laurel *(Kalmia latifolia),* huckleberries *(Galussacia* spp.) and blueberries *(Vaccinium* spp.). Typical herbs include trailing arbutus *(Epigea repens),* galax *(Galax aphylla),* and bracken fern *(Pteridium aquilinum).*

Most stands are strongly even-aged. This community has tree species generally regarded as fire-dependent or fire-associates (pitch, shortleaf, and table-mountain pine). Occasionally catastrophic wildfire initiates stand regeneration.

Ecologically, white pine and Virginia pine are able to exploit sites where catastrophic fire has initiated regeneration but neither of these species are well-adapted to periodic fire, and will not dominate areas with a frequent fire return interval (FEIS).

Windthrow may be an important disturbance agent, particularly where Virginia pine is present. This species is very shallow rooted and subject to windthrow. It is relatively short-lived and becomes susceptible to red-heart disease after 50 to 60 years. This disease makes the species more vulnerable to breakage from snow and ice.

Bark beetles, including southern pine beetle are potent biotic disturbance agents. The area is currently in a severe outbreak. Periodic SPB epidemic conditions in older susceptible stands can be expected at least once each decade. Age-class distribution can exacerbate the incidence and severity of SPB and other bark beetles.

This community has a relatively high natural disturbance rate ranging from one to ten percent annually depending on current stand structure (strongly correlated to age). Large-scale, rather than small-scale disturbance dominate as stand initiating events. Canopy turnover rates are shortest for Virginia pine, pitch pine, and table mountain pine (generally 100 years or less). Shortleaf pine canopy turnover rates are generally longer (100 to 200 years).

Natural fire return intervals for pitch, shortleaf, and table-mountain pine range from 7 to 15 years (FEIS). Somewhat longer intervals would apply to Virginia and white pine. Canopy resistance of Virginia pine and table-mountain pine stands in the community is shorter than for other southern yellow pine species. Stands older than 70 years of age generally have high turnover rates (as much as 5 to 10 percent per year).

Dry and Dry Mesic Oak-Pine (CISC Forest Types 10, 12, 13, 32, 42, 44 and 45)

There are 927 acres of this community type in the analysis area. None of this acreage is in the 0-10 year age class. There are 307 acres in the 11-30 year age class and 480 acres with stand ages 71-90.

The dry and dry mesic oak-pine and dry-mesic oak may develop on the same type of sites depending on the kind and intensity of disturbance. Shortleaf pine, pitch pine, white oak, scarlet oak and chestnut oak are the most common canopy species. Other common species include Virginia pine, table-mountain pine, loblolly pine, other oaks, hickories and red maple. Common shrub layers include blueberries *(Vaccinium spp.),* huckleberries *(Gaylusaccia spp.)* and mountain laurel *(Kalmia latifolia).* Dogwood *(Comusjlorida),* sourwood *(Oxydendron arboreum),* sassafras *(Sassafras albidum),* and blackgum *(Nyssa sylvatica)* are common in midstories. Common understory and vine species include sedges *(Carex spp.,* panicum grasses *(Panicum spp.),* broomsedge *(Andropogon spp.),* other grasses, pipsessewa *(Chimaphila maculata),* beggar's ticks *(Desmodium spp.),* bracken fern *(Pteridium spp.),* greenbriar *(Smilax*

spp.), Virginia creeper *(Parthenocissus quinquefolia),* and grapes *(Vitis spp.).* The type grades into more xeric mixed pine-hardwood types or more mesic oak types depending on elevation, aspect, landform, and soils. The community is transitory on a given site. Historically, fire, aboriginal activities, windfall, natural mortality, and other disturbances maintained this forest community (USDA 1997).

Estimated disturbance regimes range from 1 to 10 percent annually with large-scale events predominating, and whole stand replacement not uncommon. Canopy turnover rates are relatively short (100 to 150 years), particularly in stands on dryer sites. Fire return intervals of 5 to 32 years have been documented. Forest health concerns include oak decline, gypsy moth, and southern pine beetle. The combination of a lack of fire and forest health problems may result in widespread replacement of yellow pine and oak by eastern white pine and non-oak upland hardwoods (red maple, blackgum, and others). These changes are likely to occur over the course of the next 20 to 30 years as mortality from oak decline and gypsy moth accelerate.

Eastern Riverfront (CISC Forest Types 46, 58, 62, 71, 72, and 98)

Very little of this community exists in the project analysis area (40 acres). It is described in both the SAA and R8 Old Growth publications. Within the Lost Creek watershed the principal overstory species in this ecological community that separates it from other hardwood dominated communities is this presence of sycamore *(Platanus occidentalis),* water oak *(Quercus nigra),* American beech *(Fagus grandifolia), sweetgum (Liquidambar styraciflua)* and other overstory trees associated with more mesic sites.

Natural disturbance events are generally flooding, windthrow, and infrequent fire.
Because annual flood events have been altered and due to fire suppression, American beech and red maple may become more prominent in this community.

Riverfront forests serve an important role for fauna associated with riparian zones.
Examples include cavity trees for birds such as wood ducks and prothonotary warblers.
Riverfront types shade streams and provide the source material of large woody substrate important in aquatic ecosystems.

The primary concerns in this community related to forest health are American beech (susceptible to beech bark disease), oak decline, gypsy moth, and invasive exotic vegetation. Restoration efforts are important because of the interface of this community to the aquatic ecosystem.

E. VISUALS

This large watershed, distinctively shell shaped, is visible from the Kimsey Highway. The headwaters are of this watershed start on Big Frog Mountain, Dry Pond Lead Mountain, Smith Mountain and Brock Mountain. Prominent features along this rim include Deep Gap and Little Frog Lookout/Sassafras Knob. Elevations run from 3322’ at the Little Frog Lookout, 1000’ at Lost Creek Campground and 800’ at the mouth of Big Lost Creek. The area contains the typical plant communities of the south end of the Cherokee National Forest. The visual inventory shows

the most outstanding scenery occurs in the foreground of various trout streams and Big Lost Creek. See visual inventory map (Appendix D).

Good views exist to the north (mountains of the Tellico area) from Kimsey Highway. The Hiwassee River itself is not visible. Daylighting, to create vistas, along Kimsey highway was done in 1998. Some sections were successful in maintaining visual quality; others not so. None of these openings are currently maintained.

A scenic driving route along the Kimsey Highway and White Oak Flats Road is listed by Tennessee Overhill.

F. RECREATION

There is good road access to the watershed while trails and facilities are limited. The area may have perception of remoteness to visitors because of gravel access and lack of development. ROS is roaded natural. This sense of remoteness and lack of development are characteristics that we might want to maintain when considering any development.

There are no roadless areas in the watershed. However, the watershed is bordered on south by Little Frog Wilderness (approximately 2 miles of shared boundary) and 2 roadless areas (approximately 2 miles of shared boundary), which are next to Little Frog Wilderness. No other significant recreation activity is on the periphery as landform keeps the busy Hiwassee River area and the Ocoee River areas separated from this watershed.

The primary recreation uses in the area are:

- Hunting and fishing
- Hiking
- Camping in Lost Creek Campground (15 sites, vault toilets, water, no showers)
- The Smith Mountain Motorcycle Trailhead is on the ridge of the watershed boundary but the 8-mile trail is not
- Driving for pleasure along the Kimsey Highway & White Oak Flats Road. A scenic drive listed by Tennessee Overhill.

The Benton Mackaye Trail, a 250-mile hiking trail that loops off the Appalachian Trail, through GA, TN, and NC, is planned. The trail will run through the western part of the Ocoee/Hiwassee district for 10 miles from the Dry Pond Lead Trail on Dry Pond Mountain down to the Hiwassee River by way of railroad grade along Big Lost Creek. Of the 10 miles routed through this watershed, 8.7 miles are new construction. Much of this though follows abandoned roads and railroad grades. However, opening up the trail along Big Lost Creek may increase illegal motorized use of the trail.

