ENVIRONMENTAL ASSESSMENT
FOR
THE SUPPRESSION OF SOUTHERN PINE BEETLE INFESTATIONS
on
The Nantahala and Pisgah NATIONAL FORESTS

Including

Haywood, Madison, Avery, Burke, Caldwell, McDowell, Buncombe, Mitchell, Transylvania, and Yancey counties on the Pisgah National Forest and Graham, Swain, Jackson, Macon, Cherokee, and Clay counties on the Nantahala National Forest

Responsible Official:

JOHN F. RAMEY

Forest Supervisor

P. O. Box 2750

Asheville, North Carolina 28802

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CHAPTER ONE: PURPOSE AND NEED

Proposed Action

The Nantahala and Pisgah National Forests (N/P) are proposing to suppress Southern Pine Beetle (SPB) infestations in susceptible host types. Susceptible host type is defined as stands dominated (more than 70%) yellow pine, white pine, or mixed pine-hardwood greater than 15 years old. Suppression activities are proposed in management areas 1 through 5, 8 (experimental forests), 11 (cradle of forestry in America), 12 (developed recreation areas), and 13 (special interest areas).

There are four treatment methods outlined in the Final EIS for the Suppression of the SPB (Volume 1, p. 2-3), however, only three will be considered in detail for this outbreak.

They are:

1. **Cut and remove** -- felling and removal of infested trees and a buffer strip of adjacent, uninfested, green trees. This technique reduces the number of beetles available to attack new, healthy trees.

2. **Cut and leave** -- felling of infested trees and a buffer strip of adjacent, uninfested, green trees toward the center of the spot. This technique disrupts the source of the attractive SPB pheromone and forces any beetles emerging from the felled trees to disperse.

3. **Pile and burn** --felling, piling and burning infested trees to destroy beetle broods before they emerge.

The method **not** considered in detail for this proposal is:

Cut and hand spray -- felling, limbing and bucking infested trees into manageable lengths and hand spraying with insecticides.

Suppression would not be appropriate or needed for all SPB infestations and limitations on control may apply in order to meet a variety of resource values or management objectives. Mitigating measures are specified to substantially reduce impacts to biological resources. Suppression activities would not occur where Forest concern, Forest sensitive, and federally listed and candidate species occur. These occurrences would be excluded from suppression treatments. Known element occurrences are identified through current inventories. Biological implementation checks prior to suppression treatments would assure that potential habitats for Forest concern, Forest sensitive, and federally listed and candidate species are avoided. Biological specialists would conduct on site implementation checks.

The need for suppression activity could occur at any time during this outbreak and each SPB infestation would be checked to determine the need for control, proper control method, and coordination needed to protect other resources. These decisions would conform to the integrated pest management (IPM) recommendations in the Final EIS for the Suppression of the SPB.

The last Southern Pine Beetle outbreak occurred on the Nantahala and Pisgah National Forest from 1989 to about 1991. During this 3-year infestation about 2,500 acres were treated with either "cut and remove" or "cut and leave". Based on circumstances of past infestations we do not anticipate the need to treat more than 2,500 acres, across the two Forests, during this infestation. We estimate that approximately 1,500 acres would be treated with cut and remove, approximately 500 acres with the cut and leave, and approximately 500 acres with pile and burn. The balance of infested acres would receive no treatment because of low risk to adjacent, healthy trees and difficulty of accessing the infested trees. If suppression treatments of more than 2,500 acres are warranted with this infestation, additional evaluation and public involvement would be conducted requiring a new decision

Connected actions for this proposal may include access to active infestations. In most all cases, suppression of active infestations would be accessed with existing roads. In some instances, minimum road maintenance or short temporary road construction may be needed. After suppression activities temporary roads would be returned to natural conditions and decommissioned. No new system road construction is proposed for control of SPB. Cut and remove would only be proposed in stands considered accessible. For the purpose of this analysis, accessible is defined as, within ¼ of a mile of a system road and slopes less than 40%. Cut and leave or monitor would be considered on inaccessible land. Pile and burn would only be considered in a very limited set of situations, such as small spots in developed recreation sites at the time of the year when cut and leave is considered less effective (October-May). Other future actions may include reforestation activities using both natural and artificial methods,;these activities require a separate analysis and decision.

Purpose and Need

Suppression of SPB infestations is needed to:

- provide for the safety of Forest visitors and workers,
- reduce risk of infestations on adjacent private land,
- reduce impacts to scenery ,
- minimize loss of pine communities, including timber resources,
- and reduce the risk of damage from wildfires by minimizing increased fuel loading.

Need For Immediate Action

SPB is indigenous to western North Carolina and populations periodically reach outbreak or epidemic levels. This outbreak can be attributed to stress on pine forests resulting from two concurrent years of drought conditions. The outlook for the summer of 2000 is less than normal rainfall, which could result in continued stress on pine forests and a continued threat of pine mortality due SPB infestations.

The Nantahala and Pisgah Land and Resource Management Plan, amendment 5, provides for suppression of SPB infestations using Integrated Pest Management (IPM). Long-term goals for IPM are to manage the forest to reduce vulnerability to SPB attack. The short-term goal, which is assessed in this document, is to suppress SPB spots to minimize impacts to forest wide resources resulting from mortality in pine communities. The effectiveness of this approach is dependent on prompt detection, evaluation and, when necessary, suppression of SPB spots to avoid unacceptable resource impacts.

Timelines associated with Biological development of SPB and NEPA Documentation
SPB Biological Development

Generally, beetle broods complete their development in about 30 days during the warm season from April to September. Generations can overlap--as many as 7 overlapping generations may occur in one year. A tenfold increase in SPB populations is possible with each successive generation. Delay of Suppression efforts can mean a substantial increase in SPB populations, which translates to spot growth and eventually spot proliferation within the susceptible host types in the area. Therefore the success of this proposal, suppressing the rate of SPB spread, depends on treating high risk sites as soon as possible.

About 11 % of the N/P national forest is considered a susceptible host type for SPB. This includes shortleaf pine, Virginia pine, table mountain pine, pitch pine, white pine, and mixed pine hardwood forest types. Current estimates of the number of SPB infestations are 237 spots.

The table below displays acres susceptible to SPB by district and an estimate of susceptible acres that are accessible for suppression activities. Accessible acres are based on areas that are within ¼ (one-fourth mile) of existing roads. The table also displays the current number of spots as of April 30, 2000.

Table 1: Susceptibility and Status of the N/P to SPB

Forest	District	Total Acres	Total Susceptible	% Accessible	Number of active spots
Pisgah	Appalachian	159,868	11605	20	12
Pisgah	Grandfather	189,253	33208	39	108
Pisgah	Pisgah	155,341	4988	47	19
Nantahala	Cheoah	120,612	17768	29	28
Nantahala	Highlands	114,394	10535	70	12
Nantahala	Tusquitee	158,889	29477	54	28
Nantahala	Wayah	134,887	6084	29	30
Total			**113,665**		**237**

Decision to be made

The decision to be made is whether to suppress SPB infestations in management areas 1 through 5, 8 (experimental forests), 11 (cradle of forestry in America), 12 (developed recreation areas), 13 (special interest areas), 16 (administrative facility areas), and 18 (riparian areas),and if so, what kinds of activities and amounts would be used. Suppression strategies would be limited to cut-and-remove, cut-and-leave, or pile and burn as described in the SPB EIS dated April 6, 1987.

Public Involvement and Issues

A scoping letter from the Supervisor's Office was mailed on December 13, 1999 and notice appeared in the Asheville Citizen-Times on December 16, 1999 asking for comments on actions to suppress SPB. Letters were also sent by all of the individual districts of the N/P to their district mailing lists. —Fifteen letters were received in response to the request for comments on the proposal.

Public responses to the scoping notices ranged from support for suppression of all infestations to just focusing on areas where health and safety of the public would be at risk. Specific comments included the following:

1. Several responses encouraged us to do individual analysis for each infestation or groups of infestations within close proximity. These comments questioned our ability to do a site-specific analysis on a Forest wide basis.
2. Caution with respect to negative impacts to scenery as viewed from the Appalachian Trail.
3. Caution against new road construction for access during cut and remove operations.
4. Protection of private lands.
5. Protecting wildlife openings from damage during cut and remove operations.
6. Protection of significant archeological sites. Archeological sites, historic and prehistoric, can be negatively impacted by ground disturbance and logging activities.
7. Increased fire and smoke management risks. More standing dead trees and dried fine fuels increases the risks of wildfires.

We classified these 7 concerns as issues and addressed them in the body of the document or through mitigation measures in the alternatives.

CHAPTER TWO: ALTERNATIVES CONSIDERED

Alternative A: No Action
Under this alternative no suppression activities would occur.

Alternative B: Proposed Action
Implement suppression activities in Management areas 1 through 5, 8 (experimental forests), 11 (cradle of forestry in America), 12 (developed recreation areas), 13 (special interest areas), 16 (administrative facility areas, and 18 (riparian areas).

The following suppression methods are proposed:

CUT and REMOVE - - The infested trees, containing SPB in and under the bark, would be removed from the spot. A buffer strip of uninfested susceptible tress next to the infested ones also would be cut and removed. The buffer would be no wider than the average height of the trees in the spot. Trees vacated by the SPB would **not** be cut. With this method there would no ground skidding on slopes greater than 40% and no new system road construction.

CUT and LEAVE - - The infested trees would be cut and felled toward the center of the spot. A buffer strip of susceptible uninfested trees next to the infested ones also would be cut and left. The buffer would be no wider than the average height of the trees in the spot. Trees vacated by the SPB would not be cut.

Cut and Leave is effective during the warmer months (May-October) for several reasons. Southern pine beetles have less energy for flight in summer. When a buffer strip of host trees are cut, beetles are forced to fly farther than to an adjacent tree, and they will often die. Also, female beetles on freshly attacked trees produce an attractant phermone to draw in other flying beetles. Phermone production is halted by felling all freshly attacked trees. Emerging beetles disperse into the surrounding area instead of concentrating attack on individual trees. Lastly, felling infested trees reduces survival of broods caused by lower moisture and higher temperatures in felled trees.

PILE and BURN - - The infested trees would be cut and piled toward the middle of the spot. The pile then would be burned until all infested bark was thoroughly charred. A buffer strip would not be needed with this method.

The Forest Service would limit the number of acres to be treated under the authority of this document to 2,500 acres for the current infestation. Due to limitations in funding, the widespread nature of the situation, and our inability to respond because of a limited number of personnel, the Forest Service has prioritized action to be taken on the Nantahala and Pisgah National Forests. In past infestations suppression activities have been limited to about 2,500 acres. Below is a priority list that would guide the use of limited suppression funding.

1. **Provide for health and safety of Forest visitors and workers**
    - Health and Safety is a concern where host type is adjacent to trail, trail head, open road, within designated recreation areas, or a threat (within ¼ mile) to recreation , administrative facilities, or other structures.
2. **Reduce risk of infestations to adjacent private lands**
    - Risk to private land is defined where private lands are adjacent to or within ¼ mile of active infestation.
3. **Minimize mortality in pine communities and protect visual quality**
    - This objective would only be pursued in Management Areas 1B, 2A, 3B, 4A, 4D, 2C, and 4C

4. **Reduce risk of increased fuel loading from mortality resulting from SPB**
    - Risk of fuel loading occurs on Southeast, South, and Southwest facing slopes where host type is comprised of 50 contiguous acres or more.

Priority 4, increased fuel loading is analyzed in addition to Priorities 1-3. Increased fire danger would occur on all stands where there is dead and dying pines contributing to fuel loading. Fire danger is expected to be highest where the host type is comprised of areas greater than 50 contiguous acres on south, southeast, and southwest slopes.

Immediacy of Project Needs and the N/P Approach to Documentation

Several comment letters from the public in the initial scoping period suggested that the N/P Forests approach this epidemic similar to the Lake Powhatan infestation of the Pisgah Ranger District of the Pisgah National Forest. This project was pursued under a categorical exclusion from documentation under the administration of facilities authority. This only requires a Decision Memo for environmental documentation, which reduces time frames by at least 60 days (approximately two life cycles of the SPB). That authority is only available for administrative or recreational facilities. For any project pursuing suppression efforts outside of recreation or administrative sites, an Environmental Assessment is required. Fortunately, the scope of this proposal is narrow and only pine trees would be subject to actions. Since biological diversity and complexity within pine stands is low, compared to rich cove forests of the southern Appalachians, we are confident that environmental effects can be adequately disclosed for a reasoned choice among alternatives. The direct, indirect, and cumulative effects of the epidemic are analyzed in this document. Stands susceptible to the current SPB epidemic are listed in appendix C.

Alternative B proposes suppression in susceptible host stands and lists mitigation for all control methods proposed. The implementation procedures -for Alternative B (Figure 1) outline conditions for pursing each of the suppression methods. Each affected resource (Archeology, Botany, Fisheries, Wildlife, and Visuals) is listed with mitigation for special conditions known to exist in the project areas, general mitigations, and specific mitigations for each method of suppression. For cut and remove activities, implementation checks prior to ground disturbance are required and measures are ground truthed to assure the environmental effects fall within the

analysis disclosed in this document. If the action would cause effects beyond those disclosed in this document, it would not be taken. . This approach satisfies the need for site specific analysis before ground disturbance, while reducing the time frames associated with analysis and writing.

The following table displays acres by Priority by district

Table 2: Acres by priority for suppression

Forest District			**Forest District**		
		Acres			**Acres**
Pisgah Appalachian	Health and Safety	2167	**Nantahala Cheoah**	Health and Safety	12517
	Private land	5172		Private land	3742
	Loss of Pine Habitat	4266		Loss of Pine Habitat	1509
	Fuel Loading			Fuel Loading	
Pisgah Grandfather	Health and Safety	21109	**Nantahala Highlands**	Health and Safety	8928
	Private land	6367		Private land	*
	Loss of Pine Habitat	5732		Loss of Pine Habitat	1607
	Fuel Loading			Fuel Loading	
Pisgah Pisgah	Health and Safety	4191	**Nantahala Tusquittee**	Health and Safety	22803
	Private land	544		Private land	4094
	Loss of Pine Habitat	252		Loss of Pine Habitat	2580
	Fuel Loading			Fuel Loading	
			Nantahala Wayah	Health and Safety	2237
				Private land	2536
				Loss of Pine Habitat	1310
				Fuel Loading	

* Stands meet criteria for both priority 1 and 2, therefore listed as priority 1

Note:
Threat to private land is an estimate of susceptible host types adjacent to private land. It does not indicate that susceptible host types are available for expansion of southern pine beetle.

Fuel loading is an estimate of number of acres that are comprised of fifty or more contiguous acres on south, southwest, or southeast aspects.

The following implementation procedures would guide suppression efforts. Decisions made in this key are based on recommendations for suppression of SPB in the SPB Final EIS. The main points for decision on a control method (once an infestation or spot is detected) are: accessibility, time of year, and impacts to other resources.