G. WATERSHED

Some watershed analysis has been completed in this watershed in the past. In 1961 a watershed analysis was completed for the Big Lost Creek Watershed. This analysis found that “all stream channels on the Big Lost Creek Watershed are in fairly stable condition. There are little or no

significant changes in stream channels in progress. The stream channels are well defined and are usually adequate for peak run-off conditions. Of course, there are small spots of bank erosion present, but these are small, isolated, and not serious enough to warrant correction."

In 1989 and 1990 a stream basin inventory was completed in the Lost Creek Watershed. This inventory did not make qualitative judgments concerning the condition of streams within the watershed, but rather gathered physical stream data categorized by habitat unit including stream width, average depth, substrate and large woody debris pieces. The inventory did allow comments to be recorded concerning stream condition. Based on examination of the data collected for streams within the watershed and associated comments, aquatic habitats do not appear to be degraded by human action or inaction within this watershed.

Some field observation was completed in 2000 to determine current watershed condition of the Lost Creek watershed and evaluate opportunities to improve watershed condition. Field observations revealed that roads and disturbance associated with the TVA power line expansion are contributing some sediment to aquatic systems. Mitigation is ongoing on the TVA power line expansion project and should reduce impacts. Road and trail related aquatic impacts (sediment) are a concern on a localized basis.

The upper end of Little Lost Creek is unstable. Channel erosion is evident in the upper reach of this stream. It is probable that past land use practices (logging/farming) have resulted in sediment deposition into this channel and adjustments are being made to establish equilibrium. It is doubtful any actions would be beneficial to remedy the stability problems associated with this stream.

Sulphur Springs Branch is a headwater tributary of Big Lost Creek. There are pH concerns associated with this stream that affects the stream's aquatic biology. This problem is associated with the natural geology of the subwatershed and is not related to the actions of man. Any remedy to increase pH would require a continual introduction of lime into the watershed.

One section (640 acres) of private land is located within the watershed. Poorly located and eroding roads are located on this land that are a source of accelerated sediment to Big Lost Creek. It is possible collaborative efforts can be realized with the private landowner (s) to mitigate this sediment source.

H. WILDLIFE RESOURCES

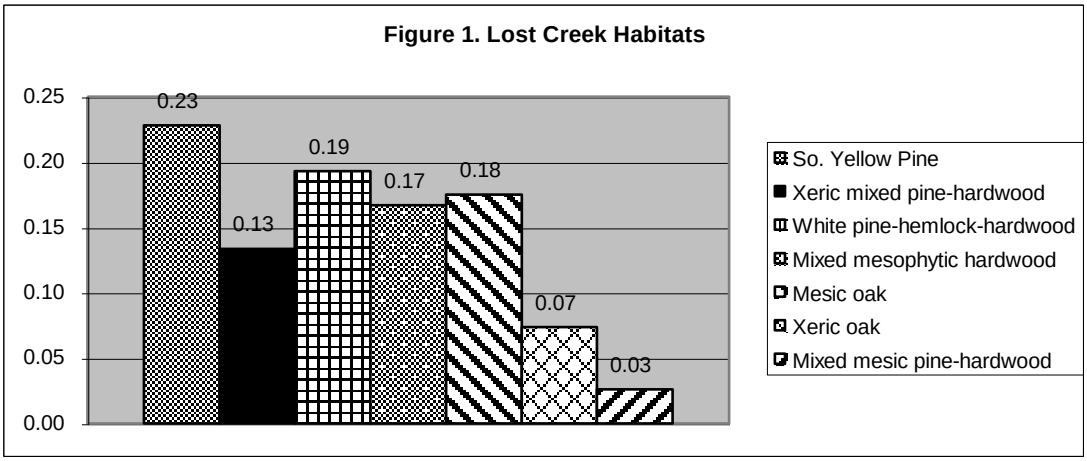
The wildlife resource within the Lost Creek analysis area is very diverse. The area provides habitat for 41 species of mammals, 81 species of reptiles and amphibians, and 137 species of birds (Burt and Grossenheider 1964, Hamel 1992, Nicholson 1997, Wilson 1995).

One important attribute of the area is that it provides a large block of contiguous deciduous forest in the mid-late successional age classes, key habitat for many area sensitive or "forest interior" birds. Bird watching is a popular activity in the study area. Other popular uses/opportunities include wildflower viewing, especially in streamside forest and rich cove forest sites, and hunting.

The analysis area includes a portion of the Ocoee Unit of the Cherokee Wildlife Management Area (WMA). The Tennessee Wildlife Resources Agency (TWRA) and the USDAFS cooperatively manage the Ocoee Unit of the Cherokee WMA. A mix of hunting occurs, including wild boar, white-tailed deer, wild turkey, and gray squirrel.

Hunter access via roads is good, with approximately 30 miles of Forest roads open for public use. Problems associated with this level of access include illegal hunting, littering, and OHV trespass, all of which have undesirable effects on the wildlife resource. Effects can be direct, resulting in illegal kill of animals or depressed reproduction; or indirect, resulting in OHV damage to managed wildlife fields. Even with properly located bear-proof trash containers in place, excessive littering in dispersed recreation areas will contribute to the "nuisance bear" problem, and may harm other species of wildlife as well.

The habitat groups in the analysis area are displayed in Figure 1. Over 73% of the study area is in mid-late successional age class condition while only 4% is in early successional 0-10 condition.



Habitat Associations

Habitat Associations are groups of species that require similar habitat conditions such as forest type and/or successional stage, or have an affinity for a specific rare community or key habitat feature.

Mixed Xeric Habitat Association

This habitat association includes species primarily associated with the dry and xeric oak, xeric pine and pine-oak, and dry and dry-mesic oak-pine forest communities. There are approximately 4,700 acres (43%) of these forests in the Lost Creek analysis area. Representative species of this association in the analysis area include pine warbler, a MIS, and Sensitive species including hairy blueberry (*Vaccinium hirsutum*) and ash-leaved bushpea (*Thermopsis fraxinifolia*). Turkeybeard (*Xerophyllum asphodeloides*) is another characteristic species of these xeric habitats that occurs in the study area.

To varying degrees, periodic fires are important for the maintenance of habitat conditions for this association. Pine-oak/heath communities, dominated by Virginia pine, Table Mountain pine, pitch pine or scarlet oak and ericaceous shrubs depend on periodic severe fires to regenerate (Schafale and Weakley 1990). Low to moderate intensity surface fires likely were characteristic of other communities in this association. Periodic prescribed fires also may be necessary to promote open canopy conditions required by many species in this association. Fire in conjunction with timber harvest can be used to restore degraded shortleaf pine-oak stands.

Because of the large acreage in these types, the xeric oak and pine-oak forests of this association make a significant contribution to oak mast capability of the analysis area. Hard mast, primarily acorns, plays a key role in the maintenance of healthy populations of both game and nongame species. Many of the understory plants in these xeric forests also are important sources of soft mast (e.g. *Vaccinium* spp., *Gaylussacia* spp.). The maintenance and enhancement of hard and soft mast capability should be a key consideration in the management of these forests.

Habitat Generalists Habitat Association

This habitat association includes species associated with a variety of forest habitats and successional stages and not closely associated with any specific rare community. To varying degrees, all of the ecological communities of the Lost Creek study area provide habitat for this association. Because of their broad distribution and general habitat requirements, habitat for this association generally is abundant in the study area. Representative MIS species include white-tailed deer, eastern wild turkey, ruffed grouse, and indigo bunting and Sensitive species include Diana fritillary (*Speyeria diana*).

By its nature, this habitat association encompasses a wide variety of habitat conditions, including multiple forest types and successional classes. The majority of the species has general habitat requirements and can occur in a variety of forest conditions. For example, the Diana fritillary occurs throughout the Southern Appalachians, inhabiting pine and deciduous forests near streams. Violets serve as the host plant for larvae (Scott 1986). Opler (1992) states that males may use a variety of habitats, but primary habitat consists of openings and fields in wet, rich woods. Roads and other openings in moist woods provide nectar plants for this butterfly. Many of the nectar plants are associated with early successional habitats or forest edges. It has recently been observed in a variety of habitats throughout the Chattahoochee National Forest (C. Wentworth, pers. comm.). Because of its general habitat requirements, no specific management actions are needed to sustain habitat conditions for this species.

Other species in this association, principally some of the major game species, have larger home ranges and multiple forest and successional stage requirements. These include white-tailed deer, wild turkey, and ruffed grouse. All three utilize a variety of forest habitats and successional stages, and as with the other habitat generalists, no specific management is required to maintain viable populations. However, if the Forest objective is to enhance populations to meet hunter demands, specific management actions are necessary. To varying degrees, these species require a mixture of forest/successional stage habitats to meet their year-round habitat needs. Key requirements include the interspersion of early successional habitats, late successional habitats (particularly mature oak stands), and grassy openings.

Wide-Ranging Area Sensitive Habitat Association

This association includes species requiring large tracts of forested land. To varying degrees, all forest communities and successional stages are utilized. Black bear (MIS) is the representative species of this association for the Lost Creek study area. In the southern Appalachians, the three most critical elements of bear habitat are habitat seclusion and diversity, den site availability, and the availability of hard mast (Griep 1999).

Because of the influence of roads on levels of poaching, legal harvest, highway mortality, and disturbance of bears, open-road density greatly affects habitat security (Brody and Pelton 1989, Van Manen 1991). These effects likely are greatest in areas open to hunting with dogs. The hunting of bears with dogs is allowed in Tennessee. In areas that are open only to still hunting or closed to hunting, Griep (1999) concluded that open road densities should not exceed 1.6 miles per square mile, with a goal of maintaining densities of approximately 0.8 miles per square mile. Overall open-road density of the study area is less then 0.5 miles per square-mile.

In the Southern Appalachians, Carlock et al. (1983) reported that bears used den trees ranging in size from 23 to 62 inches DBH. Most tree dens were in hardwood stands. Ten different tree species were used with Chestnut oaks used most frequently. Potential den trees are most abundant in late successional and old growth stages of the mixed mesophytic, dry-mesic oak, dry and xeric oak, and dry and dry-mesic oak-pine communities. There only are approximately 3,300 acres of these older hardwood forests in the study area.

State wildlife agency data indicate that bear populations in the study area have increased over the last decade. In Polk County, Tennessee, bait station visits have increased from 20% in 1985 to 51.7% in 1998 (TWRA 1999). The bait station route within the study area (Smith Mtn. Rd.) had an index of 46.7% in 1998. Along with increasing population comes the problems of nuisance bears, particularly in developed campgrounds and heavily used dispersed camping areas.

Mixed Mesic Forest Habitat Association

This association includes species which are primarily associated with sites that are moist but well-drained, and occur on north-facing slopes, steep slopes, lower slopes, slopes next to creeks and rivers, coves, more northern latitudes or higher elevations (Roecker and Wentworth 1999). This would include the mixed mesophytic, conifer-northern hardwood, dry-mesic oak, and dry and dry-mesic oak-pine forest communities (6,100 acres or 56% of the Lost Creek area). Most species in this association are found in mid, late, and old growth successional stages. There are approximately 5,100 (47%) of these older mesic forests in the Lost Creek study area. Representative species of this association in the analysis area include the Forest Sensitive broad-leaved tickseed (*Coreopsis latifolia*), ground pine (*Lycopodium clavatum*), American False Hellebore (*Veratrum viride*), Fraser's sedge (Cymophyllus *fraserianus*), and butternut (*Juglans cinerea*). Closed canopy conditions appear to be important to most species in this habitat association (Roecker and Wentworth 1999).

Streamside Habitat Association

This habitat association includes species primarily associated with forested riparian areas along streams. It also includes headwater areas, such as coves, draws, and hollows adjacent to small stream channels upstream from riparian areas and extending through first order streams (Stewart and Stewart 1999). Headwater transition zones are highly variable areas with a micro climate and characteristics that provide cooler, moister soil conditions than exist in the surrounding forest. These areas are critical to the survival of many invertebrates and amphibians found in the analysis area. Representative species of this association in the Lost Creek study area include the dusky salamander (*Desgmonathus fuscus*), and other species such as blackbelly salamander (*Desgmonathus quadramaculatus*), Acadian flycatcher, and Louisiana waterthrush. This association also includes the river otter, reintroduced by TWRA into the Hiwassee River downstream of the study area. There have been unconfirmed reports of otters in Hiwassee River near the analysis area. These streamside habitats occur to varying degrees in all of the forest communities in the analysis area except for the most xeric, upper slope and ridge-top stands.

The primary disturbance regimes along streamside zones include flooding and natural tree mortality resulting in small gaps in the forest canopy (Stewart and Stewart 1999). Fire is infrequent and normally would occur in these areas during times of extremely dry conditions or drought.

Mid and Late Successional Deciduous Forest Habitat Association

This habitat association emphasizes forest age and structure and to a lesser degree a particular forest type. Instead it covers a broad range of deciduous forest types. Fifty percent of the analysis area is mid to late successional deciduous habitat.

The mid-successional stage is a period when distinct overstory, midstory and understory canopy is present. This stage provides hard mast capability, larger standing snags, and live cavity trees. The late-successional stage provides the larger trees within the forest and the higher capability for large snag production, large live cavities, den tree production, and hard mast capability. Also small gaps become more common as some tree species die allowing full sunlight to reach the understory and midstory (McDonald 1999).

The gray squirrel is a MIS species that is a typical representative of this habitat association. Many other MIS including black bear, wild turkey, white-tailed deer, pileated woodpecker, and black-throated green warbler also are associated with mid-late successional deciduous forests. Because of other habitat requirements, the latter species have been included in other habitat associations but would none the less benefit from management for mid-late successional deciduous forests.

Grass/Forb Habitat Association

While this habitat is usually considered old-field succession, timber regeneration areas, or wildlife openings, it can be associated with all ecological communities discussed. Under these communities, grass/forb habitat would be open woodlands or scattered trees with little to no

midstory development (Peters 1998). The Eastern bluebird is a MIS that is a typical representative of this habitat association. Currently only 0.8% of the area provides this type of habitat, including 2.5 miles of powerline.

There are 40 acres of wildlife openings in the analysis area. In these areas virtually no exposed soil surface conditions exist and decaying thatch from previous growing seasons predominantly covers the area. An additional 54 acres is in grassy to shrubby habitat found in a powerline right-of-way. These areas provide nesting and foraging cover sought by some species. Ground dwelling rodents thrive in this protective cover and abundant food supply (Peters 1998).

Open woodlands are characterized by partial to complete ground cover of annual and perennial plants, few shrubs, scattered pole and sawtimber size trees and in most cases, a proliferation of newly germinated tree seedlings. More often than not this type of habitat is the result of a combination of periodic fire and partial overstory removal that maintains or mimics woodland or savannah like conditions. As a result, habitat conditions are maintained or created due in part to the intensity and periodicity of fire and in part to the degree of canopy closure of overstory trees (Peters 1998).

Ground disturbing activities such as timber management also create grass/forb habitat. In these instances, grass/forb habitat conditions are created the first growing season following activities and rapidly evolve into shrub/seedling/sapling stands over the next 2-3 years. In predominantly forested areas, these are the habitats that are in the most limited successional stage and exist for the shortest amount of time. Many species of wildlife that are common in years 1 and 2 after treatment are uncommon to absent at the same site in years four, five and beyond (Peters 1998).

Shrub/Seedling/Sapling Habitat Association

These habitats are a successional stage that could be found in all ecological communities. The MIS associated with this habitat is the Yellow-breasted Chat.