Figure 1:

IMPLEMENTATION PROCEDURES FOR SUPPRESSION ACTIVITIES

Fresh attacks, green infested, brood trees present?

NO → **MONITOR**

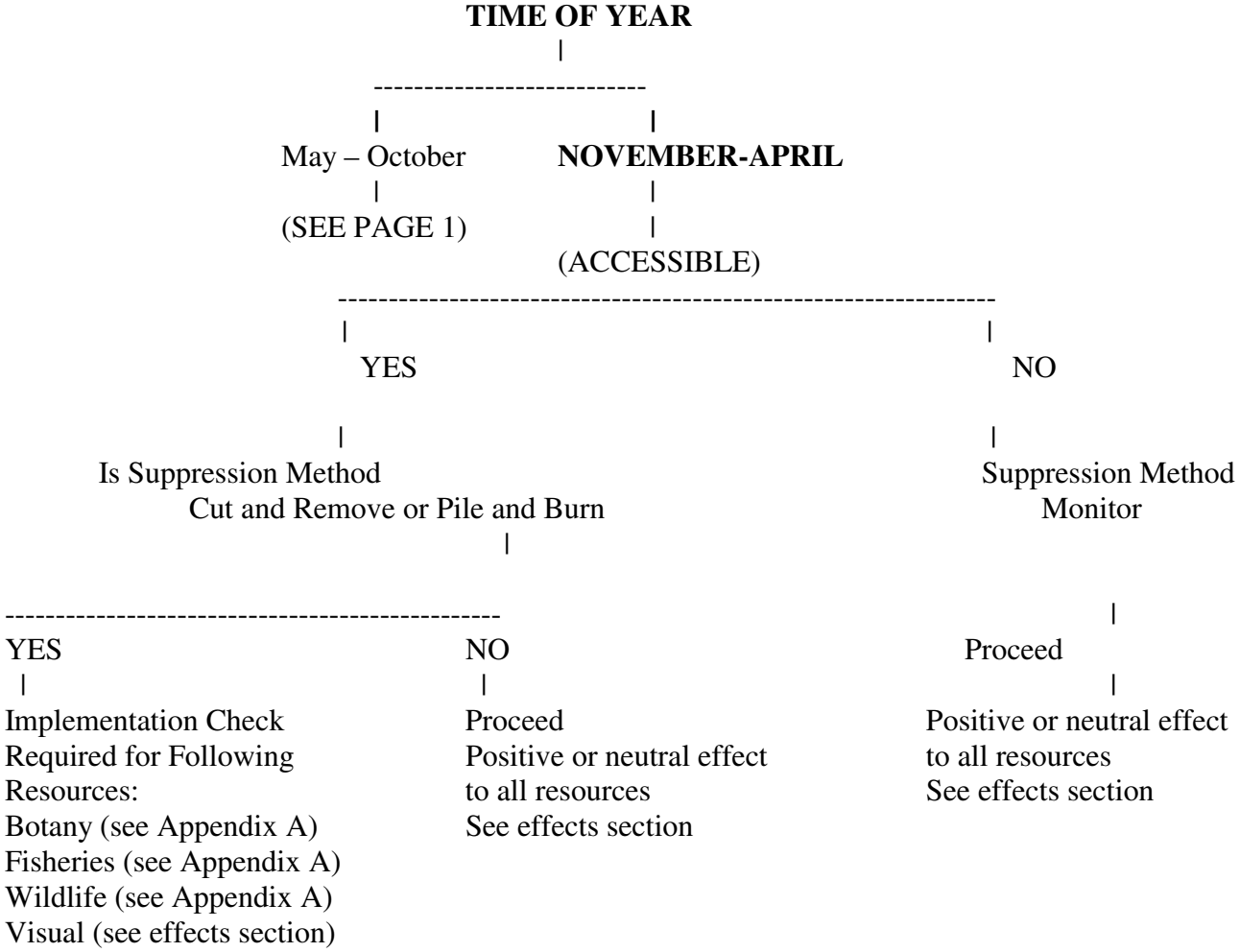
YES → **TIME OF YEAR**

MAY-OCTOBER → ACCESSIBLE

- YES → Is Suppression Method Cut and Remove
  - YES → Implementation check Required for Following Resources: Botany (see Appendix A) Fisheries (see Appendix A) Wildlife (see Appendix A) Visual (see effects section)
  - NO → Proceed. Positive or neutral effect to all resources. See effects section
- NO → Suppression Method Cut and Leave or Monitor → Proceed. Positive or neutral effect to all resources. See effects section

November-April → (SEE NEXT PAGE)

(Continued from previous page)



CHAPTER III – ENVIRONMENTAL EFFECTS

Introduction

This section discloses environmental effects of alternatives. To analyze effects of Alternative B, the ID team constructed the likely future conditions with and without control of SPB. This analysis tiers from the Final Environmental Impact Statement for the Suppression of the Southern Pine Beetle (1987) USDA Publication 49, Southern Pine Beetle (Thatcher and Berry), USDA Publication 645, Rating the Susceptibility of Stands to Southern Pine Beetle Attack (Mason, Lorio, Belanger, and Nettleton, 1991), USDA Publication 575, Direct Control Methods for the Southern Pine Beetle (Swain and Remion, 1981).

Background Information

The SPB (*Dendroctonus frontalis* Zimmermann) is the most destructive pine bark beetle in western North Carolina and the southern US. Pine trees are killed singly, in small groups, or in large numbers, sometimes exceeding hundreds of acres. SPB is a native pest to the South and occurs in small numbers (endemic) until outbreak or epidemic population levels develop. Infestations can develop into outbreak levels when pine forests are stressed by crowded growing conditions, trees are damaged from ice or wind, drought conditions, or when stands are considered biologically mature. These stress conditions can often prevent the tree from producing adequate resin flow to "pitch out" the attacking insect, which is the tree's main defense in a SPB attack. Once pine stands are weakened, they become more susceptible to attack by SPB. Once populations develop in weakened trees, the beetles may spread to healthy trees that normally would resist attack. When beetle populations become large (epidemic), they can successfully attack healthy, vigorous trees and result in widespread mortality. Pine engraver beetles (*Ips* spp.) and the black turpentine beetle (*Dendroctonus terebrans* Oliver) are frequently associated with SPB outbreaks. Their interrelation in predisposing trees to southern pine beetle attack or in competing for the same food supply has not been fully explained. Natural enemies, including diseases, parasites, and predators (primarily the clerid beetle) can help maintain beetle populations at endemic levels. However, these forces seem to have relatively little effect during epidemics. Most major outbreaks last from 3 to 5 years and occur in irregular cycles of about 7 to 10 years, sometimes longer in the Mountain region.

Forest Health has predicted, that if a Southern Pine Beetle infestation of epidemic proportions occurs on the Nantahala & Pisgah National Forests, 30% pine mortality or 34,099 acres could be affected across both National Forests.

Forest types that are susceptible to Southern Pine Beetle infestations consist of 22.3% of the Nantahala and Pisgah National Forests. Pine forests in Tennessee are in an epidemic situation and Kentucky and southwest Virginia have significant outbreaks of SPB as well. Combined with the growing presence of SPB in North Carolina, pine habitat throughout the southern Appalachians would be affected. Areas where severe mortality occurs are expected to regenerate naturally and, in some areas, may need artificial planting if stocking is inadequate. The pine forests in the southern Appalachians may experience a 30+% increase in seedling-aged forests.

Many privately owned acres of pine forest are also experiencing SPB outbreaks and suppression activities have been minimal. Quite frequently in the Appalachians, yellow pine stands are found on shallow soil along mountain ridges where large-scale mortality may cause soil instability and limit natural regeneration where the potential for artificial regeneration activities are limited.

SPB Host Types

The southern pine beetle attacks all species of pines, but prefers loblolly, shortleaf, Virginia, pond and pitch pines. However, in epidemic years, SPB do attack white pine and mixed white pine hardwood stands. Southern pine beetle behavior in yellow pine and mixed yellow pine hardwood has been studied for many years and the science is well documented, however, their behavior in white pine type is less understood.

SPB Biology

Generally, beetle broods complete their life cycle in about a month during the warmer months, from April to September. Generations can overlap--as many as 7 overlapping generations may occur in one year. A tenfold increase in SPB populations is possible with each successive generation. Adults from overwintering broods emerge and begin attacking uninfested trees in early spring, about the time dogwood trees begin to flower. During mild winters, beetles may not overwinter, but remain active, attacking new trees, but generally the expansion of areas attacked by SPB's is slowed. Trees are killed by massive attack of SPB, which essentially girdles a tree and by the blue stain fungus (carried by the beetle), which plugs the water and nutrient transportation system of the tree. During outbreaks, thousands of beetles can attack a single tree, an average of 35 pairs of beetles attack each square foot of the main stem in larger trees.

Two processes are involved in the expansion of areas attacked by SPB, spot growth and spot proliferation. Spot growth occurs when beetles attack uninfested trees on the edge of the infestation, usually 20 to 100 feet or more outside the spot. Spot proliferation occurs when new spots are started, usually in the spring and fall months.

Suppression

The primary objective of a suppression project is to reduce the beetle populations to a low level, as rapidly as possible, to prevent further tree mortality. Throughout the South, the primary method of control is cut and remove. This method provides beneficial economic impacts by recovering the value of infested trees and minimizing losses of future values by reducing rates of expansion. Where trees cannot be treated by cut and remove, infestation spread may be controlled by the cut and leave method. This method should be used only during the summer months. In the winter months monitoring of spots is usually recommended due to the slow rate of spread of the beetles. The pile and burn method is limited due to high economic costs.

Susceptibility and Hazard Ratings

Rating a stand's susceptibility to SPB attack provides information that can be used to identify current or future hazard conditions and to select stands for early treatment for reducing potential SPB losses. Stand ratings may also be used for other purposes such as 1) improving the effectiveness of priority settings for management actions, 2) monitoring pest activity during endemic periods, 3) scheduling direct control treatments and 4) assessing outbreak and loss potential. Historically, southern pine beetle have developed under a broad range of forest and environmental conditions. Bennett (1965) reported that dense stands and slow tree growth were frequently associated with outbreaks in the Gulf Coastal Plain. He further indicated the importance of stand age and composition in relation to susceptibility to SPB attack. Lorio and Hodges (1974) suggested certain soil, tree, and stand characteristics that have a high susceptibility to SPB. Stands having these high hazard characteristics basically, are more likely to suffer heavier losses over time than are those classified as low hazard. Ownerships with a predominance of low-hazard stands will have less potential for severe beetle-caused losses than those having a large proportion of high-hazard stand conditions. Generally a relatively small proportion of forested land is classified as high hazard to SPB attack. Lorio et al. 1982 estimate relatively low percentages of high-risk and moderate-risk stands would be expected under mixed ownership in other states across the South. Land holdings that receive more intensive management treatments will have a greater proportion of low-hazard stands, whereas stands with little to no management will have a larger proportion of stands in the higher hazard classes.

Stands of dense, slow-growing natural or planted, saw timber sized stands have an increased potential for loss to SPB. Severely damaged or weakened trees and stands are believed to serve as low-level SPB reservoirs from which future outbreaks develop when environmental conditions favor beetle development. During periods of population increase and decline, other forms of tree stress- disease, attacks by other beetle species (Ips spp., etc.), logging, drought, lightening – play an important role in spot initiation and growth. Low-level SPB populations are strongly dependant upon the availability of easily accessible and suitable host material for their survival. When SPB activity is low, most spots initiate in very high hazard stands. As host and environmental conditions become more favorable for the beetles, spots increase in number and size, and the outbreak expands into less suitable (low to moderate hazard) stand types and age classes. Removal of high hazard trees or stands will aid in prevention of future outbreaks.

During periods of low population, aerial surveys are conducted to detect change in SPB activity or monitor spot numbers, size and locations. As beetle activity increases in these indicator areas, the survey can be expanded to include other, less susceptible zones. Stands may be rated from an information base using the appropriate model for the geographic area. This approach has been applied to the N/P by use of the Southern Region's Continuous Inventory of Stand Conditions (CISC). In situations where existing data and computerized systems are available, it is advantageous to rate large areas quickly with a computerized approach. (Agriculture Handbook 646).

Mountain Risk, a model developed at Clemson University (Hedden, 1983), is the only model developed to assess risk in the Southern Appalachians. Unfortunately it is only moderately applicable to the situation in western North Carolina, because it does not give ratings for white

pine. In endemic population years for SPB white pine is considered low risk. This model estimates risk using the proportion of pine (shortleaf, pitch, or Virginia pine) in the stand and the radial growth in the last five years. Radial growth is a measurement of vigor in a tree. The more stress a tree is under the smaller the width of the tree growth rings will be.

A. Physical Environment

Fire

Existing condition

Pine stands with no recent fire history (1995 or later) are at greatest risk from wildfire. These stands probably have well-developed understories typically associated with unburned pine and pine/hardwood forest types. As the trees die and needles dry and cure, the probability of ignition will increase when ignition sources exist. Data show most stands that are susceptible to SPB infestation have not recently been burned.

Those stands that do not have a recent fire history will likely have well-developed understories. These understories are what make up most of the existing fuel loads. Although these fuel loads contribute significantly to wildfire behavior, yellow pine in older age classes on moderate slopes (less than 40%) can typically survive moderate fire behavior. Individual trees, mostly superdominants (single trees with heights above the forest canopy) of pitch or white pine may also be more likely to receive damage from a fire if they have been attacked and killed by SPB. Younger pine stands generally do not have well developed understories; however, their closed canopies and low height predispose them to stand replacement crown fires.

Table Mountain pine can generally survive moderate fire behavior, and in the event of severe fire, will reproduce through seeds released from serotinous cones if soil structure remains intact. Stand replacement fires in Table Mountain pine are considered necessary for continuation of the species on that site. Stand replacement fires are generally prescribed if the stand is considered biologically over-mature. White pine and white pine hardwood stands are considered susceptible to even moderate fire behavior and generally will not survive. As the trees die and needles dry and cure, the probability of ignition will increase when ignition sources exist. These dead trees will also add to fuel loads and increase the danger to firefighters, due to the severity of the fire.

Environmental Effects

Alternative A: The direct effect of a no action alternative would be increased fuel loads in areas where tree mortality occurs. Since generally the size and number of spots would be larger in this alternative, the effects would be more severe. Indirectly, as larger fuels dry out and become more readily available for ignition, fires would become more difficult to suppress. Standing dead trees may be more susceptible to lightning strikes. Fire line construction would be more difficult in areas with large, downed trees, possibly resulting in larger acreage fires. Any ignition of larger fuels may result in increased smoke emissions. Private land depending on its proximity to forested susceptible land is also at risk.