High stem densities of persistent woody vegetation characterize shrub/seedling/sapling habitats; briar patches, canebrakes, regeneration areas (4-10 years old approx.), rhododendron, laurel, vine tangles such as grape, honeysuckle and kudzu. This habitat provides an abundance of nesting sites for birds, small mammals, reptiles, and amphibians. It also provides food in the form of browse, leaves, fruits, and seeds for a variety of animals. These areas also have the potential to produce large numbers of insects due to the combination of thick growth and standing dead and decaying material (Peters 1999).

Forest Interior/Area Sensitive Mid-Late Successional Deciduous Forest Habitat Association

This association includes bird species requiring mid-late successional or older deciduous forests (Mitchell 1999). Most are neotropical migrant birds that primarily nest and raise young in the temperate Americas, and the pileated woodpecker is a permanent resident. These species are treated together due to their requirement for continuous forested tracts. Many avoid edges during nesting and are adapted to forest interior conditions. Area sensitivity refers to the concept that successful breeding is not likely to occur in small patches of otherwise suitable habitat.

A key attribute in measuring the quality of forest interior habitat is proportion of edge, an artifact of juxtaposing forested and nonforested habitats, within a landscape-scale analysis area. Habitat edges fragment optimal or suitable forest interior habitat, and are associated with microclimatic changes in light, temperature, wind, incidence of human influences including fire, increased predation and nest parasitism, and increased competition from exotic and pest species (Primack 1993, Yahner 1998). In addition, adults of some forest interior bird species display "lucifugous" or light-avoiding tendencies after long periods of adaptation to deep shade (Martin et al. 1993).

Ambient moisture is also an important feature influencing the abundance and distribution of many of these species, including the Cerulean, yellow-throated, Kentucky, black-throated green, hooded, worm-eating, and northern parula warblers, and the yellow-throated vireo (Martin et al. 1993, Hamel 1992). These birds are often distributed more evenly across mixed mesophytic landscapes, but are more restricted to moist patches in drier landscape settings. This may have implications for maintaining contiguous patches of potentially moist forest conditions and zoning management activities that interrupt this continuum. This need is more pronounced at range peripheries (Martin et al. 1993).

Many species are distributed across a wide range of elevations, although this association focuses on older forests found at lower to moderate elevations. Ecological communities that provide habitat within the analysis area include the mid- and late successional forests and old growth forest within the conifer-northern hardwood forest, mixed mesophytic, dry-mesic oak forest, dry and dry-mesic oak-pine forest, and eastern riverfront forest, and to a lesser extent, the xeric deciduous community types. The total area in deciduous forest types at a mid-successional age class or older is approximately 5,400 acres, or 50% of the study area (excludes xeric pine/pine oak). MIS found within the study area include the black-throated green warbler and the pileated woodpecker.

The study area is located within the Blue Ridge physiographic province. SAMAB (1996) reports that percent "hard" edge within this province is 17%; thus 83% of the area is forested. Findings of Robinson et al. (1995) indicate that landscapes within the mid-western U.S. that are at least 75% forested provide high quality habitat for area sensitive species. A coarse overview indicates that the Forest Service portion of the Lost Creek analysis area (approximately 10,900 forested acres) surrounds one private inholding of 640 acres. Most of this privately owned land is currently forested. This indicates that the project area has a very high probability of providing high quality habitat for this species group, and that fragmentation of area sensitive habitat is not likely an issue. In order to emphasize this species group, maintenance of the forest composition and structure in the analysis area is an important factor.

Seeps and Springs Habitat Association

Springs are places where water flows out of the ground as a result of gravity or pressure. Seeps are springs where water flows out of soil or rock with no discernable outlet, and are characterized by poorly drained soils (McDonald 1999b). Species within this habitat association are Coville's rush (*Juncus gymnocarpus*) and white-fringeless orchid (*Platanthera integrilabia*). The latter is a sensitive species on the Cherokee National Forest.

Permanent Water Habitat Association

Beaver pond and wetland complexes are found in valley bottoms, on floodplains, and in headwaters, often on low gradient streams. They include a mosaic of herbaceous and shrub wetlands with areas of open water, and often have semi-permanent to permanent flooding caused by stream impoundment by beavers (SAMAB 1996). Beavers are keystone species--they play a critical role in creating and maintaining a special ecosystem which many other species within their habitat association, and related wetland associations, rely upon. Some examples are known from the study area, including portions of Big Lost Creek.

A low market value for beaver pelts has resulted in an overall increase in beaver populations, and conflicts between private landowners and beavers are on the rise due to flooding of property and structures. National forests may offer potential restoration sites for these ecologically important animals in specific areas where minimal conflicts with roads and other facilities and resource uses occur.

OPPORTUNITIES AND POSSIBLE MANAGEMENT PRACTICES

A. AQUATIC ECOSYSTEMS

A monitoring program should be implemented to document the level of acidity emanating from Sulpher Springs Branch. A determination of whether the stream is naturally acidic or the result of some past human activity should be made. If the cause is attributable to anthropological activities, a plan to neutralize the acidity should be developed. If the acidity is truly natural, the associated acidophilic community should be investigated for unique or rare species.

If acid conditions are not too severe, fish should be re-introduced into those stream reaches where they appear to have been extirpated. Any proposal for re-introduction should be endorsed by the scientific community and lead by the Tennessee Wildlife Resources Agency.

Many of the stream reaches have been impacted by historic logging activities including channelization and “splash dams”. Beaver were removed from the entire watershed; but are beginning to come back. As a result of these actions, large, woody debris is lacking in all of the streams resulting in poor quality (shallow depth and little in-stream cover) pools. Cover logs and more intricate fish structures should be constructed in the stream reaches. Beaver should not be removed from areas where their dams do not cause damage to facilities.

Small, ephemeral ponds constructed in the log landings or on the closed roads would provide spawning areas for salamanders and frogs, and watering areas for bats and other animals

B. TRANSPORTATION

Opportunities exist for doing backlog road maintenance (deferred maintenance) to the existing system roads, especially those open to public travel:

- rebuild lost template to some roadway sections and add additional gravel

- control runoff from roads directly into streams
- improve drainage (replace/add culverts, construct dips, leadoff ditches, etc.)
- relocate sections of road parallel to streams

C. VEGETATION RESOURCES

Conifer-Northern Hardwood Forest

Because white pine is intermediate in shade tolerance, the selection system (uneven-aged management) could be used to maintain this community if desired on the landscape. The even-aged and two-aged systems might be more appropriate in initiating stand regeneration and/or restoration efforts. Timber harvests could be used to regenerate stands, shift species composition or lower tree density enhancing tree-vigor and/or promoting long-term ecosystem stability. At the landscape level, the potential need to create a mosaic of different age classes in this more disturbance-dependent subtype might also be addressed through harvesting. Harvests might also be used to promote greater within-stand horizontal or vertical structure. Normal disturbance rates for natural stands are not well documented. A range of one to ten percent annually would appear to be reasonable based on estimates for related ecological communities on similar landforms. Harvesting of one-half of one percent per year of this ecological community using either the selection method or in small even-age cuts (generally less than 40 acres in size) would mimic natural processes within the variance of expected natural disturbance.

Applicable vegetation management practices other than timber harvesting could include prescription burning, manual cutting for site preparation or to release selected crop trees, and vegetation control via herbicide application (for both silvicultural purposes and the control of invasive exotic vegetation).

White pine, particularly when its young, is easily killed by even low-intensity fires. Prescribed burning may be needed to perpetuate older white pine-northern hardwood types however. Fire return intervals are not well documented but could range from 20 to 30 years (Fire Effects Information System). Hemlock components are not currently threatened by hemlock wooly adelgid (HW A) but may be impacted in the next 20 to 30 years. Opportunities to mitigate the potential effects of HW A are conceptual and contingent on many factors, including desired future condition of the site, potential natural vegetation, and whether understory cohorts are already "in place".

Where oak is a desired overstory component, various management practices could be done to lower hazards and risks associated with oak decline and gypsy moth and to respond to specific wildlife or other resource needs. Important forest health threats to white pine include annonus root rot *(Fomes annosus),* bark beetles and other minor pests.

Because white pine is a relatively long-lived species, moderate to long rotations (100 to 150+ years) and/or cutting cycles (10 to 20 years) could be used in this community.

Mixed Mesophytic Forest

There is a general lack of advanced oak regeneration in many, if not most, mixed mesophytic stands. This is of significance where hard mast and high-value forest products are desirable. Shifts in species composition are a function of the kind(s), frequency, magnitude, and intensity of disturbance coupled with the individual tree silvics (shade tolerance, fruiting/seeding habit, seedbed and germination requirements, and responses to microsite conditions). Oak may become less predominant as a stand component in the mixed mesophytic forest over the long-term unless stands are actively managed to promote advanced oak regeneration.

Vegetation management alternatives to ensure oak components include pre-harvest site preparation techniques to favor advance oak reproduction and other practices (intermediate thinning and low-intensity prescribed burning on dryer sites) that can help create conditions favorable for oak seedling establishment (see also the discussion for dry-mesic community). Enrichment planting of high-quality oak seedlings is an option for many stands.

Even-aged, two-aged, or uneven-aged systems could be used to regenerate mixed mesophytic forests. Consequently, even-aged harvests should be prudently planned as shelterwoods or small clearcuts (generally 20 acres or less in size). Two-aged cutting methods should be tailored to retain small sawtimber trees as leave trees with higher leave basal areas (up to 35 square feet depending on stand conditions and site-specific objectives). Selection management may be appropriate, but little research has been done to assess the full impacts of either single tree or group selection harvest methods in this ecological community. Single tree selection would undoubtedly favor species composition shifts away from oak to more shade-tolerant species as regeneration cohorts. Silverbell *(Halesia tetraptera* [*carolinaJ)* seems to predominate many stands where disturbance is infrequent. Forest health concerns include problems associated with sustaining oak components over time, the potential loss of hemlock *(Tsuga canadensis),* dogwood *(Comusflorida)* and American beech *(Fagus grandifolia)* and butternut *(Juglans cinerea)* to exotic pests. Invasive, exotic vegetation, particularly kudzu *(Pueria lobata)* can be a problem. This community is relatively more resistant and resilient to change from natural disturbance than other ecological communities because of its inherent diversity and biological complexity.

Moderate to long rotations (100 to 150+ years) and/or cutting cycles(20 to 25 years) are possible harvest alternatives in this community. At the landscape scale, decadal regeneration harvesting of five percent (one-half of one percent annually) of this ecological community would appear to be within the normal variation of disturbance in natural stands.

Fire may have played a role in current species composition in many mixed mesophytic stands. Some tree species found in mixed mesophytic overstories are extremely resistant to fire; for example, yellow poplar. Other species such as northern red oak are considered integrally associated with fire (Fire Effects Information System). Natural fire return intervals are not well documented but could range from 20 to 25 years where oak components are more dominant.

Dry Mesic Oak Forest

Active management may be essential in maintaining oak communities. Oak advance reproduction needs to be assessed prior to any planned regeneration harvest. If oak is part of the identified desired future condition and advance oak reproduction is absent, a series of treatments may be needed to enhance the opportunity for oak cohort establishment. Forest health conditions should also be assessed. Oak decline hazard rating models should be used to analyze the short-term and long-term risks associated with susceptible and aging stands.

If site-specific analysis indicates a need for this community to persist on the landscape, management prescriptions should reflect the planned work needed to ensure future oak stands. These could include crop tree thinning, preharvest site preparation to reduce rank non-oak midstories, prescribed burning to control white pine or other vegetation management designed to promote a young oak cohort. Other integrated pest management strategies such as "slow the spread" for gypsy moth should be integrated in prescriptions. Subtle shifts in species composition may be appropriate to lower gypsy moth risks and address oak decline hazards. It may be ecologically prudent to shift species compositions toward a mixed pine-oak type if there is sufficient evidence to indicate the site either once supported pine or that the ecological landform and soils infer the suitability of the site to conversion to a mixed conifer-oak composition. Better sites could be managed to increase yellow poplar as a component. Prescribed fire generally should be of low intensity with specific objectives designed to reduce white pine and red maple or reduce potential wildfire fuels. The Fire Effects Information System should be used to model intensity and set parameters needed to formulate prescribed burning cycles and reduce white pine components.

Depending on specific objectives, even-aged, two-aged, or group selection may be appropriate. Single-tree selection generally does not provide regeneration conditions favoring sustaining the dominant species in this community.

When group selection is planned, consideration should be given to thinning between groups to increase midstory light for advanced oak regeneration. Groups should average about one acre in size. Cutting cycles should be determined based on growth and might range between 10 and 20 years on most sites. The two-aged system was developed specifically for use in this ecological community. It is particularly applicable where advance oak reproduction is in place and/or where efforts to mitigate visual concerns are important. The two-age system capitalizes on favoring oak regeneration, which is intermediate in shade tolerance over yellow poplar, which is intolerant to shade. Yellow poplar will not prosper in the high shade left as overstory in the two-aged system. Leave basal areas (BAs) of 15 to 35 square feet are generally appropriate.

Clearcutting can be used to regenerate damaged stands or stands where there is little need to mitigate visual effects. Natural regeneration from sprouting stumps and other sprouting saplings normally restocks stands with abundant regeneration. An assessment of the probability of oak regeneration should be done if oak dominance is part of the desired future condition.

Harvesting of one to two percent of this ecological community appears to be within natural variances. Harvesting above the mean natural disturbance rate may be needed to address current or future forest health problems.

Dry and Xeric Oak Forest

Opportunities may exist to restore shortleaf, pitch, or table-mountain pine stands on landforms currently occupied by xeric oak.

Careful review of historical evidence and ecological assessments are needed as rationale for this activity. This type could sustain some growing-season burning fire. Fire return intervals have been documented to range between 10 to 20 years.

Rates of harvesting of one to two percent would be within natural disturbance variances. Even-aged, two-aged, and group selection regeneration methods could be used to mimic natural dynamics.

Xeric Pine and Pine Oak Forest

To maintain this ecological community, periodic disturbance through active management (e.g., prescribed burning and intermediate harvest thinning) may be needed. Shortleaf pine and pitch pine restoration may be appropriate on some sites. Historic and prehistoric studies confirm the persistence and dominance of both shortleaf pine and oak types in the Lost Creek analysis area. Shortleaf pine stands can be managed to enhance herbaceous vegetation through a series of treatments. Once established, intermediate thinnings and prescribed burning can create stand conditions approximating pre settlement conditions. Many sites that are now in Virginia pine were historically shortleaf pine. Shortleaf pine stands maintained by periodic fire form a unique and stable ecological subtype. This species is relatively long-lived, can be managed for large, high-quality saw timber, and provides other long-term resource benefits the Virginia pine components cannot provide. Management of older pine stands should include assessments of species composition (specifically how much of the stand is Virginia pine), and the age, basal area density, and radial growth during the last 10 to 20 years. Generally, stands with ages over 70, BAs greater than 100, and radial growth of less than 1/10 of an inch annually indicate a moderate to severe southern pine beetle risk. Risk can be lowered by regenerating high-risk stands, thinning, prescribed burning to control rank understories, or a combination of activities. Silvicultural options include even-aged, uneven-aged, and two-aged systems. Partial cutting (of any kind) is generally imprudent in Virginia pine due to its shallow rooting habit. Uneven-aged methods generally will require considerable efforts to control unwanted regeneration and achieve the desired balanced and regulated stand. Other analysis pertinent to the use of uneven-aged management would include access needs based on cutting cycle (re-entry), as well as effects of roading on soil and water resources. Economic analysis may also used when comparing relative management costs of this silvicultural system versus alternative systems and methods.

Harvesting of two percent or more of this ecological community per year would probably be feasible and still stay within natural variances of stand replacing events such as wind, ice, insects, disease, and fire.