Alternative B: Direct, indirect and cumulative effects from monitoring treatment would be the same as those effects addressed in Alternative A. The direct effect from cut and remove treatment would be a moderate increase in fuel loads in the short term equivalent to other timber

removal treatments. There will be a slight initial increase in wildfire risk until the remaining tops decompose occurs. After decomposition occurs fuel loading would decrease and there would be considerably less risk with wildfire. Indirect and cumulative effects from this alternative would again be equivalent to other timber removal treatments. For those areas treated with the cut and leave method, the direct effect would be increased fuel loads, as in Alternative A. As fuels dry out and become available for ignition, risk from wildfire would increase. Indirect effects from this might initially result in increased fire intensities in and around treatment areas. Direct effects from pile and burn treatment would be increased fuel loads in concentrated areas. Consumption of larger fuels and smoldering piles would increase smoke emissions in the area. Indirectly, while pile burning may result in initial increases in soil nitrogen availability, the treatment may produce fire intensities that result in decreased soil productivity in isolated areas. Potential problems with residual smoke, spotting, and scorching of nearby trees may limit where this treatment can be applied. Cumulative effects from this treatment may include difficulty in reforestation of the pile locations.

Cumulative Effects

Cumulative effects for both alternatives include a possible increase in tree mortality as fires build intensity and burn or scorch areas outside actual infestations. The addition of dead cured fuels to existing loads of highly flammable fuels could exponentially increase wildfire risks in areas that are currently confronted with wildland/urban interface problems. Cumulative effects would include possible scorching and additional tree mortality should fuel loads affect fire intensities.

Air Quality

Existing Condition

All proposed actions are within Class II air quality areas. Class 1 and II air quality areas could be affected because of the widespread distribution of susceptible host types on the N/P. Class I areas adjacent to the project area are the Congressionally designated Wildernesses of Linville Gorge, Shining Rock and Middle Prong on the Pisgah National Forest, Joyce Kilmer-Slickrock, Southern Nantahala and Ellicott Rock on the Nantahala National Forest, and The Great Smoky Mountain National Park.

Environmental Effects

Alternative A: With no suppression efforts the number and acres of SPB spots is expected to be larger in the no action alternative. Because of increased fuel loading in these areas, the severity, size and duration of a wildfire could be increased. Smoke sensitive areas, particularly roadways could be impacted more severely. In the event of wildfire, smoke emissions would increase initially. Any fire activity may also result in decreased visibility and increased particulate matter in the atmosphere for brief periods. This alternative would have no additional or cumulative effects on air quality.

Alternative B: With suppression efforts, the number and acres of SPB spots is expected to be smaller. Smoke sensitive areas, particularly roadways could be impacted. In the event of wildfire, smoke emissions would increase initially. Any fire activity may also result in decreased visibility and increased particulate matter in the atmosphere for brief periods.

Pile and Burn treatments may result in residual smoke problems, but would be used on a limited basis, if at all. Compliance with FSM 5140 Smoke Management Guidelines would minimize negative impacts of burning on air quality.

Cumulative Effects

This alternative would have no cumulative effects on air quality.

Water, Hydrology, and Soils

Existing Condition

The existing condition of soils and water varies depending on site-specific conditions. The potential affected soil and water environment ranges from well-drained upland sites to wetlands.

Environmental Effects

Alternative A: Alternative A would not change the existing soil and water conditions or trends in those conditions from present. Since no actions would be taken, no soil would be disturbed or water resources impacted by SPB suppression activities. There would be no readily observable change in water yield due to the reduction in pine cover, although specific sites may have somewhat more soil moisture for several growing seasons following tree mortality.

Alternative B: Any treatment undertaken must conform with policy, laws and regulations, including the North Carolina Forest Practice Guidelines Related to Water Quality and the North Carolina Best Management Practices for Forestry in the Wetlands of North Carolina, and the Soil and Water protection standards in the FEIS -Vegetation Management in the Mountainous Region. Alternative B if implemented with the above practices would not cause readily observable changes to the present water resource conditions. On a specific site, local soil erosion may occur, but water quality should not be affected since the material should not reach a stream channel. Overall, the effects of Alternative B on soil and water resources would be similar to those in Alternative A.

Cumulative Effects

There are no cumulative effects for Water, Hydrology or Soils for either alternative.

B. Biological Environment

Overstory Vegetation

Existing Condition

The last major outbreak for the Nantahala/Pisgah Forests was in the late 1980's where suppression actions were taken on approximately 2,300 acres over a 3-year period from 1988 to 1990. That outbreak followed a drought period that lasted 2 to 3 years. Current conditions on the N/P are similar to those experienced in the late 1980's. Western North Carolina has been experiencing an extended drought since 1998. Isolated stands in 1998 and 1999 also received considerable ice damage (particularly, white pine stands). In 1999 incidence of trees attacked by black turpentine and pine engraver beetles increased significantly. These trees are now weakened and more susceptible to attack from SPB and the stands are now at higher risk to attack as well. During the last four years of monitoring SPB populations, the Forest Service, Forest Health Protection Unit has indicated that there has been an increase in SPB populations and a decrease in predator populations. Monitoring on the District level has indicated that population levels are at epidemic proportions. In 1998 almost all spots were in stands considered high risk. In 1999, the proportion of attacks in the lower risk stands (mainly white pine) increased significantly, which is an indicator of high SPB populations.

SPB spots were first detected in 1998 on inaccessible, dry, steep ground, which would be most affected by the reduction in moisture. These spots were mapped in the summer/fall of 1999. Aerial detection flights were flown on the Nantahala and Pisgah National Forests, concentrating on high-risk areas. Most of the activity early in 1999 occurred in older (greater than 50 years) yellow pine, with little to no past management. As the year progressed, activity began to be documented in white pine host types and younger, more vigorous classes of yellow pine, and recently thinned pine stands (which should be at lower risk). Detection of this increase in SPB activity in white pine was difficult due to the fact that white pine is slow to show signs of attack. Many of the trees retained their green needles through December, 2000. At the time of this analysis much of the damage is still undetectable from the air as infested trees are still not fading or budding from hardwood leaves is masking the colors. Spot sizes and activity levels are underestimated in this analysis, due to a seasonal limitation of detection capability.

Environmental Effects

Both Alternatives: Risk or susceptibility is very difficult to predict in an epidemic situation. Drought conditions, aging stands of less vigorous pines, and existing initial attack by black turpentine and pine engraver beetles in many stands are expected to contribute to the already epidemic proportion of southern pine beetle outbreak in western North Carolina. Yellow pine stands as young as fifteen years old are not withstanding SPB attack and spot expansion is occurring. Spots are also spreading in younger more vigorous white pine. There have even been reports of non-target host types such as Eastern hemlock being attacked, but these attacks have been unsuccessful and have resulted in "pitching out" the SPB. However attacks in non-host types is another indicator of an epidemic situation. In endemic years all of western North

Carolina is considered low risk. From field observations in epidemic years, all yellow pine stands (Yellow pine includes the following forest types: shortleaf pine, loblolly pine, pitch pine, Virginia pine, and table mountain pine), especially those greater than 50 years old on southern aspects are considered high risk. Yellow pine/hardwood stands, fifty years old or older, are considered moderate risk. White pine is considered low risk. Currently risk evaluation seems to have little bearing on spot initiation, but serves better as an indicator of spot expansion rates. We will most likely see high risk stands with greater tree mortality, but spot proliferation in all risk categories. Looking at preliminary data collection this spring, 2000 conducted by Forest Health Protection and district personnel the population of SPB beetles is still epidemic. High rates of spot expansion are predicted.

Currently there are 237 active spots effecting 600-800 acres on the Nantahala and Pisgah Forests. The SPBIS database is used to track these spots. Each district on the Nantahala and Pisgah is updating this database with recommended treatments, number of infested trees, and spot size. Currently recommended treatments are 50 % cut and remove, 25% cut and leave, and 25 % monitor.

The current outbreak of over 200 inventoried spots is expected to spread rapidly as temperatures increase during the summer months. According to the North Carolina Division of Forest Resources, Madison, Mitchell and Yancey Counties have the largest number of infestations on private land, and Forest Service personnel observations suggests the same trend. Because of limited management practices on private land the outbreak and subsequent tree mortality on private land is expected to be greater than those on Federal land. Pine and pine/hardwood types are routinely thinned on the N/P. However, evidence is beginning to suggest that past management practices are having little bearing on susceptibility to SPB attack in this epidemic. Thinned vigorous stands are not withstanding attacks. Similar behavior is being reported in eastern Tennessee, Kentucky, and northern Georgia. The following indicate the number of acres analyzed in this document.

Table 3: Acreage of susceptible host type on the N/P by county

Forest	County	Acres	**Forest**	County	Acres
Pisgah	Avery	1107	**Nantahala**	Cherokee	25440
	Buncombe	799		Clay	4037
	Burke	13381		Graham	16798
	Caldwell	8240		Jackson	1540
	Haywood	1714		Macon	8751
	Madison	6776		Swain	4016
	McDowell	10503		Transylvania	285
	Mitchell	1815			
	Yancey	1240			
Total		**45,575**	**Total**		**60,867**

Table 4: Susceptible Acres by forest types by District and Forest.

Pisgah National Forest			
District	**Appalachian**	**Grandfather**	**Pisgah**
Forest Type	Acres	Acres	Acres
White Pine	2795	8458	1568
White Pine/ hemlock	108	311	12
White Pine / Cove/Hardwood	1544	2145	438
White Pine / Upland Hardwood	2722	4985	1104
Shortleaf Pine/Oak	51	1257	13
Pitch Pine/Oak	0	4033	1022
Virginia Pine/Oak	401	1695	125
Table Mountain Pine/Hardwood	0	643	0
Shortleaf Pine	144	350	223
Virginia Pine	492	2104	7
Pitch Pine	509	5460	475
Table Mountain Pine	0	1765	0

Nantahala National Forest				
District	**Cheoah**	**Highlands**	**Tusquitee**	**Wayah**
Forest Type	Acres	Acres	Acres	Acres
White Pine	4815	6911	5029	2153
White Pine/ hemlock	231	377	133	
White Pine / Cove/Hardwood	1985	876	1704	
White Pine / Upland Hardwood	806	2142	2236	457
Shortleaf Pine/Oak	2143		6202	698
Loblolly Pine /Oak			144	
Pitch Pine/Oak	2750	162	3050	1502
Virginia Pine/Oak	321		477	136
Table Mountain Pine/Hardwood	0	0	0	13
Loblolly Pine			141	
Shortleaf Pine	2039		8165	726
Virginia Pine	167	28	1183	111
Pitch Pine	2470	39	1043	251
Table Mountain Pine	41		0	36

A GIS analysis of SPB susceptibility on a Forest-wide basis was developed for this analysis using the Forest geographical information system. A list of susceptible host types sites by district, compartment, and stand is available to unit managers for suppression activities and available to the public on the Forest Web Site (www.cs.unca.edu\nfsnc). As suggested by research, this type of analysis (computerized) is the most effective and time efficient way to deal with the SPB epidemic.

Risk as explained in this analysis was not used to prioritize stands for treatment. Priority is rated as (1.) Threat to health and safety, (2.) Threat to public land (3.) Loss of pine communities and (4). Fuel loading. In the listing, GIS coverage, or access database, stands that are listed **road** or **trail** under the threat category are considered a threat to public, health and safety by threatening an open Class 1 or II road or developed system trail. Stands that are listed as private are within ¼ mile of private land.

Susceptibility and Effects can best be analyzed by species groups:

<u>Yellow Pine and Yellow Pine /Hardwood:</u>

Stands dominated by yellow pine and yellow pine hardwood are generally found on dry, southerly aspects. These stands are expected to regenerate into the same general forest type of yellow pine, especially on these drier aspects, however the proportion of hardwoods may increase in these stands. Even though these stands are expected to remain dominated by yellow pines, certain species that require bare ground to regenerate and successfully compete may not be in the same proportion as in the prior stand. Pitch and shortleaf may be out-competed by Virginia pine and in some isolated cases loblolly pine (primarily on the south end of the Nantahala). Options for regenerating these stands may be diminished, as seed for pitch and shortleaf may not be readily available in some stands if all individuals are attacked. Individual pitch or white pine canopy trees or superdominants may drop out of the stands all together if killed by SPB and sufficient ground disturbing activities do not coincide with a good seed crop.

Table Mountain Pine - Table mountain pine occupies mostly xeric sites in the Appalachians on rocky and shaly areas. Regeneration of the species requires site disturbance, light, and heat. On western and northern exposures, table mountain pine cones are distinctly serotinous (closed), but on southerly and easterly exposures many cones open soon after maturing. A large percentage of cones remain on the tree up to 25 years and the seed in these cones can remain viable for over 9 years. Regeneration for table mountain pine, killed by SPB, on exposed sites will depend on site disturbance. Light and heat will be present but the presence of bare mineral soil for seed germination may not be available without disturbance from fire or mechanical means. On protected sites such as northerly or easterly aspects fire may be necessary to ensure adequate regeneration of the table mountain type due to the number of closed cones. In areas without disturbance pine reproduction is periodic and often in scattered patches. In table mountain pine stands with undisturbed conditions, especially without fire, successional trends are toward increases in red maple, blackgum, and various species of oak. Sustainability of natural table mountain pine stands can most often be credited to periodic fire.

White Pine – White pine is found on a wide variety of sites across the N/P Forest but is most prominent on along rivers and streams. In the absence of fire, white pine occupies large acreages on upland sites across the Forest. It is a long-lived tree commonly reaching 200 years of age if undisturbed. Bare mineral soil is not necessary for seed germination with white pine and seeds can germinate on both disturbed and undisturbed litter layers. Good seed crops occur every 3 to 5 years with some small amount of seed being produced every year. In North Carolina during years of adequate seedfall white pine seedlings become established and develop in shaded conditions. White pine stands killed by SPB can regenerate without disturbance from mechanical equipment or fire. In many pure white pine stands natural regeneration often shifts to a larger component of hardwood because of seeds buried in the soil and duff by birds and other animals such as squirrels.

Alternative A: No action will result in continuing mortality of susceptible host types, which includes all pine species.

The direct and indirect effects on vegetation would be:

- Larger acreages of mortality in pine types and a loss of valuable forest products
- A shift in species composition towards hardwood and brush may occur as pine trees are killed along with no disturbance from fire or logging equipment to produce a suitable seed bed.

The cumulative effects on vegetation would possibly be a need for reforestation activities such as site preparation and possible tree planting. These treatments would be necessary in areas where it was determined that the pine component was an important part of the landscape. The primary site preparation treatment may be prescribed fire in order to mimic the natural disturbances that were conducive to the establishment of pine and mixed pine/hardwood communities. Where cone/seed crops are infrequent artificial regeneration may take place in the form of planting seedlings. It is important for some species, such as shortleaf pine, to have adequate seed crops coincide with disturbances like fire to result in successful regeneration of the community

Alternative B: Using Integrated Pest Management control techniques for SPB suppression would reduce the amount of mortality in susceptible host types.