Dry and Dry Mesic Oak Pine

A number of treatments and activities, including prescribed fire, may be needed to sustain this ecological community. Current stand conditions can help indicate possible management practices needed to accomplish broad ecosystem objectives. Oak decline hazard rating and SPB risk assessments can help managers prioritize vegetation management strategies and regeneration needs. Analysis of age class distribution (current and future) can help determine optimum harvest regimes in keeping with natural disturbance variance

Harvests of one to two percent annually of stands greater than 70 years of age appear to be within a natural variance. Moderate rotations (even-aged systems) of approximately 100 years are possible on average sites with shorter rotations appropriate for poor sites and longer rotations of up to 125-150 years possible on exceptional sites.

Even-aged, two-aged, and uneven-aged systems can be used. Single-tree selection in this community may not successfully regenerate oak components.

Shortleaf pine should be favored as a species component over Virginia pine and white oak (which is less susceptible to oak decline) should be favored over red oak as a stand component.

Eastern Riverfront Forest

Opportunities to use timber harvesting or prescribed burning for ecosystem restoration or maintenance are limited due to riparian concerns. Efforts to control invasive exotic vegetation, particularly kudzu, should be implemented.

D. VISUALS

- Establish permanent vista points along Kimsey Highway including pull offs for views across watershed and north to Tellico.

E. RECREATION

- Develop universally accessible hunting or fishing areas.
- Complete Benton Mackaye Trail
- Develop trailhead parking for Benton Mackaye Trail
- Rehabilitate Lost Creek Campground (harden sites, work to eliminate illegal camping through design features and stream bank rehabilitation).
- Develop primitive picnic sites along Kimsey Highway

F. WILDLIFE RESOURCES

Mixed Xeric Habitat Association

- Restore degraded native communities through the use of cultural treatments, timber harvest, and prescribed burning.

- Use intermediate treatments to maintain a substantial oak component in mixed pine-oak stands.

Habitat Generalists Habitat Association

- Maintain a diversity of high quality mast-bearing age (50+ years-old) oaks and hickories.
- Enhance browse, soft mast, and other forage production through the use of fire, timber harvest, and maintenance of grassy openings.

Wide-Ranging Area Sensitive Habitat Association

- Maintain road densities of 0.8 miles per square mile, but in no case higher than 1.6 miles per square mile.
- Optimize den tree availability and mast production using 120-year rotation while providing soft mast and herbaceous forage.
- Provide educational materials to the public in developed and dispersed recreation sites on the proper handling, storage, and disposal of foods to avoid bear/human conflicts.
- Replace traditional garbage containers with bear-proof containers in areas experiencing or expected to experience "nuisance bear" problems.

Mixed Mesic Forest Habitat Association

- In dry-mesic oak, and dry and dry-mesic oak-pine forest communities, fire can be used to control the proliferation of white pine and rhododendron, and to favor oak regeneration.
- A number of TES and locally rare plant species are associated with these mesic habitats. Significant populations of these rare species should be protected from land-disturbing activities. In addition, exotic species such as kudzu (*Pueraria lobata*) and Nepal grass (*Microstegium vimineum*) should be controlled when they threaten species viability.

Streamside Habitat Association

- Appropriate Forest-wide water quality standards and guidelines should be followed on all projects.
- Off-highway vehicles, bicycles, and horses should be prohibited within the streamside habitat except at designated crossings.

Mid and Late Successional Deciduous Forest Habitat Association

- Retain hard and soft mast producing species that benefit wildlife.
- Use prescribed burning to enhance oak regeneration establishment and remove competing white pine regeneration in all forest community types.

Grass/Forb Habitat Association

- Maintain existing wildlife openings as early successional habitat and look for opportunities to increase acreage in grass/forb condition.

- Utilize timber harvest to achieve conditions desired by early successional habitat associates (Peters 1998).
- Retain all natural cavities trees along borders and within grass/forb habitats (Peters 1998).

Shrub/Seedling/Sapling Habitat Association

- Cluster these habitat types to provide suitable habitat for sustainable populations of species in this association.
- Control kudzu by the use of appropriate herbicide (e.g. Transline).

Forest Interior/Area Sensitive Mid-Late Successional Deciduous Forest Habitat Association

- Optimize habitat by maintaining older preferred forest types, while also providing grasses and forbs, thickets, and other vegetated nonforested conditions.
- Increase structural diversity, particularly in mid-successional forest (41-80 years old) by prescribed burning in dry-xeric oak and mixed pine-oak communities, thinning while retaining basal area and large-diameter trees, and conducting group selections ranging from 0.10 to 0.25 acres in size,
- Sustain current levels of early successional habitat up to a maximum of 3%. Early successional habitat includes regeneration areas in the 0-3 year old age class, shrub-scrub thickets, powerline corridors, "unmanicured" old fields, and native warm season grass plantings.
- Maintain all existing late successional and old growth hemlock forest.

Seeps and Springs Habitat Association

- Protect seeps and springs from roads and other activities including special use permits for spring boxes and pipes.
- Revegetate with emphasis on native species if surface soil is exposed.

Permanent Water Habitat Association

- Cooperate with state wildlife agencies to evaluate opportunities for restoring/maintaining beaver colonies in selected areas within the watershed.

LITERATURE CITED for Wildlife Resources Section

Biggins, Richard G. 1985. "Recovery Plan for Smoky Madtom (Noturus baileyi). U.S.D.I. Fish and Wildlife Service, Southeast Region, Atlanta, Georgia.

Brody, A.J., and M.R. Pelton. 1989. Effects of roads on black bear movements in western North Carolina. Wild. Soc. Bull. 17:5-10.

Burt, W., and R. Grossenheider. 1964. A Field Guide to the Mammals. The Peterson Field Guide Series. Houghton Mifflin Co., Boston.

Carlock, D.M., R.H. Conley, J.M. Collins, P.E. Hale, K.G. Johnson, A.S. Johnson, and M.R. Pelton. 1983. The Tri-State Black Bear Study. The Pope and Young Club and the Tenn. Wildl. Res. Agency. TWRA Tech. Ret. 83-9. 286pp.

Cherokee National Forest Aquatic Database. 2000.

Dinkins, Gerald R. 1982. Status of the Smoky Madtom (Noturus baileyi). Final report for contract to USDA Forest Service.

Dinkins, Gerald R. 1984. Aspects of the Life History of the Smoky Madtom, Noturus baileyi Taylor, in Citico Creek. Univ. of Tennessee, Master of Science Thesis.

Etnier, David A. and Wayne C. Starnes. 1993. *The Fishes of Tennessee.* The University of Tennessee Press, Knoxville.

Greip, S. 1999. Conservation and management of black bears in the Southern Appalachian National Forests. Draft Habitat Association Report for the FWRBE planning team. 7pp.

Hamel, P.B. 1992. Land manager's guide to the birds of the South. The Nature Conservancy, Southeastern Region. Chapel Hill, NC.

Martin, W.H., S. Boyce, and A. Echternacht, Eds. 1993. Biodiversity of the southeastern United States: upland terrestrial communities. John Wiley and Sons, New York.

McDonald, J. 1999. Mid- and Late- Successional Deciduous Forests. Draft Management and Conservation Strategies for Habitat Associations. USDA Forest Service.

McDonald, J. 1999b. Seeps and Springs. Draft Management and Conservation Strategies for Habitat Associations. USDA Forest Service.

Mitchell, L. 1999. Conservation and Management of Forest Interior/Area Sensitive Mid-Late Successional Deciduous Forest. Draft Management and Conservation Strategies for Habitat Associations. USDA Forest Service.

Nicholson, Charles P. 1997. Atlas of Breeding Birds of Tennessee. The University of Tennessee Press, Knoxville.

Opler, P. A. 1992. Diana Speyeria diana. Page 150 in :A field guide to eastern butterflies.

Houghton Mifflin Company, New York.