The direct and indirect effects on vegetation using IPM control techniques:

- Minimize mortality in these pine and mixed pine/hardwood forest communities.
- Minimize loss of high value forest products over the next 2-3 years.
- A change in species composition; a shift toward hardwood and brush species may occur as mature pine trees are killed and in the absence of disturbance.

Under alternative B, stands that threaten road and trail corridors (often the most visible in the foreground) would be given priority in suppression efforts because of the threat to Forest visitors and workers.

Cumulative effects on vegetation using IPM control techniques would minimize the impact to age class distributions across the N/P. With widespread mortality resulting from SPB, large acreages of young age classes would develop.

Wildlife Habitat - Management Indicator Species (MIS)

MIS were selected based on their lifecycle habitat requirements of pine forest type that may be affected by an SPB infestation and resulting pine mortality. The species selected are; Yellow-bellied sapsucker, Eastern Wild Turkey, Pileated Woodpecker, and Pine Warbler.

Effects to Existing Condition by Alternative and Treatment

MIS were selected based on their lifecycle habitat requirements of pine forest type that may be affected by an SPB infestation and resulting pine mortality. The species selected are; Yellow-bellied sapsucker, Eastern Wild Turkey, Pileated Woodpecker, and Pine Warbler.

The Yellow-bellied sapsucker breeding range is limited to high elevation forests (4000'+ elevation) in NC where the habitat is open hardwoods with dead trees. The sapsucker utilizes small hardwoods for cavity nesting and probes dead trees for insects. The highest SPB susceptible forest type is pine-hardwood of sapling/pole timber size. The total pine/hardwood on the Nantahala and Pisgah Forests above 4000' elevation is 3,255 acres. Forest Health's prediction/estimate of mortality loss across the forest is 30%, therefore, 977 acres of this species habitat would be lost. The Yellow-bellied sapsucker breeding range is predominantly across the north-eastern United States and southern portions of eastern Canada with a small portion of its range extending into the southern Appalachians, including North Carolina. The winter range extends from the Gulf of Mexico into and including the majority of its breeding range. The loss of 30% of the pine within its habitat would increase this species preferred habitat of open hardwoods with dead trees in pine/hardwood forest type stands. The No Action alternative may increase this species habitat within the pine/hardwood stands. Cut and Burn as a treatment is being considered for very small, site-specific areas where health and safety is the highest priority. These sites do not occur above 4,000 feet, therefore, cut and burn will have no affect to this species habitat. Cut and Leave, as a treatment, would cut those trees with active infestations of SPB and a small buffer of green trees in the direction of the infestation spread. The dead trees, where the SPB is no longer present, would remain standing and provide foraging habitat as secondary wood boring invade the dead trees. Therefore, there may be an increase in foraging habitat for the sapsucker by the cut and leave treatment and overall, preferred habitat is expected to increase. However, this improved foraging habitat will be less with Cut and Leave than No Action. Cut and Remove as a treatment will harvest those trees with active infestations of SPB and a small buffer of green trees in the direction of the infestation spread. The dead trees, where the SPB is no longer present, may be removed if decay has not reduced yet the wood value. The

amount of foraging habitat may be less than Cut and Leave treatments, however, suitable habitat would remain across the stand with any suppression treatments.

Pileated Woodpecker utilizes standing, dead, and down trees for foraging and nest in cavities they create in large (18"+) live trees. The highest SPB susceptible forest type is 80 year old+ white pine-cove hardwood forest type and riparian habitat with mature vegetative conditions. There are 2,607 acres of white pine/cove hardwood forest across the Nantahala and Pisgah Forests. 782 acres of this forest type are projected to become infested by the SPB and suffer mortality. The dead and dying white pine will provide foraging habitat for the woodpecker, therefore, the No Action Alternative will improve foraging habitat. However, as white pine is the majority of species present within these stands and the No Action Alternative will not attempt to control the infestation, large areas of suitable diameter trees for cavity excavation will be lost. Therefore, the No Action Alternative will not improve habitat overall if the infestation is aggressive.

Pile and Burn treatment will not affect the woodpecker's habitat due to the very small scale of treatment proposed. Cut and Leave treatment will leave foraging habitat for the woodpecker on site and may slow or stop the SPB from causing wide scale mortality within cavity habitat in the white pine/cove hardwood forests and riparian stands. The Pileated Woodpecker forages on downed logs as well as standing, dead trees. Therefore, Cut and Leave will improve foraging habitat and retain nesting habitat within the stands. Cut and Remove as a treatment will harvest those trees with active infestations of SPB and a small buffer of green trees in the direction of the infestation spread. The dead trees, where the SPB is no longer present, may be removed if decay has not reduced the wood value. The resulting amount of foraging habitat may be less than cut and leave treatments, however, suitable cavity habitat would remain across the stand if the SPB infestation is slowed or stopped as a result of treatment.

The Pine Warbler is found in all size and age classes of pine stands, but seldom in hardwoods. It forages for insects on pine needles, usually high in the canopy layer. Warblers occasionally utilize berries and other soft mast found in the shrub layer of pine stands during summer months. The highest SPB susceptible forest type is pure pine forest type. This species range extends throughout the south-east with low levels of wintering and breeding habitat in western North Carolina. The SPB caused pine mortality has spread throughout most of its range.

This warbler has the highest potential for SPB infestation mortality to affect its habitat as it is entirely pine forest dependent. No Action Alternative would result in the greatest potential acreage of pine mortality as no attempt to halt the progression of the SPB epidemic would be made. Foraging habitat and nesting habitat will decrease as the pine die since this species nests in pine trees and forages insects from pine needles of 20' plus trees. Pile and Burn would not affect this species due to the small amount of potential habitat that would be affected across the Nantahala and Pisgah Forests. Cut and Leave and Cut and Remove treatments will limit the amount of habitat affected by SPB mortality, however, the felling of actively infested trees would reduce foraging habitat as this species rarely forages at ground level. The benefit of retaining the most pine habitat as possible through suppression efforts is greater than the minimal loss of foraging habitat by the cutting of a buffer.

The Eastern Wild Turkey has a wide home range and generally utilizes habitats unaffected by an SPB infestation. The habitat use is mainly in acorn-producing hardwood forest types, grass/forb areas during brood rearing, and springs, seeps, and riparian areas where diverse herbaceous vegetation is generally available year-round. However, research by the South Carolina Wildlife and Marine Resources Department (Still and Baumann) has indicated that pine stands provide habitat for the Wild Turkey. The research indicated that although hens avoided pure pine stands, 40% of their nests occurred in mixed stands and 30% in stands with a pine overstory. Gobblers also were shown to prefer pure pond and slash pine that indicates their probable use of VA, pitch, and shortleaf pine stands. Riparian habitats provide food and winter thermal refuges for the Wild Turkey where SPB infestation and overstory mortality may cause these sites to be diminished in habitat value. Changes in the soil moisture caused by overstory mortality may change the herbaceous layer, insects, and amphibians present that are utilized for food by Wild Turkeys throughout the year. Conifer mortality will significantly reduce the winter thermal cover sought by the Wild Turkeys for roosting and reduce the warmer environment where herbaceous vegetation is commonly available for food during winter months.

The No Action Alternative will allow the pine SPB mortality to cover entire stands and a greater acreage. The affect of this mortality on Wild Turkey is not known but it is likely to improve soft mast ground and shrub layer density (i.e. blackberries) and availability for 5-10 years until regeneration again closes the stand canopy. Brood rearing habitat will also likely improve under these conditions. Pine seed as a food source will be lost for up to 20 years across the affected area. In white pine/cove hardwood stands or riparian habitat, not attempting to slow or stop the SPB infestation will result in less desirable habitat conditions, especially in riparian habitats where loss of canopy cover will result in drying action within this moist environment and reduced thermal characteristics. Therefore, aggressive SPB infestations would have a negative affect on Wild Turkey habitat in white pine/cove hardwood forest types and riparian areas. Active treatments will limit any negative affects by slowing or stopping the SPB infestation.

Pile and Burn will not affect the Wild Turkey habitat due to the small acreage likely to receive this expensive treatment. Cut and Leave and Cut and Remove treatments will slow or stop the SPB infestation resulting in a smaller acreage across the Nantahala and Pisgah Forests being affected. Cut and Leave treatments will improve habitat for nesting by providing fallen trees which may be utilized as nesting cover and the increase in soft mast expected to be produced by the open canopy. Cut and Remove treatments will increase the amount of brood rearing and soft mast habitat due to the increases in herbaceous and shrub layers but nesting cover will not improve. It is determined that treatment actions will result in an overall benefit to Wild Turkey habitat, however, Cut and Leave treatment will result in greater habitat enhancement.

Table 6. Summary of Effects to MIS Species habitat by Treatment

Species	No Action	Pile & Burn	Cut & Leave	Cut & Remove
Wild Turkey	*No overall habitat Benefit	No effect to Habitat	Highest habitat Benefit	Beneficial to Habitat
Pine Warbler	Negative effect to Habitat	No effect to Habitat	Beneficial to Habitat	Beneficial to Habitat
Pileated Wood.	No overall habitat Benefit	No effect to Habitat	Beneficial to Habitat	Reduced Benefits
Yellow-bellied	Beneficial to Habitat	N/A	Reduced Habitat Benefits	Reduced Habitat Benefits

***Negative effect in White pine/cove hardwood and riparian areas, beneficial or no effect in other forest types.**

Table 7. Potentially Affected MIS Habitat

Forest Type	Pileated Woodpecker	Pine Warbler	Wild Turkey	Yellow-bellied Sapsucker
3-White pine		8,906 acres		
4-wpine/hem		352 acres		
9-wpine/cove	2,607 acres		2,607 acres	
10-wpine/hdwd			4,203 acres	
12-shortleaf pine/oak			2,906 acres	
13-loblolly pine/hdwd			43 acres	
15-pitch pine/hardwood			4,174 acres	
16-VA pine/hardwood			898 acres	
20-Table Mtn pine/hardwood			194 acres	
31-loblolly		42 acres		
32-shortleaf		3,494 acres		
33-VA pine		1,228 acres		
38-pitch pine		3,074 acres		
39-Table Mtn		552 acres		
1\ Riparian	7,668 acres		7,668 acres \	
Total	10,290 acres	17,648 acres	22,693 acres	*3,214 acres
30% mortality	3,807	5,294	6,808	964

* delineated as both pine/hardwood forest type and elevation on Table 3

Estimated loss of habitat based on Forest Health's prediction of 30% potential loss of susceptible pine across the Nantahala AND Pisgah Forests. This estimate is based on 1999 SPB activity and the activity reported during the spring of 2000 and it is expected to be 5-10% higher on Districts with a greater pine acreage and dry, ridge sites as found on the Grandfather Ranger District.

1\ Riparian acreage was determined as perennial streams within or adjacent to pine forest types as 100' buffer. This pine type acreage is also accounted for within specific forest type acres. Therefore, estimated acres of habitat affected are high.

Cumulative Effects

Forest types that are susceptible to Southern Pine Beetle infestations consist of 22.3% of the Nantahala and Pisgah National Forests. Pine forests in an epidemic situation include Tennessee, Kentucky and southwest Virginia where significant outbreaks of SPB have occurred. Combined with the growing presence of SPB in North Carolina, the affect to pine habitat in the southern Appalachians will affect pine dependent species on a very broad scale. Areas where severe mortality occurs are expected to regenerate naturally and, in some areas, may be artificially planted if stocking is inadequate. The results of these stands regenerating will be a 30+% increase in pine seedling aged forests throughout the southern Appalachians. Many privately owned acres of pine forest are also experiencing SPB outbreaks and suppression activities have been minimal. Quite frequently in the Appalachians, yellow pine stands are found on shallow soil along mountain ridges where large scale mortality may cause soil instability and limit natural regeneration where the potential for artificial regeneration activities are limited due to access.

Habitat for the Indiana Bat may improve over the long term with the expected increased amount of hardwood within the pine/hardwood forest types that are infested by SPB and experience pine mortality. The resulting temporary open canopy condition is expected to allow early successional tree species, commonly deciduous trees and shrubs, to regenerate. Therefore, the pine/hardwood forest type acreage across the southern Appalachians, including the Nantahala and Pisgah National Forests, may be reduced while acreage of hardwood/pine forest type increases.

The Pine Warbler may no longer maintain a breeding range within the southern Appalachians as the availability of their habitat is presently limited. Many of the non-mobile species requiring cool, moist conditions may lose populations which occur in scattered pockets across the forest as SPB mortality reduces or eliminates the pine overstory at these sites. The effect to these species population will be determined through the site-specific biological implementation checks prior to the selection of a treatment and the continued bird point data collected across the Forests annually. Populations of these non-mobile species may be affected where access and priority preclude treatment. This situation is expected to be minimal as the habitat affected by an SPB epidemic, for the majority of non-mobile Threatened, Endangered and Sensitive species found across the Nantahala and Pisgah National Forests, is within white pine/cove hardwood and white pine/upland hardwood stands are accessible and therefore, potential suppression treatments are likely. Therefore, any negative effect to populations of Threatened, Endangered, and Sensitive species is expected to be minimal.

Plant Communities

Existing Condition

After review of the proposed activity, it was determined that the activity is limited to a relatively few Natural Community types: Pine-Oak Heath Forest, Chestnut Oak Forest and Acidic Cove

Forest. These common natural community types are described below. Taken together, they are the existing botanical condition. These concepts follow the work of Schafale and Weekly with modification from the Newell's wilderness vegetation descriptions and the current botanical inventory work conducted on the Forests.

Pine-Oak Heath Forest
Synonymy: Pine-Oak Heath Forest (Schafale & Weakley), Xeric Evergreen Forest (Newell).

Dominate Species & Physiognomy: The Pine-Oak Forest Heath Community usually occurs on convex ridges surrounding cove forests. "Yellow pines" such as virginia pine (*Pinus virginiana*), pitch pine (*Pinus rigida*) and table mountain pine (*Pinus pungens*) as well as Chestnut oak (*Quercus montana*) and scarlet oak (*Quercus coccinea*) with some black oak (*Quercus velutina*) dominate the tree canopy. Generally a dense shrub layer of mountain laurel *(Kalmia latifolia*), huckleberry (*Gaylussacia baccata*) or blueberry (*Vaccinium sp.*) is found. Herbaceous species are generally few and sparsely distributed. This community type is very common throughout the Forest but is often restricted to long linear areas of ridge tops. Generally the low herbaceous diversity in this community makes this community have a relatively low probability and occurrence of plant PETS species with the exception of *Tsuga caroliniana*. *Tsuga caroliniana* is a common component of the Pine-Oak Forest Heath Community. The Pine-Oak Heath Forest Community often grades into Chestnut-Scarlet Oak Forest or Acidic Cove and Slope Forest communities in the coves.