Peters, G. 1998. Grass/Forb Habitat Association. Draft Management and Conservation and Habitat Associations. USDA Forest Service.

Peters, G. 1999. Shrub/Seedling/Sapling Habitat Association. Draft Management and Conservation Strategies for Habitat Associations. USDA Forest Service.

Primack, R. 1993. Essentials of Conservation Biology. Sinauer Associates Inc., Sunderland, MA.

Robinson, S., F. Thompson, T. Donovan, D. Whitehead, and J. Faaborg. 1995. Regional Forest Fragmentation and the Nesting Success of Migratory Birds. Science 267:31.

Roecker, R. and C. Wentworth . 1999. Mixed Mesic Forests. Draft Habitat Association Report for the FWRBE planning team. 6pp.

Schafale, M. P., and A. S. Weakley. 1990. Classification of the natural communities of North Carolina. Third Approximation. North Carolina Natural Heritage Program, Raleigh, NC. 325pp.

Scott, J. A. 1986. *Speyeria diana* Great Smokies Fritillary. Page 324 in: The Butterflies of North America. A Natural History and Field Guide. Stanford University Press. Stanford, CA. 583pp.

Southern Appalachian Man and the Biosphere (SAMAB). 1996. The Southern Appalachian Assessment Terrestrial Technical Report (SAATR). Report 5 of 5. Atlanta: USDA Forest Service, Southern Region. 288pp.

Stewart, E., and R. Stewart. 1999. Management and conservation strategies for streamside species. Draft Habitat Association Report for the FWRBE planning team. 10pp.

Tennessee Wildlife Resources Agency. 1999. Big Game Harvest Report 1998-1999. Technical Report No. 99-1. Nashville, TN. 248 pp.

Van Manen, F.T. 1991. A feasibility study for the potential reintroduction of black bears into the Big South Fork Study Area of Kentucky and Tennessee. Tenn Wildl. Res. Agency Tech Rep. 91-3. 158pp.

Wilson, L. 1995. Land Manager's Guide to the Amphibians and Reptiles of the South. The Nature Conservancy, Southeastern Region Chapel Hill, NC.

Yahner, R. 1988. Changes in wildlife communities near edges. Conservation Biology 2:333-339.

LOST CREEK WATERSHED ECOSYSTEM ASSESSMENT TEAM

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APPENDIX A

ROAD LISTING			
Road No.	**Road Name**	**Length (mi.)**	**Comments**
Open to public			
A039	Park Drive	0.80	county road; RR underpass limits vehicle size to small
103	Whiteoak Flats	6.77	
103A	Big Lost Creek	0.10	open to creek; abandoned beyond
333	Lost Creek Rec.Ar.	0.16	
23	McFarland	5.45	includes 2.26 mi. across pvt. land county juris, FS mtc.
80	Smith Mountain	6.70	
68	Kimsey Highway	7.58	
private	Rymer Cemetery	0.15	private road off 23 on private land
	Sub-total	**27.71**	
Closed to public			
173	Probst	0.52	special use road
1003	Little Lost Creek	2.93	
11732	Powell Ridge	0.43	
5032	Whiteoak Flats Sp.	2.00	
1173	Deerfield-Piney Fl.	0.91	
1160	Boring Branch	3.93	
11581	Upper Boring Br.	0.51	
11727	Upper Marys Br.	1.68	
11712	Upper Bear Pen	0.18	TVA powerline access road
23D	TVA Rd. No. 6	0.06	TVA powerline access road
5031	Lower Bearpen Ld	1.10	
5030	Chestnut Gap	1.80	
11692	Chestnut Gap Lead	0.49	
1176	Rymer Camp	2.30	
117701	Sulphur Springs	1.80	
68A	Sassafras Tower	1.02	
331801	Jenkins Grave Gap	0.73	
117601	Dry Pond	0.38	
68B	TVA Road No. 8	0.30	TVA powerline access road
68C	TVA Road No. 9	0.07	TVA powerline access road
331701	Deep Gap Knob	0.50	

117401	South McFarland	0.40	
117501	Standing Rock	0.30	
1173-1	Deerfield-Piney Fl.	1.90	
117502	Puncheon Camp	0.25	
1176-1	Rymer Camp So.	5.93	
117605	Rymer Camp Spur	0.31	
	Sub-total	**32.73**	
	TOTAL	**60.44**	

APPENDIX B

Lost Creek Watershed Forest Development Roads		
Road No.	**Findings (Existing Conditions)**	**Recommendations (Opportunities)**
	Open to public	
A039	county road. (1) leading to project area: paved 0.5 mi. to Ellis Creek ford; some gravel beyond; railroad underpasses limit vehicle size to single unit truck; steep grades, rocky & rutted sections require high clearance/4WD vehicles; (2) along project area: ridge road in fair condition, but does have deferred maintenance needs	county maintenance; (1) beyond ford needs reconstructing or relocating; (2) along project area needs include: reshaping, drain mudholes, construct dips, construct leadoff ditches, etc.
103	major collector road providing access to Lost Creek Rec. area as well as entire Lost Creek watershed; connects with FDR 23 to provide connecting access to FDR 68, FDR 236 as well as FDR 80 and outlets to TN 68; well-built road in basically good condition except for some chronic weak soils that rut after freeze-thaw conditions; good bridges on Little & Big Lost Creeks; some road runoff directly into Little Lost Creek; road directly parallells Mary Branch for about 0.5 mi. with little filtering, but is stable; previous overtopping problems at upper crossing now solved; road continues to run close to Mary Branch, but more filtering exists	continue high level of maintenance; some deferred maintenance needs, but not as much as on FDR 23; a few opportunities exist to reduce water from roadway into watershed, such as approaches to Little Lost Creek bridge; check for sufficiency of filtering area around Big Lost Creek bridge; check road section parallel to Mary Branch for opportunities to reduce runoff; address freeze-thaw conditions with use of filter fabric and additional gravel
103A	0.1 mi. managed open to Big Lost Creek; large mud holes and no outslope; from top of ridge water is channeled straight down to creek with no outlet or filtering; ford and opposite bank used as dispersed site; trees block road at 0.2 mi.;	runoff from road needs to be controlled utilizing filtering areas; reshape and construct dips; eliminate use across ford in dispersed use area; abandoned section of road needs to be addressed for watershed protection needs
333	good gravel road in campground; but some features (tent pads, picnic tables, etc.) are close to Big Lost Creek with no filtering between use area and creek	continue good maintenance; opportunities exist for reducing sediment from areas of use into Big Lost Creek
23	major collector road beginning at FDR 68 providing access to the heart of Lost Creek watershed and the private	major deferred maintenance needs to restore template and drainage; opportunities exist for reducing runoff

	property (2.26 mi. on private); ties to FDR 103 and FDR 236, provides access to FDR 80 and ties to county roads at Turtletown; various standards representing past work done on different sections; 3 sections recently relocated away from streams, other sections parallel to and/or cross several streams including Little Lost Creek, Piney Flats Branch, Standing Rock Branch, Puncheon Camp Branch, Rymer Camp Branch, Sulphur Springs Branch, Chestnut Gap Branch, Big Lost Creek, Bearpen Branch and several unnamed tributarties to these; some steep grades with long stretches of ditches with no cross drains; exposed rock in places; soft soils in places; private landowner has voluntarily contributed money in the past for road maintenance and encouraged (granting R/W exchange for) relocation	into watershed with some possible relocations; continue to work with private landowner on improving road through private land (possible partner)
80	collector road tying FDR 23 and FDR 68; provides access to Smith Mountain and the upper part of Lost Creek watershed; old ridge road that is stable, but has lots of rocks sticking up in roadbed and some ditches filled up with plugged culverts; 3.5 mi. from FDR 23 to FDR 1176 in fair condition, recently reconstructed for timber sale with dips and reconditioning; remaining section very rough; no apparent impact to watershed	major deferred maintenance needs, especially from FDR 1176 to FDR 68 to restore template and drainage; add gravel; control runoff from FDR 80 on to FDR 11692 (see Findings for FDR 11692)
68	collector road accessing upper part of Lost Creek watershed; connects Greasy Creek community to TN 68 tying to FDR 23, FDR 80 and FDR 66; generally high ridge road following close to watershed boundary; fair condition, but currently impacted by TVA for powerline construction from Deep Gap westward; some loss of roadway with rocks sticking up; some weak spots that soften during freeze-thaw conditions	deferred maintenance needs to restore template; some drainage work and gravel needed; continue other annual maintenance

private	access to Rymer Cemetery; steep grades, but stable; one short section diverges from the main road and is in the riparian area of a tributary to Piney Flats Branch for about 0.1 mi.; appears to be no major problem	private maintenance responsibility; continue current maintenance
	Closed to public	
173	special use road; part of old FDR 103A closed by blizzard of '93 and not opened back to public; put under special use and reworked; current condition unknown (no FS lock)	condition could not be assessed, but road was reconstructed by the permittee in 1993; steep grades with lots of dips need continual maintenance
1003	generally a ridge road that is fairly stable; part maintained as linear wildlife opening; no apparent watershed problems; last part of road grown up (approximately 0.2 mi.)	continue current maintenance; reconstruction needed for timber haul to widen curves for tractor trailers
11732	similar condition as FDR 1003	continue current maintenance
5032	generally ridge road that is stable; maintained as linear wildlife opening; no apparent watershed problems; trees down at approximately 1.0 mi.	continue current maintenance; sufficient for light wildlife maintenanc traffic; for timber haul would need more work
1173	maintained as linear wildlife opening; stable for what was seen; tree down at 0.5 mi.; first part re-worked for recent timber sale; crosses tributary of Little Lost Creek	continue current maintenance; sufficient for wildlife maintenance traffic
1160	maintained as linear wildlife opening; generally ridge road that is stable, but has some erosion over dips; at the beginnng there is some rutting that needs maintenance; no apparent impact to the watershed; trees down at 1.55 mi.	needs regular maintenance, i.e., reshaping and cleaning dips; continue other maintenance for light wildlife maintenance traffic
11581	seeded, stabilized road, not linear wildlife opening; appears ok; tree down at 0.1 mi.	infrequent maintenance ok; would need work to be used as timber haul road
11727	good ridge road; maintained as linear wildlife opening; no major problems	continue current maintenance
11712	TVA powerline access road; some (15-20%) grades, but ok for powerline maintenance traffic; ridge road	TVA should continue adequate maintenance to keep waterbars working
23D	TVA powerline access road; adjacent to Bearpen Branch; adequate for low volume traffic for powerline maintenance	TVA needs to keep road stable because of proximity to stream; use only when necessary for powerline maintenance
5031	primitive, unimproved; begins on FS,	need to reshape with dips, etc. near

	goes on private (FS has no right-of-way), continues on FS; provides access to TVA powerline; driveable about 0.1 mi., then grown in; some erosion near gate on steep grades, but most of road (that is visible) is stable; generally a ridge road	beginning to correct erosion; continue other current maintenance for TVA powerline access traffic; reconstruction needed for use as a timber haul road
5030	maintained as linear wildlife opening for 1.0 mi.; beginning to grow up beyond that; no visible impact to watershed; tree down at 1.25 mi.; sidehill road crossing high on tributaries of Chestnut Gap Branch	continue current maintenance; sufficient for light wildlife maintenance traffic
11692	ridge and sidehill road; some steep grades; erosion between dips particularly where runoff from FDR 80 reaches road first 0.1 mi.; no visible impact to watershed	stablize eroding areas between dips; possibly seed more heavily; try to control runoff from FDR 80
1176	fairly stable; recently used for timber sale to 0.84 mi. (jct. with FDR 117701); tree down at 0.6 mi.; some minor erosion between dips; grown in beyond 0.84 mi.; sidehill road with crosssings on the following streams and/or their tributaries: Pace Shanty Branch, Sulphur Springs Branch and Chestnut Gap Branch	correct erosion problems; continue other current maintenance
117701	basically ridge road; maintained as linear wildlife opening; first 0.3 mi. recently reconstructed for timber sale; some erosion causing rutting between dips; no apparent impact to watershed; condition beyond first section unknown	correct erosion problems; continue other current maintenance
68A	ripped, seeded for linear wildlife opening; good stand of grass; no dips, but stable; minor erosion at beginning before gate; access to Sassafras Radio Tower	continue current maintenance
331801	low standard road 8’ wide well barricaded and grown up at the beginning; access to Little Pond Mountain Wilderness; maintained as ML 1; evidence of fair amount of foot traffic to wilderness; at top of ridge appears to go into wilderness around graves ; trail goes to graves	continue to maintain for foot traffic; consider decommissioning as road and leave as trail, at least beyond the first 0.1 mile which is at the top of the ridge at the wilderness boundary

117601	low standard road 8-10’ wide; mostly stable with some minor ersoion in places; 12-15% grades with a 25% pitch; all dips not functioning, but still mostly stable; access to Little Pond Mtn. Wilderness; doubles as FDT 76 Dry Pond Lead Trail; mostly foot traffic with some evidence of single track wheeled vehicles (unknown if motorized or non-motorized); maintained as ML 1 but with gate, but no other evidence of recent vehicular use	continue to maintain for foot traffic; consider removing gate, barricading adequately and decommissing as a road leaving it as a trail
68B	TVA powerline access road; steep grades (>15%, some 25-30%), but ok for powerline maintenance traffic; ridge road; appears to have no impact to watershed; currently being used by TVA as staging for supplies and equipment; some widening and gravel added; should be stable after TVA use ends	TVA needs to maintain well because of steep grades; keep waterbarred and seeded; consider large staging area for picnic area; keep first section of road open and maintained for that use
68C	TVA powerline access road; condition unknown, but ridge road; currently being used by TVA for powerline construction	TVA needs to keep maintained well; be sure it is stablized after TVA contract ends
331701	low standard, but stable road 10-12’ wide; roadbed and slopes stabilized with grasses and other low vegetation; well-drained with stable, functioning dips; provides access to wildlife opening; minor erosion for first 100’ to gate and at the end of the road for 50’ to the field	correct erosion (low priority); continue current maintenance for current use; improvements would be needed for timber haul
117401	access to wildlife openings; in recent years extended beyond fields for timber sale; some rutting; road at head of Little Lost Creek; tree in road at 0.25 mi.	correct erosion; reshape; clean and construct dips; continue other current maintenance
117501	access to wildlife opening for 0.1 mi.; mainly stable ridge/high sidehill road; growing in beyond wildlife field	continue current maintenance; sufficicnt for light wildlife maintenance traffic; other work needed if used for timber haul
none	unclassified primitive road off FDR 23 for about 800’ in riparian area of Little Lost Creek; climbs to ridge tying to recent timber sale temporary road off	leave abandoned; remove gate but be sure road is adequately blocked to prevent use

	FDR 117401; total length about 1000'; no recent use; no apparent damage	
1173-1	maintained as linear wildlife opening; stable ridge road; no major problems	continue current maintenance; sufficient for light wildlife maintenance traffic; some curve widening needed for timber haul
117502	primitive, but basically stable high sidehill road; access to wildlife openings	continue current maintenance; sufficient for light wildlife maintenance traffic; major work needed if used for timber haul
1176-1	stable; well-constructed sidehill road; maintained as linear wildlife opening from mp 1.7 to mp 5.1; crosses Rymer Camp Branch and several of its tributaries high in the watershed; trees in the road at 5.4 mi.; some minor rutting on steep grades near the end; roadbed of last section beginning at mp 5.53 well seeded	correct minor erosion; continue current maintenance; no major work currently needed
117605	fairly stable, but steep grades; some rutting; sidehill road; probably no major impact to watershed	correct erosion; clean dips; construct dips