The Pine-Oak Heath Forest Community is found throughout the analysis area usually associated acidic soils and dryer slopes and ridges. It is thought that this community is fire dependent and requires periodic burning to maintain this community. Table mountain pine, for example, is fire dependent species. A hot stand replacement fire is normally needed to open the serotinous cones of table mountain pine. Mature stands of table mountain pine should be excluded from treatment so that a natural fuels load is allowed to accumulate. The Pine-Oak Forest Heath Community has a general low potential for PETS and Forest Concern species in the analysis area. This proposal would cause the Pine-Oak Heath Forest Community impacted by this to be in an earlier successional stage.

Chestnut Oak Forest
Synonymy: Chestnut Oak Forest (Schafale & Weakley), Montane Oak Slope Forest (Newell).

Dominate Species & Physiognomy: The Chestnut Oak Forest Community usually occurs on convex slopes surrounding cove forests. Chestnut oak (*Quercus montana*) and scarlet oak (*Quercus coccinea*) with some black oak (*Quercus velutina*) dominate the tree canopy. Generally a dense shrub layer of mountain laurel *(Kalmia latifolia*), huckleberry (*Gaylussacia baccata*) or blueberry (*Vaccinium sp.*) is found. Herbaceous species are generally few and sparsely distributed. This community type is very common throughout the Forest. Generally the low herbaceous diversity in this community makes this community have a relatively low probability and occurrence of plant PETS species. The Chestnut Oak Forest Community often grades into Pine-Oak Heath Forest near ridges and Acidic Cove Forest in the coves.

The Chestnut Oak Forest Community is found throughout the analysis area usually associated acidic soils and dryer slopes and ridges. It is one of the most abundant communities in the analysis area. The Chestnut Oak Forest Community has a general low potential for PETS and Forest Concern species in the analysis area. This proposal would cause the Chestnut Oak Forest Community impacted by this to be in an earlier successional stage.

Acidic Cove Forest.
Synonymy: Acidic Cove Forest, Hemlock Forest (Schafale & Weakley), Alluvial Forest (Newell).

Dominate Species & Physiognomy: This forest community is dominated by cove hardwood species such as oaks (*Quercus montana*), tulip popular (*Liriodendron tulipifera*), black birch (*Betula lenta*), white pine (*Pinus strobus*) and eastern hemlock (*Tsuga canadensis*). The distinguishing feature of this community is the dominance of evergreen Ericaous shrubs such as *(Rhododendron maximum*) and doghobble (*Leucothoe fontaniana*) or mountain laurel (*Kalmia latifolia*) in the midlayer. The herbaceous layer is usually very poorly developed with sparse and nondiverse species. Generally, the low herbaceous diversity in this community makes this community have a relatively low probability and occurrence of plant PETS species. The Acidic Cove and Slope Forest community is very common throughout the Forest. It typically occurs at low to mid elevations in coves and lower slopes.

The Acidic Cove Forest community is found throughout the analysis area usually associated acidic soils. The Acidic Cove Forest community has a general low potential for PETS and Forest Concern species in the analysis area. No PETS plants were found in this community. Most of the potential for PETS plants in the Acidic Cove Forest community are bryophyte (moss and liverwort) species. Currently, a very limited amount of data habitat and population exists for these rare bryophyte species. Fortunately, these bryophyte are often substrate specific and likely habitat within the Acidic Cove Forest can be detected.

Effect of Treatments to Natural Communites

The unmitigated effects of the southern pine beetle to many plant communities are to transform them into earlier (secondary) successional phases. This process would be expected to continue until the host trees are greatly reduced in number. Over time, natural succession would restore these communities to current successional phase. The natural communities, within the Nantahala/ Pisgah National Forests, that are most affected by the activity of the current epidemic are: Pine-Oak Heath Forest, Chestnut Oak Forest and Acidic Cove Forest. Control procedures (alternative B) would tend to arrest this successional change. In alternative, “A”, no action or “B” control options, there would be no net gain or loss of these community types. However, alternative “B” would lessen the amount of early successional phases within the affected communities. There is a risk, in either alternative, that an exotic invasive plant species may become locally established or become more prevalent within a community affected by the mountain pine beetle because an earlier successional community can favor establishment. In the action alternative, where control options exist and may be effective, it is a management recommendation that invasive plant populations in or near areas of activity be controlled as part of this proposal (management

advisement recommendation). This recommended mitigation would reduce the risk of alteration of Natural Comminutes by exotic invasive species.

Southern pine beetle control procedures are not compatible with the 29 Special Interest Areas, (Management Area 13) registered with the North Carolina Natural Heritage Program. These areas contain natural comminutes that are of special scientific and scenic value.. To protect the integrity of the plant communities within botanical special interest areas, it is recommended that they be excluded (required mitigation).

Effects of No Action Alternative

The general effect "No action" Alternative ("A") of an uncontrolled beetle infested areas may be the **direct effects** of killing of the host "yellow pine species", white pine and rarely other tree species such as *Tsuga*. Because of the broad possible nature of the infestation, little specific information is known about the possible indirect effects (such as increased light, temperature or fire susceptibility) caused by the mountain pine beetle mortality to individual plant species or communities. However, the **indirect effects** may include: successional change to an early community stages. This may benefit certain plant species such as *Rubus* or exotic plant species or reduce certain late stage successional species such as *Trillium*. In alternative, "A", no action or "B" control options, there will be no net gain or loss of original communities types.

EFFECTS TO PLANT MANAGEMENT INDICATOR SPECIES

This proposal may affect five plant management indicator species. These species are 1) Carolina hemlock, *Tsuga caroliniana*; 2) pitch pine, *Pinus ridida*; 3) table mountain pine*, Pinus pungens*; 4) Turkey beard*, Xerophyllum asphodeloides*; and 5) white pine, *Pinus strobus*. These species are representative species of plant communities that are included within the proposed action. Please see the N/P plan for a discussion of these species. It is expected that the SPB would have a greater effect (indirect and direct) on these species, and the associated communities, than the control methods. However, the proposed action will not convert natural community types. Therefore, in the long term, >10 years, natural succession would tend to "repair" the effects of the unmitigated SPB damage. Table 8 below summarizes some of the expected effects to plant MIS and gives the natural community relationships.

Table 8. Expected effects to plant MIS

MIS Species	N/P Plan community indicator	Natural Community (as used in this document)	Effects, unmitigated	Effects, with treatment
Carolina hemlock	Carolina bluff community	Pine-Oak Heath Chestnut Oak Forest	Slight	Slight (see discussion of effects for Tsuga caroliniana)
turkey beard	Yellow pine forest	Pine-Oak Heath	Moderate to slight increase due to increase of sunlight	Slight increase due to increase of sunlight in activity areas.
table mountain pine	Xeric yellow pine forest	Pine-Oak Heath	Direct mortality with SPB. Heavy loss of mature individuals, probably will stimulate seedling recruitment. A buildup of fuels may make community more prone to fires.	Less mortality expected. Retain more mature individuals. Less prone to hot fires.
pitch pine	Xeric yellow pine forest	Pine-Oak Heath		
white pine	Natural white pine community	Acidic Cove Forest	Direct mortality with SPB Moderate loss of mature individuals	Less loss of mature individuals. Hardwood species may replace white pine.

Aquatic Environment

The Environmental Assessment for the suppression of Southern pine beetle infestation on the Nantahala and Pisgah National Forests outlines two management alternatives and associated limitations. Included are several limitations that partially alleviate the need for analysis of potential effects to aquatic resources. For example, no new system roads would be built and no temporary roads would be built that cross perennial streams. This reduces potential effects to aquatic resource substantially, since research has shown that it is the effect of sedimentation from roading, particularly, stream crossings, and not the timber harvest itself, that is the greatest threat to aquatic resources during timber management activities. In addition, no cable logging would be done, which removes areas with slopes greater than 40% from having the woody material removed from the landscape. And furthermore, no treatment would occur within riparian areas (100' on each side of the stream) unless examined site-specifically by an interdisciplinary team to assess overall benefit to riparian resources. If a proposal involves any of these situations, this document does not apply and site-specific analysis is necessary.

In examining the distribution of pine and mixed pine/hardwood stands across the Forests, it has been determined that streams and lakes within all parts of the river continuum (reference above) would potentially be affected by the Southern pine beetle. This makes it extremely difficult to analyze potential effects to aquatic resources across the landscape in one document. Therefore, Attachment 1 outlines a decision tree that would serve as an aid to check potential effects on a stand-by-stand basis, to assure effects are within the range as discussed below. The philosophy and mechanisms outlined below will be applied as management is prescribed for each stand affected by the Southern pine beetle. Mitigation measures are stated to reduce adverse impacts on aquatic resources..

Potential Effects of the No Action

Left untreated, infested pine and mixed pine/hardwood stands have the potential to lose all or part of the pine component to damage from the Southern pine beetle. This has the potential to affect several parameters important to stream and riparian health and function. First, large woody debris (LWD) transport to stream channels would increase as infested trees die. And second, the loss of all or part of the shading on a stream would affect primary productivity and water temperature. These direct effects to the stream channel would result in indirect effects in aquatic community composition and health within the stream, and cumulative effects on landscape-level community structure.

Woody debris constitutes the major organic input to low order streams, where it is apparent that wood has a significant role in energy flow, nutrient dynamics, and stream morphology, and in shaping the biotic community (Swanson et al. 1976, Keller and Swanson 1979, Anderson and Sedell 1979). While this influence is less observable in larger streams, the influence of LWD along the margins of larger systems is still important.

As pine species are affected and LWD enters streams, aquatic invertebrate populations would respond with increases in species which utilize wood, including borers, gougers, and scrapers,

and several groups which utilize wood surfaces (e.g. Chironomidae, Heptageneidae, Baetidae, Nemouridae, Peltoperidae, Perlodidae, Limnephilidae, Rhycophilidae) (Dudley and Anderson 1982). As LWD decomposes and is utilized by aquatic invertebrates, its usefulness diminishes, which results in the gradual return to pre-LWD community structure. Subsequently, as the pine component is lost from mixed pine/hardwood stands, deciduous leaf input increases as the hardwood component ages. This results in increases in aquatic organisms such as shredders and filterers. This combination of events can lead to vastly improved habitat conditions for aquatic organisms, given that the community is one not sensitive to increases in maximum summer and daily temperatures. Both structural (i.e. LWD) and residual (i.e. leaves and other small organic matter) nutrient sources become more available to the system, which can result in higher species richness and diversity. In systems dependent on cooler water temperatures (such as trout streams), species may occur in lower densities where shade has been measurably affected until riparian conditions (particularly streamside shading) return to pre-infestation levels.

As with many groups of organisms, aquatic invertebrate and fish community dynamics have been proven to be cyclic and adaptable to surrounding conditions. For example, habitat suitability for a particular species may be improved with the input and retention of LWD, which is reflected in increased population levels of that species. But as the microhabitat (e.g. surface of the log) deteriorates and becomes less suitable, population levels respond accordingly. This process can take anywhere from several weeks (if environmental conditions cause rapid breakdown of woody material) to many years, and is thought to occur more rapidly with pine and other soft wood species than with hardwood species (Webster 1977).

In this situation, it is expected that relatively large amounts of LWD (primarily white and yellow pine species) would enter adjacent stream systems as the southern pine beetle damage results in tree mortality within riparian areas. Aquatic invertebrate communities would respond accordingly, becoming dominated by species utilizing wood at some point in its life history (see above). This immediate burst of LWD input would be followed by a period of relatively little LWD transport to streams as riparian forests move through early stages of succession. These effects would be less pronounced in mixed pine/hardwood stands and in isolated areas that have not suffered the extreme drought conditions much of Western North Carolina has experienced during the last two years. And, if succession rates lag behind the retention and decomposition rates of the LWD in the streams, it could be even longer before natural LWD transport rates return (Bryant 1983).

Hall and Baker (1975) summarize many of the beneficial and adverse effects of organic debris on fish habitat. Most of the adverse effects concern water quality, particularly intragravel dissolved oxygen, and stream channel instability. Concerns about water quality involve increased biological oxygen demand (BOD) from large deposits of decomposing fine particulate organic matter, which can potentially affect fish spawning success. In most cases, this fine organic matter is flushed downstream before problems with BOD reach problem levels.

Although debris has been cited as a problem for instream fish movement (Merrell 1951, Holman and Evans1964), this may have been overstated, as there is a plethora of literature documenting the benefits of LWD to habitat diversity and fish production, particularly addressing spawning

and nursery areas and juvenile and adult instream cover (Narver 1971, Sheridan 1969, Hall and Baker 1975, Boussu 1954, Bryant 1981, et al.). Studies also clearly demonstrate that increased habitat diversity results in more diverse, stable fish communities (Fraser and Cerri 1982, Bisson and Sedell 1984). Results of these and other studies clearly document the importance of LWD for fish habitat.

Habitat for resident fish species would likely be improved as LWD enters the system through tree mortality. This, combined with increases aquatic invertebrate population levels, will likely result in measurable improvements in fish population levels-- especially for species whose habitat requirements are structurally-oriented (e.g. trout, bass). Such improvements would continue until LWD is decomposed or flushed downstream by high flows (Lisle 1986). In systems dependent on cooler water temperatures (such as trout streams), species may occur in lower densities where shade has been measurably affected until riparian conditions (particularly streamside shading) return to pre-infestation levels.

At the landscape level (i.e. across the Nantahala and Pisgah National Forests), measurable effects on the aquatic community and habitat are not likely to be seen, except locally within pure pine stands having no riparian understory which support temperature-dependent aquatic communities (i.e. trout). In this situation, potential effects would consist of shifts in aquatic invertebrate and fish communities as described above. In addition, rare aquatic species dependent on local habitat conditions within this type of area could be affected (reference attached list of rare species), should they occur. Such effects would continue, with a gradual return to a pre-disturbance community structure as riparian vegetation responds similarly. In any case, the magnitude of such changes in aquatic community structure and function would likely be local in nature, and would not occur beyond several hundred feet downstream of the affected stand.

Effects of Treatment

Implementation of these suppression methods would have the same potential effects as the No Action alternative, except to a lesser extent. Also, LWD input to stream channels is likely to be less since the trees would be felled under human control and opening size would likely be smaller. For stands with streams within or adjacent to them, it may be necessary to implement habitat improvement measures (e.g. manipulation of LWD, riparian planting, etc.) to minimize effects to rare and temperature-dependent aquatic species. These recommendations will be made following the site-specific surveys.

Since no new transportation system is being considered and no perennial stream crossings would be allowed, there would be no potential effects from access activities on aquatic systems.

Burning is not likely to affect aquatic communities as long as it occurs outside the designated riparian area, where potential effects of riparian soil and water heating on stream structure and function are minimal.

PROPOSED, ENDANGERED, THREATENED, AND SENSITIVE SPECIES

Mitigation measures are specified to substantially reduce impacts to biological resources.. Suppression activities would not occur where Forest concern, Forest sensitive, and federally listed and candidate species occur. These occurrences would be excluded from suppression treatments. Known element occurrences are identified through current inventories. Implementation checks prior to suppression treatments would assure that potential habitats for Forest concern, Forest sensitive, and Federally listed and candidate species are avoided..

Wildlife Analysis (WILDA)

An analysis of the 107 Forest Sensitive and Concern species list which includes all Federally Endangered, Threatened, Proposed, and Regional Sensitive species was done based on both county records and habitat (Appendix 1). Species dependent on pine habitat for any portion of their lifecycle were considered and the predicted results of epidemic SPB infestation resulting in 30% pine mortality were used to analyze potential effects by treatment. This determination resulted in three species being evaluated as having potential for being directly effected by the SPB infestation and two species being further analyzed as having potential of indirect effects from the SPB infestation in pine stands. Additionally, several butterfly sensitive or concern species would be indirectly affected by the Cut and Leave treatment. Implementation checks have are required in stands with the following conditions; white pine/cove hardwood forest type, white pine/upland hardwood forest type, and riparian areas within pine/hardwood forest type stands (Appendix 2). This analysis was based on the best available information.

Riparian area terrestrial species would not be affected by any of the four treatment proposals in pure pine stands due to the acidity levels in the soil, and common dominance of rhododendron vegetation. Occurrence records and recent surveys have demonstrated that these species utilize deep, moist leaf litter which is not sufficiently present in pine stands, even those with a hardwood understory. Potential habitat is limited to the stream channel and does not expand into the pine-dominated vegetation.

Suppression activities would not occur where Forest concern, Forest sensitive, and federally listed and candidate species occur. These occurrences are excluded from suppression treatments. Known element occurrences are identified through current inventories. Implementation checks prior to suppression treatments would assure that potential habitats for Forest concern, Forest sensitive, and federally listed and candidate species are avoided..

Indiana Bat, *Myotis sodalis*

White Pine/Cove hardwood, White Pine/ Upland hardwood, and yellow pine/hardwood forest types are defined in the U.S. Fish & Wildlife's Biological Opinion (April 7, 2000, page 91) as potential habitat for the Indiana Bat, a Federally Endangered species may occur in Graham, Macon, Cherokee, and Swain counties. Under normal conditions, pine does not provide peeling or sloughing bark for the bats to utilize for roosting. When pine trees die, especially from SPB attacks, they lose their bark very quickly and therefore are not likely to be utilized as maternity

or other day roosting sites. However, hardwood trees in the immediate vicinity of the SPB infestation may provide potential roosting sites. Indiana Bat habitat is defined in the B.O. (page 32 & 33) as >60% canopy cover, 9+" diameter trees. An infestation of SPB within these pine-dominated forests would result in an less than 60% canopy cover as 70%+ of the stand composition is pine subject to mortality. Current condition of suitable habitat for the Indiana Bat on the Nantahala and Pisgah National Forests was evaluated in the B.O. (page 32 & 33). Yellow pine/hardwood forest type was determined to provide 4% of the suitable habitat across the forests or 25,675 acres. The analysis by forest type for this environmental assessment determined that 50,083 acres of the white pine/cove hardwood, white pine/upland hardwood, and yellow pine/hardwood is currently found across the Nantahala and Pisgah National Forests. This difference in acres is due to defining the white pine forest types separately from hardwood dominated forest types and not eliminating acres too young to contain 9" trees. The Biological Opinion (page 46 & 47) addresses the effect of timber salvage and natural catastrophic events. Timber salvage within the four counties of Cherokee, Graham, Macon, and Swain were estimated to be 252 acres per year (B.O. page 63). A determination was made that this activity is not likely to jeopardize the Indiana Bat and incidental take that may occur during this activity was recognized and allowable. Page 64 in the B.O. states that salvage on the remainder of the Nantahala and Pisgah National Forests is not likely to adversely effect the Indiana Bat. Forest Health projects up to 30% of the susceptible stands across the Nantahala and Pisgah National Forests may become infested with SPB. Ed Brown, Forest Silviculturist & Linda Randolph, District Silviculturist estimated the total number of acres that may be treated across the Nantahala and Pisgah National Forests to be 2500 acres. This estimation was based on the epidemic of SPB in the 1980's. The projections of Cut & Remove treatment and potential infestation exceed the estimation of salvage acres in the B.O. of 600 acres.

Therefore, when the SPB infested acreage treated by Cut and Leave or Cut and Remove, approaches 252 acres in Graham, Macon, Cherokee, and Swain of white pine/upland hardwood, white pine/cove hardwood, and yellow pine/hardwood forest types, the U. S. Fish & Wildlife would be advised and formal consultation re-initiated. The terms and conditions, stated in the B.O., would be applied for any treatment within these forest types for Graham, Macon, Chereokee, and Swain counties. Informal consultation with Allan Ratzlaff (U.S. Fish & Wildlife Service, April 12 and May 30, 2000) determined that cutting of green pine trees (which exhibit tight bark conditions) that are actively infested with SPB and a surrounding buffer of green, pine trees, would not effect the Indiana Bat.

Wildlife PETS and Forest Concern Species Effects by Treatment

Pine forest type dependent species directly affected by the SPB mortality

Olive-sided Flycatcher – Forest Concern
Northern Pine Snake – Forest Concern
Nesticus mimus – Forest Sensitive spider species

Species that may be indirectly affected by SPB mortality other than those riparian and cove hardwood species previously addressed.

Southern Appalachian Woodrat – Forest Concern
Allegheny Woodrat – Forest Concern

Effect of No Action

The species that would potentially be affected by the loss of pine habitat are; Olive-sided Flycatcher, Northern Pine snake, and Nesticus mimus.

Olive-sided Flycatcher habitat is described as coniferous forests, mainly spruce-fir, with dead trees at 5000' elevation. A SPB infestation may improve habitat for this species by increasing the availability of dead trees within pine forests. However, if the infestation and resulting mortality continues uncontrolled large portions of pine stands may be eliminated. The Appalachian Ranger District is the only district within the Nantahala and Pisgah National Forests (NANTAHALA AND PISGAH Forests) with a pine forest type at this elevation. Historical records indicate that this species has occurred in Haywood, Macon, McDowell, Mitchell, and Swain Counties. Therefore, it is assumed to be present down to the 4500' elevation. The districts's with pine forest type at 4,500 feet and above are the Pisgah (30 acres), Appalachian (1088 acres), Highlands (21 acres) Ranger District's. The total high elevation pine on the Nantahala and Pisgah National Forests is 1,139 acres. Forest Health's estimation of the SPB infestation may reduce this habitat by 342 acres or 30%. As little habitat exists on the Nantahala and Pisgah National Forests for this species, there would be a negative effect on this species by the SPB infestation and monitoring as a treatment that would not slow or stop the resulting pine mortality.

The Northern Pine Snake has been found in Cherokee, Clay, Graham, Macon, and Swain counties in pine and mixed pine/oak stands. The total acres of pine and pine/oak forest within these counties is 32,581. The estimate of SPB infestation provided by Forest Health may reduce this habitat by 30% or 9,774 acres, therefore-, no action would negatively effect the population viability of the Northern Pine Snake.

Nesticus mimus is a spider species found on private lands on Grandfather Mountain and Table Rock Mountain on the Grandfather Ranger District. This species requires cool, moist, rock ledges and outcrops. If the pine overstory, currently shading the rock ledges and outcrops suffers mortality due to the SPB infestation, the habitat for this species would be reduced. As the species is found at only these two locations, the affect to this species population would be negative by not attempting to slow or stop the SPB infestations.

Southern Appalachian Woodrat and Allegheny Woodrat are found in rock outcrops across the Nantahala & Pisgah National Forests. Shade is thought to increase the potential habitat of rock outcrops for these species. Loss of the overstory directly surrounding these sites may indirectly affect these species and cause them to abandon rock outcrops directly affected by overstory mortality. The majority of documented occupied sites are within hardwood forest types, therefore, any these species would be experience minimal indirect effects to individuals and not affect the population viability across the forest.

Effects of Pile and Burn

Due to the expense of this treatment, only priority one stands would be considered for treatment in the analysis within recreation and/or administrative sites.

The Olive-sided Flycatcher would benefit from this treatment by minimizing the potential spread of the SPB and resulting mortality. This would only be the case where stands are 4,500+ feet in elevation and the dead snags are left standing. As this treatment is only being considered where visuals and safety are an issue, leaving the dead trees standing could not be considered however, there have been no stands identified at this elevation for treatment of Pile and Burn. Therefore, there would be no effect to this species by this treatment on other than its habitat of 4,500+ feet elevation.

The effects to the Northern Pine Snake are analyzed for those counties where occurrence records exist. This snake lays eggs beside large boulders and logs during the months of May-June. There is little likelihood of any eggs being destroyed by this treatment as it is being proposed on a limited scale across the counties. A mitigation measure for any Pile and Burn treatment is added to pile brush for burning away from any boulders or large rocks present. As the species is mobile during the remainder of its lifecycle, viable population levels -would not be affected across those counties where it occurs.

The Nesticus mimus would be affected by any overstory mortality prior to this proposed treatment. However, as Table Mountain pine and other fire dependent species occur at the Table Mountain site and it is a highly visited recreation area that may be considered for Pile and Burn treatment in an attempt to limit the expansion of any SPB infestation. The mitigation measure for Pile & Burn treatment for the Northern Pine Snake occupied counties is-included for this potential treatment of SPB infestations on Table Rock Mountain.

The Allegheny Woodrat is known to occur on Table Rock Mountain and along with the Southern Appalachian Woodrat, is known to occur around areas of rock outcrops and boulders across the Nantahala and Pisgah Forests. The Pile and Burn treatment mitigation measure for all piling and burning to be done away from boulders and rock outcrops will protect these species from any direct affects. The Pile and Burn treatment may reduce the spread of the SPB infestation and resulting pine mortality that would reduce the amount of rock outcrops affected by overstory mortality with increased temperature and drying conditions.

Effects of Cut and Leave

Olive-sided Flycatcher habitat would be protected from expanding SPB infestations if this treatment was utilized within the 1,139 acres of habitat on the Nantahala and Pisgah Forests. Actively infested trees and a small buffer of green trees surrounding the SPB infestation would be felled. Dead trees where SPB are no longer present would remain standing. This treatment would limit the habitat loss due to SPB mortality and provide improved habitat conditions with

the standing, dead trees left on the site. Therefore, the effects to this species habitat would be beneficial during the SPB infestation.

This treatment would also benefit the Northern Pine Snake by preserving as much of its habitat as possible during the SPB infestation. The felled trees may provide cover and nest sites in the areas where the overstory has died. However, a mitigation measure would be added to this treatment within Cherokee, Clay, Graham, Macon, and Swain counties to fell all trees away from boulders to ensure any eggs that may be present are not destroyed. Beneficial effects would result from the Cut and Leave treatment.

This mitigation measure is not required outside the four counties listed where the snake may be present. *Nesticus mimus* would benefit from any felling activity around occupied boulders and rocks. The cut trees may provide shade where canopy mortality has occurred and the spider habitat of cool, moist conditions is subject to direct sunlight.

Allegheny and Southern Appalachian Woodrats occur in and around shaded boulder and rock outcrops. Cut and Leave treatment would fell trees around these rocks that provide shade and protection to any woodrats in the area. Additionally, as the trees decompose, they would provide a short term food source of fungi and wood boring insects to the woodrats. Therefore, this treatment will benefit both species.

Effects of Cut and Remove

The beneficial effects to Olive-sided Flycatcher would be the same as Cut and Leave because the removal of felled trees from a site would have no effect on this species.

As the Northern Pine Snake is mobile, individual snakes would leave the immediate area of the activity. However, skidding activities may cause any nests to be destroyed during the months of May and June in the four counties. The mitigation measure listed for Cut and Leave for felling away from boulders would be utilized for this action as well. Skidding and skid trails would avoid boulders and large rocks where nests may be present is also a mitigation measure for this treatment. With mitigation measures in place, there would be no negative effect to this species by the proposed treatment and there would be positive effects to the species by limiting mortality within its habitat.

Nesticus mimus would not be affected by this treatment due to the inaccessible habitat where this species occurs. Cut and Remove would not be a treatment considered on rock and cliff faces on Table Rock Mountain.

The Allegheny and Southern Appalachian Woodrats would not be affected by this treatment with the mitigation measure to avoid rock and boulder areas for skidding and skid trails listed for the pine snake. The shading and foraging benefits of the Cut and Leave treatment would not occur with the removal of felled trees from the site. There would be indirect benefits to the woodrats by limiting the SPB mortality with this treatment.

Additional PETS and Forest Concern Species Evaluated for Cut & Remove Treatment

Diana Fritillary – Forest Sensitive
Southern Grizzled Skipper – Forest Sensitive
Tawny Crescent – Forest Sensitive
Silvery Blue – Forest Concern
Golden-banded skipper – Forest Concern
Indian Skipper – Forest Concern

This proposed treatment includes constructing an estimated ¼ acre landing along the right-of-way for every 5 acres harvested. The disturbed, sunny attributes found along the edge of roads have a frequent occurrence of flowering plants that are nectar species for butterflies. The following list of butterfly species utilize the nectar plants found under these conditions; Diana Fritillary, Golden-banded skipper, Silvery Blue, Indian Skipper, Tawny Crescent, and Southern Grizzled Skipper. Over the Nantahala and Pisgah National Forest, this habitat is estimated to be 5,884 acres. A small portion of this habitat would be temporarily destroyed by the establishment of landings when Cut and Remove is selected for treatment of the SPB sites. The amount of disturbed landing sites would be determined by the amount of SPB control where Cut and Remove is the selected treatment. Erosion control seeding of the disturbed sites would be implemented immediately after harvest. It is expected that the seed source in the soil would re-establish this nectar species within two growing seasons. Across the Nantahala and Pisgah Forests, establishing landings would have no effect to the population viability of these butterfly species across the Nantahala and Pisgah Forests.

SPB susceptible stands were identified as accessible if they were within ¼ mile of an existing road. Harvested SPB infested trees may require skid trails to pass through stands that are not pine or pine/hardwood. If Cut and Remove is determined as the treatment for these sites, site-specific skid trail routes would be determined by an ID team to limit the effects of actions as described in this analysis.

Cumulative Effects

Forest types that are susceptible to Southern Pine Beetle infestations consist of 22.3% of the Nantahala and Pisgah National Forests. Pine forests in Tennessee are in an epidemic situation and Kentucky and southwest Virginia have substantial outbreaks of SPB as well. Combined with the growing presence of SPB in North Carolina, the affect to pine habitat in the southern Appalachians would affect pine dependent species on a very broad scale. Areas where severe mortality occurs are expected to regenerate naturally and, in some areas, may be artificially planted if stocking is inadequate. The pine forests in the southern Appalachians may experience a 30+% increase in seedling-aged forests. Many privately owned acres of pine forest are also experiencing SPB outbreaks and suppression activities have been minimal. Quite frequently in the Appalachians, yellow pine stands are found on shallow soil along mountain ridges where large-scale mortality may cause soil instability and limit natural regeneration where the potential for artificial regeneration activities are limited.

Habitat for the Indiana Bat may improve over the long term with the expected increased amount of hardwood within the pine/hardwood forest types that are infested by SPB and experience pine mortality. The resulting temporary open canopy condition is expected to allow early successional tree species, commonly deciduous trees and shrubs, to regenerate. Therefore, the pine/hardwood forest type acreage across the southern Appalachians, including the Nantahala and Pisgah National Forests, may be reduced while acreage of hardwood/pine forest type increases.

The Olive-sided Flycatcher may no longer survive in North Carolina, as the availability of their habitat is presently limited. Populations of Northern Pine Snake may be isolated for 20+ years if connecting pine habitat is lost to SPB mortality resulting in reduced reproduction. Many of the non-mobile species requiring cool, moist conditions may lose populations which occur in scattered pockets across the forest as SPB mortality reduces or eliminates the pine overstory at these sites. These effects would be determined through the implementation checks required for white pine/cove hardwoods and white pine/upland hardwood forest types prior to active treatment. Populations of these PETS species may be affected where access and priority preclude treatment, however, this situation is expected to be very minimal as the majority of white/pine cove hardwood and white pine/upland hardwoods across the Nantahala and Pisgah National Forests are accessible and expected to be treated. Therefore, any effect to populations of PETS species is expected to be minimal.

Botanical Analysis (BOTA)

. PLANT PETS AND FOREST CONCERN SPECIES.
The potential effects to PETS plant species that are exposed to logging activities such as moving heavy equipment, skidding logs, and temporary road construction are **direct effects** of damaging individual plants and the **indirect effects** of modifying the habitat. Some of the expected indirect effects of the canopy gaps created by the proposed activity would initially produce an increase in light, temperature, reduce humidity, and decrease soil surface moisture. **Cumulative effects** are those (negative) effects that result from current past and planned activities. Sinse all known and potential populations of plant PETS and Forest Concern Species (with the exception of *Tsuga caroliniana* discussed separately) would be avoided by the recommendations given in this document, there are no cumulative impacts expected or known for any plant PETS or Forest Concern species.

Direct and Indirect Effects:
The action proposal would have minimal undesirable indirect effects to PETS plant and Forest Concern species, because most of the indirect effect caused by the unmitigated effects of the pine beetle are thought to be greater than any of the action alternatives. These effects may have a positive affect or negative affect depending upon the particular plant species. Some weedy and early successional species such as *Rubus*, are expected to increases in the activity and beetle damaged area. PETS plant species may be negatively effected by the competition of these species.

POSSIBLE EFFECTS TO PLANT PETS BY METHOD:

CUT and LEAVE, and Pile and BURN
The cut and leave and pile-and-burn actions described in the proposed action are thought to have a minimal potential undesirable effect upon any plant PETS species populations. This opinion is based upon the assumptions that: 1) As proposed, all currently known plant PETS populations are excluded from the activity 2) the activity is within common community types with low probability of PETS plant species 3) tree felling and the burning of slash piles would have little chance of directly killing individuals of PETS plants or injuring enough individuals to cause a significant loss of individuals to affect the loss of viability of any potential a local population of PETS plants 4) the indirect effects of untreated areas would have more habitat change than untreated areas and 5) the proposal avoids many sensitive habitats over 4,000 feet (3,600 feet. for the Grandfather District) in elevation (required mitigation A ii). Furthermore, to protect the integrity of the plant communities within botanical special interest areas, it is recommended that they be excluded (required mitigation: A iii). If this method is utilized, no further recommendations are given.

CUT and REMOVE
This method utilizes heavy equipment and may require temporary access road construction. There is some risk to unknown plant PETS populations exposed to these activities.
Because of the rather broad possible activity areas of about 100,000 acres, we used broad scale potential habitat information. Even so, a large amount of specific information exists in previous surveys conducted through the Forests during flowering seasons. Furthermore, the activity areas are confined to only a few natural community types. These natural community types and the associated plant PETS are listed in Tables 8. These community types are the very common throughout the entire Forests (See Schafley and Weakley for detailed descriptions of these communities). All these communities have a characteristically low probability of plant PETS species occurrence in any given acre of land. However, also, because of the large scale of this proposal, there are numerous PETS plant species (106) that may be affected by proposed action.

Because of the timelessness needed to salvage and control further loss of trees, it is not practical to conduct botanical surveys in all potential activity areas until specific areas are selected. Therefore, all areas selected for Cut and remove activity, including proposed temporary access roads, would have an implementation check by a qualified botanist before the activity is implemented (required mitigation: B i). If a PETS plant is detected, or "likely" habitat is encountered within the unit or access road, the unit would be excluded(required mitigation: B ii). The implementation check would include: the date checked, area(s) checked, the botanist(s) conducting the check, the county and list of possible plant PETS species and there associated habitat, and wither the species or likely habitat is present.

POSSIBLE EFFECTS TO SPECIFIC PLANT PETS SPECIES:
There is one PETS plant that is likely to be affected by the proposed suppression actions: *Tsuga caroliniana*. This species is considered likely to be affected because of the known close habitat link to the areas of proposed action and have known populations on the Forests.

Tsuga caroliniana
Status: Federal: None; NC State, none; Global G3?; Forest Sensitive.
Known Forest occurrences: >100 populations are known, not tracked by North Carolina Natural Heritage.

Tsuga caroliniana is known to be a regular sometimes-common component of the Pine Oak Heath Community. In the analysis area, *Tsuga caroliniana* occurs mostly along ridges and upper slopes. Therefore, *Tsuga caroliniana* occurs in proposed activity areas and individual *Tsuga caroliniana* would be directly effected by this proposal. However, *Tsuga caroliniana* has a viable population outside the analysis area in areas that would not be affect by this proposal. Therefore, although this proposal would likely negatively affect individuals of *Tsuga caroliniana* it would not effect local viability of *Tsuga caroliniana* within the analysis area. Furthermore, the habitat for *Tsuga caroliniana* is not expected to be permanently altered by this proposal and *Tsuga caroliniana* is expected to recover in the proposed activity areas. No mitigation for *Tsuga caroliniana* is recommended.

On a Forest wide scale, this proposal would have very little effect on *Tsuga caroliniana*. There are so many individuals known distributed over such a wide area across the Forest that the species is not monitored in any quantified manner. Therefore, this proposal would have little effect on the total numbers of *Tsuga caroliniana* individuals throughout the Forest but would directly affect some individuals. This proposal (all alternatives) would have no effect upon the Forest viability of *Tsuga caroliniana.* This proposal has no known cumulative affects to *Tsuga caroliniana.*

Aquatic Analysis (AQUA)

Implementation of the No Action alternative or Alternative B may affect rare aquatic species occurring in streams within or adjacent to pure pine stands with little or no understory to minimize effects on water temperature. These effects are unavoidable in areas that would not be managed, as they would result from damage inflicted by a native forest pest. In this case, site-specific measures would be implemented to minimize effects to sensitive and Forest concern species and avoid trends towards Federal listing. This same approach would be taken in stands proposed for management of the Southern pine beetle to minimize potential negative effects on aquatic resources. Based on a review of Federally-listed aquatic species and pine or mixed pine/hardwood stands, it is not likely that these species or their habitat would be affected by damage from the Southern pine beetle.

C. Cultural and Economic Environment

Recreation

Existing Condition

Several developed recreation areas currently have SPB spots or have the potential to be attacked in the future. Many recreation sites have a high probability for SPB outbreaks.

A recreational opportunity usually contains three principle components: the recreation activity, the setting in which it takes place, and the resulting experience. Recreation Opportunity Spectrum (ROS) is a planning tool used to divide outdoor recreation settings, activities, and experience opportunities into categories. Opportunities within the spectrum range from a very high chance of solitude, self-reliance, challenge, and risk, to a highly social interactive experience. All of these categories are represented on the Nantahala and Pisgah National Forests. An important factor in determining the category and acres of each ROS setting is location and density of roads, and the predominance of natural features and vegetation. Fewer roads and more natural vegetation result in experiences that are considered more remote and have less evidence of human-caused impact. A more complete description of the ROS system is found in ROS Users Guide (1986).

Visitors have expectations of what they will see in the forest and this usually includes attractive and natural appearing scenery. This affects visitors' experiences and enjoyment of recreational activities. If scenic quality is lost through removal of large areas of timber, or large areas of dead and dying trees left in view, then visitors' experiences are also diminished.

Environmental Effects

The activities associated with IPM, and road reconstruction may affect a recreation opportunity by modifying the environmental setting through removal of trees and disturbance of the ground, and by decreasing the probability of isolation from the sights and sounds of non-recreation human activity. These effects may change the existing ROS class of an area temporarily or for an extended time.

Alternative A: Patches of dead and dying trees in the recreation areas would detract from the natural setting and decrease the quality of visitors' experiences. Depending on the size of the SPB outbreak patches could be quite large and dominant. As the trees die, safety hazards in the recreation sites would be created from falling limbs and trees. Less developed recreation areas and trails would not be closed, but more highly developed sites would be closed or use disrupted for periods of time depending on the extent of the SPB outbreak in the area. Dead trees would be removed and if it was a shady site, this could change the character of the area, possibly discouraging use until new vegetation replaced the trees removed.

Cumulative Effects - In landscapes that have high recreational use, continued SPB spots where trees are left to die and fall apart on the ground would have a compounding

negative effect on visitor experience. The longer a landscape is allowed to move further from natural appearing, the harder it will be for it to revegetate to a former natural appearance, and use may remain lower.

Alternative B: The detrimental effects of no action would be minimized with this alternative. Rather than waiting until the outbreak moves through a developed area, pockets of trees would be removed as they were infested. The intent would be to suppress the SPB spot with the least impact to the uninfested trees and to minimize disruption to the facility. Sites would still be closed or use disrupted for periods of time depending on the outbreak. And because most of the developed sites are in areas of high probability, it is likely most sites would have some impact over the next few years, and the character of areas might change through loss of trees. This in turn would have a negative impact on visitors' experiences and use may decrease until new vegetation fills in.

Cumulative Effects: There would be shorterm impacts from harvesting, road reconstruction; however these impacts would be less than leaving the SPB spots uncontrolled as in Alternative A. Quick action and mitigation to minimize the impacts to recreation areas from SPB outbreaks would lessen the negative impacts to user experiences.

Scenery Management

Existing Condition
Scenery consists of the combination of landforms, rock outcrops, water bodies, and vegetation as seen across the landscape. Modifications to the landscape seen on public lands include clearings, roads, and timber harvests. National Forest lands may appear as a continuous forest cover with patches of younger trees in areas of past timber management. Logging roads used to access these harvest areas may be visible as well. Existing openings vary in size and the degree to which they blend-in with the surrounding forest.

Southern Pine Beetle outbreaks can occur in Yellow and White Pine. Susceptible forest types are distributed throughout the Nantahala and Pisgah National Forests. It is difficult to predict where outbreaks would occur or what their specific effects to the scenery would be. Therefore, mitigating measures are needed to limit possible adverse effects to scenic attributes.Some of the susceptible areas have past timber harvest or SPB suppression treatments with associated roads and landings – while others may be relatively undisturbed with a continuous canopy cover.

Scenery Analysis
All travel corridors and use areas in and around susceptible stands would be considered for potential viewpoints. Some potential viewpoint locations would be specific points or vistas, while others may be segments of trail or road. Some of the views would be seen as the viewer is moving (in a vehicle or walking), while others would be from stationary locations. Views may be filtered or screened by foreground vegetation; others may be open and unobstructed. The degree of potential impact varies with these and several

other factors such as distance from viewer, viewer position, slope, size, shape and type of proposed treatment or road, landing, etc.

The Land and Resource Management Plan (LRMP) for the Nantahala and Pisgah National Forests assign visual quality objectives (VQO) for each management area. The VQO assignment depends on distance zone (DZ) and sensitivity level (SL). For this analysis, inventoried DZ and SL data was referenced with management areas for each susceptible stand. The resulting susceptible stands database determined VQOs for each stand, which has reasonable access and potential for SPB infestation. This database would be used to inform managers which VQO must be met and what mitigation is necessary for each particular stand.

The following chart shows which VQOs are assigned for each MA, based on the distance zone and sensitivity level; all stands seen from the Blue Ridge Parkway or Appalachian Trail must meet PR VQO in MA 1B, 3B and 4D:

	MA 1B & 3B	**MA 4D**	**MA 2A & 4A**	**MA 2C & 4C**	**MA 5 & 14**
R	--	--	FG SL 1	all DZ SL 1 & 2	all DZ & SL
PR	--	FG SL 1, MG SL 1	MG & BG SL1, all DZ SL 2 & 3	all DZ SL 3	--
M	all DZ & SL	BG SL 1, all DZ SL 2 & 3	--	--	--

Distance zones are categorized by foreground (FG), middleground (MG), and background (BG). Sensitivity levels are categorized by SL 1, 2 and 3; SL 1 being the most sensitive. Retention VQO must be met within one growing season, PR VQO within two growing seasons, and M VQO is allowed three. Refer to the LRMP for specific definitions of visual management terminology, and management area standards.

Mitigation

The following mitigation applies to all areas visible in the foreground and middle ground from open roads, trails, recreation areas, lakes and rivers. In Appendix C there is a complete listing of susceptible host type by stand, which included VQO information. VQO analysis was completed using GIS technology. Data are available for public review. In this GIS layer, assigned VQOs are noted in the *VQO* and *vqo_buffer* fields of the susceptible stands attribute table; the more restrictive VQO from these two fields applies. Retention is the most restrictive VQO noted in the attribute table, while Modification is the least. The *vqo* field contains the visual quality objective assigned through the forest plan. The *vqo_buffer* field indicates stands, which may be visible in the FG or MG from the Appalachian Trail or Blue Ridge Parkway. All stands indicated as visible from the AT or BRP, which are in MA 1B, 3B or 4D, must meet PR VQO. If an affected stand has no *vqo* or *vqo_buffer* attribute, contact a landscape architect for clarification.

For all VQOs (MA 1b, 3b, 2a, 2c, 4a, 4c, 4d, 5, 14)
Mitigation techniques:

- Establish irregular shaped openings to avoid straight lines or geometric forms.
- Leave unsusceptible trees and shrubs where practical.
- When cutting buffer, feather edges of openings 30-50 feet into un-infested trees.
- Slope cut-banks on roads and landings (where applicable).
- Seed skid roads, temporary roads, landings, and cut/fill banks (where applicable).

(R) Retention VQO (MA 2a, 2c, 4a, 4c, 5, 14)
Mitigation techniques:

- No new bladed skid/temp. roads or landings; skid to system road, or use existing skid/temp. roads and landings only.
- Slash treatment when stands are cut and removed.
    - Burn or lop and scatter slash to within 2 feet of the ground for 150 feet beyond the edge of an open road or trail.
    - No slash treatment required in middleground; burn if needed.
- Log debris treatment when stands are cut and left.
    - Lop and scatter to within 2 feet of the ground for 150 feet beyond the edge of an open road or trail; do not pile and burn.
    - To extent possible, lop and scatter in middleground; do not pile and burn.

(PR) Partial Retention VQO (MA 2a, 2c, 4a, 4c, 4d; and 1b, 3b seen from AT or BRP)
Mitigation techniques:

- Contact landscape architect for assistance in road/landing location in foreground areas where a new bladed skid road, temporary road or landing is needed.
- Screen or blend-in skid/temp. roads and landings where visible within 200 feet of open roads, trails, etc.
- Slash treatment when stands are cut and removed.
    - Burn or lop and scatter slash to within 2 feet of the ground for 100 feet beyond the edge of an open road or trail.
    - No slash treatment necessary in middleground; burn if needed.
- Log debris treatment when stands are cut and left.
    - To extent possible, lop and scatter in foreground; do not pile and burn.
    - No treatment required in middleground; pile and burn if needed for beetle suppression.

(M) Modification VQO (MA 1b, 3b, 4d)
Mitigation techniques:

- When adjacent to open roads, trails, etc., screen or blend-in skid/temp. roads and log landings where practical.
- Slash treatment when stands are cut and removed.
    - Burn or lop and scatter slash to within 4 feet of the ground for 50 feet beyond the edge of an open road or trail.
    - No slash treatment necessary in middleground; burn if needed.
- Log debris treatment when stands are cut and left.

- To extent possible, lop and scatter in foreground; pile and burn if needed for beetle suppression.
- No treatment required in middleground; pile and burn if needed for beetle suppression.

Cumulative Effects

Treatment of infested stands would create openings of various sizes in the forest canopy, and some new skid roads, temporary roads and landings would also be visible. Changes that would be seen on National Forest lands would be in addition to other timber harvests and logging roads currently visible from various viewpoints. Initially, treated areas may have piled trees or slash, burnt areas, visible skid trails, and little understory vegetation. Over time (4 years or more), these areas would be noticeable primarily because of the change in the height and density of the new vegetation compared to the surrounding forest. To some viewers the resulting variety would be pleasing. To others who prefer a more homogeneous appearing forest, the resulting variety may not be acceptable. After 8 or more years, most affected stands will visually blend-in with the surrounding forest leaving little evidence of suppression treatments.

Ultimately, suppression of SPB outbreaks would have a positive net effect since untreated infestations would spread rapidly and kill many more acres of forest. Cumulative scenery impacts resulting from outbreaks or suppression are unpredictable, but if left untreated those impacts would be much greater.

Heritage Resources

Alternative A: Monitoring/No Action

Dead and dying trees are often susceptible to tip-up or blow-down which can adversely affect heritage resources, buried archeological sites may be exposed and historic structures could be damaged. Forested stands that are an integral part of the setting associated with National Register of Historic Places sites could be damaged and lost if SPB suppression treatments are not applied.

Alternative B

The three SPB suppression treatments are all considered beneficial to heritage resources. Neither Cut and leave nor pile and burn are considered to have potential for adverse affect on heritage resources. Cutting infested trees will reduce the possibility of future tip-ups and blow-downs. There are no expected direct effects, other than site preservation. SPB spots treated by cut and leave or pile and burn require no further heritage resources compliance review because they are considered non-impacting. Cut and remove is considered beneficial to heritage resources because it reduces site damage from tip-ups and blow-downs. However, skidding, yarding, and access road construction, temporary roads, skid trails and bladed skid trails, are considered potential and direct adverse affects to heritage resources. All ground-disturbing activities have the potential to affect heritage resources. SPB spots proposed for cut-and-remove would be

compared to the Heritage Resource Atlases to determine if the area has had prior survey, has known sites and the NRHP eligibility of the respective sites. Areas previously surveyed with no sites or Class III sites require no further review and the activity may be allowed.

Archeology

The following mitigation measures will be followed to eliminate adverse impacts to National Register of Historic Places eligible (Class I) or potentially eligible (Class II) sites from SPB suppression treatments:

All SPB spots scheduled for treatment, with the cut and remove suppression method, would be checked by the zone archeologist or forest archeologist prior to any suppression activity. The implementation check would be documented on the NFsNC SPB Heritage Resources Compliance Checklist.

SPB spots proposed for cut and remove would be compared to the Heritage Resource Atlases to determine if the area has had prior survey, has known sites and the NRHP eligibility of the respective sites. Areas previously surveyed with no sites or Class III sites require no further review and the activity may be allowed. Areas with known Class II sites must be avoided by any ground disturbing activities, skidding, road construction, etc.

Areas not previously surveyed would be checked with the GIS probability analysis to determine survey need or not. Areas with 0 – 10% slope and areas 10+ - 20% slope within 150 feet of water require archeological field survey prior to any ground disturbance**.** All newly located/recorded sites would be avoided. All areas greater than 10% slope and not within 150 feet of water are considered low probability and require no archeological implementation check prior to impact. Final decision to check or not would be made after Zone archeologist or Forest archeologist compares GIS ratings with heritage resources atlas. This would be done to ensure special kinds of sites, Traditional Cultural Properties and/or sacred sites are not adversely affected by the proposed activity. Site-specific consultation with Federally recognized tribes may be required prior to any activity.

All SPB areas surveyed in a fiscal year would be reported in a forest report (Pisgah and Nantahala separate) to be submitted to the State Historic Preservation Officer (SHPO) no later than March 1 of the following year.

> Relocate and mark known Class I and II archeological sites prior to suppression activity and choose techniques that avoid or minimize disturbance.

Cumulative Effects: There are no cumulative effects on the Heritage Resource with this proposal.

Economics

There are economic effects from the current SPB epidemic. The effects can be measured in terms of timber, visual, and recreational resource damage. Some of these effects can be measured with traditional market valuation tools for example, the monetary value of timber losses. These losses can be direct from loss of the entire value of the tree to loss due to decrease in tree grade or drop on overall lumber prices due to increase supply in the market.

However, non-market values such as the value of certain viewpoints or the value of the overall scenery to the destination of a developed recreation and how they related to overall tourism revenue and harder to measure.

Other impacts could be an increase in wildfire suppression costs, or increase in site preparation cost and reforestation would increase given the debris and hazards that would exist across the host type and impacts to local and regional timber industry loggers and forest products facilities as potentially merchantable trees would be lost to decay.

Given the widespread nature of the SPB epidemic, and the uncertainty of risk predictions in epidemic SPB situations the impacts to National Forest in western North Carolina are difficult to predict. Please note that the decision to make and purpose and need do not depend on an economic "return" to justify taking action.

Alternative A

With the unmitigated spread of SPB, losses are expected to be greater in this no action alternative.

Timber

The impacts associated with no action are a loss of opportunity in the timber value of stands with SPB infestations. Trees and stands that occur on lands suitable for timber production in the current N/P Land Management Plan, Amendment 5, have the possibility of dying and not providing the expected, normal economic return to the federal treasury, and local economy and tax base. .

Fire

In the case of wildfire, suppression costs are expected to be higher because of the increase in fuel loading and spot size.

Other

The cost of site preparation under this alternative is expected to be greater with larger spot sizes.

Scenery and Recreation

Certain viewsheds would be heavily impacted. For example, the Nolichucky and French Broad River Corridors have been heavily impacted. Much of the current susceptible host types have some level of infestation or are in immediate threat of SPB spot proliferation or growth. The visual value of these areas is secondary to most visitors, such as river rafters or fisherman. However, there is some un-measureable point where visitors would choose another destination and would visit areas that have been less heavily impacted. Current revenues from outfitter guides do not indicate that this is occurring. Ranger Districts are receiving calls on the cause of the "bug killed" areas, but visitor days seem to be the same or increasing from last year. There is a possibility of fewer visitations for some day-use and campground facilities, with a commensurate loss of income, but is considered unlikely at this time. Most recreation on the N/P is not directly tied to the susceptible host types and given the small percentage (11%) of the total land base the impacts are considered insignificant.

Cumulative Effects
The impacts to the value of the forest could last for many years. These losses could include forest product related losses, recreation impacts to campgrounds, day-use facilities and those that visit the forest to view and enjoy the "forested appearance". The value of these losses depends upon the severity of the SPB epidemic. The local communities would experience a loss of revenue from federal funds as stands that might be harvested are killed and no recovery of product or value is realized.

Alternative B

The economic impacts for alternative B would be similar to alternative A, although the degree would be reduced. Direct control and suppression efforts would address spots according to the priority listing in this document. Priority One stands are within ¼ mile of a trail or road and have the potential to directly affect the road or trail corridor. Visual and Recreational economic losses should be lessened with control efforts. Monetary losses in these stands could also be minimized if the cut and remove option is implemented. Cut and Remove option could cost initially however should in the long run minimize future losses.

The available supply of pine forest products in the future is greater than alternative A as less mortality would occur. There would be less expense expected in the suppression of wildfires, and future reforestation costs.

The control of spots in close proximity to private lands would lower the risk of SPB spread from the national forest to private lands. This would reduce the chance of economic losses to private timberland and the pine tress that adjacent residents value for sight, shade and property value.

Cumulative Effects
Timber values would not be impacted as much as under alternative A. The cut and remove method would result in the capturing of some economic return to the treasury and generate funds to the affected counties. The impacts to the local forest products industry would be enhanced by the protection of many pine stands that might provide a source of material in the future.

Irreversible and Irretrievable Commitments of Resources

Alternative A

There are no known irreversible commitments of resources associated with this alternative. The irretrievable commitments would be the loss of pine saw timber on national forest system lands; losses of private pine saw timber if the SPB spreads from the national forest to private lands; the loss of economic value from the impacted stands and recreational income sources; losses of habitat for various wildlife species and losses to future timber supply from mortality in pine stands of all ages.

Alternative B

The use of equipment during the cut and remove activities could result in minor losses to soil productivity from compaction.. This could result in an irretrievable ,short term commitment.

The irretrievable commitments would be the same as alternative one but proportionately reduced by the amount of acres treated and the effectiveness of the treatments.

D. Mitigation Measures by Resource For Alternative B

Limitations on Actions to Reduce Effects on All Resources

1. Build no new system roads.
2. No new perennial stream crossings
3. No Cable logging
4. No suppression treatment of SPB within riparian areas as defined by the N/P Plan, unless a site-specific resource plan is prepared by an Interdisciplinary Team.
5. Alert visitors at recreation areas and trailheads if logging activities are occurring.
6. Post information on SPB activity on Forest Bulletin Boards.
7. Use of GIS database or stands listing to determine status of potential to affect other resources, for example check stands for treatment for assigned VQO to determine mitigation.

Measures to reduce effects on Archeology

The following mitigation measures will be followed to eliminate adverse impacts to National Register of Historic Places eligible (Class I) or potentially eligible (Class II) sites from SPB suppression treatments:

All SPB spots scheduled for treatment with the cut and remove suppression method will be reviewed by the zone archeologist or forest archeologist prior to any action on the ground. The review will be documented on the NFsNC SPB Heritage Resources Compliance Checklist.

SPB spots proposed for cut-and-remove will be compared to the Heritage Resource Atlases to determine if the area has had prior survey, has known sites and the NRHP eligibility of the respective sites. Areas previously surveyed with no sites or Class III sites require no further review and the activity may be allowed.

Areas with known Class II sites will be avoided from any ground disturbing activities, skidding, road construction, etc.

Areas not previously surveyed will be subject to a GIS probability analysis to determine need for implementation check. Areas with 0 – 10% slope and areas 10+ - 20% slope within 150 yards of water require archeological implementation check prior to any ground disturbance**.** All newly located/recorded sites will be avoided. All areas greater than 10% slope and not within 150 yards of water are considered low probability and require no archeological survey prior to impact. Final decision to conduct implementation check or not will be made after Zone archeologist or Forest archeologist compares GIS rating with heritage resources atlas. This will be done to ensure special kinds of sites, Traditional Cultural Properties and or sacred sites are not adversely

affected by the proposed activity. Site-specific consultation with Federally recognized tribes may be required prior to any activity.

All SPB areas surveyed during the fiscal year will be reported in a forest report (Pisgah and Nantahala separate) to be submitted to the State Historic Preservation Officer (SHPO) no later than March 1 of the following year.

Relocate and mark known Class I and II archeological sites prior to suppression activity and choose techniques, which avoid or minimize disturbance.

Measures to reduce effect to Visual Quality

Use the database for stands with susceptible host type to determine VQO's for each stand that has reasonable access and potential for SPB infestation. This database will be used to inform managers the VQO for each area and the necessary mitigation.

The following mitigation applies to all areas visible in the foreground and middle ground from open roads, trails, recreation areas, lakes and rivers. Appendix C has a complete listing of susceptible host type by stand, which includes VQO information. VQO analysis was completed using GIS technology and the data is available for public review. In this GIS layer, assigned VQOs are noted in the *vqo* and *vqo_buffer* fields of the susceptible stands attribute table; the more restrictive VQO from these two fields applies. Retention is the most restrictive VQO noted in the attribute table, while Modification is the least. The *vqo* field contains the visual quality objective assigned through the forest plan. The *vqo_buffer* field indicates stands that may be visible in the fore ground or middle ground from the Appalachian Trail or Blue Ridge Parkway. All stands indicated as visible from the AT or BRP that are in MA 1B, 3B or 4D, must meet PR VQO. If an affected stand has no *vqo* or *vqo_buffer* attribute, contact a landscape architect for clarification.

For all VQO's (MA 1b, 3b, 2a, 2c, 4a, 4c, 4d, 5, 14)

Mitigation techniques:

- Establish irregular shaped openings to avoid straight lines or geometric forms.
- Leave unsusceptible trees and shrubs where practical.
- When cutting buffer, feather edges of openings 30-50 feet into un-infested trees.
- Slope cut-banks on roads and landings (where applicable).
- Seed skid roads, temporary roads, landings, and cut/fill banks (where applicable).

For (R) Retention VQO (MA 2a, 2c, 4a, 4c, 5, 14)

Mitigation techniques:

- No <u>new</u> bladed skid/temp. roads or landings; skid to system road, or use existing skid/temp. roads and landings only.

- Slash treatment when stands are cut and removed.
    - Burn or lop and scatter slash to within 2 feet of the ground for 150 feet beyond the edge of an open road or trail.
    - No slash treatment required in middle ground; burn if needed.

- Log debris treatment when stands are cut and left.
    - Lop and scatter to within 2 feet of the ground for 150 feet beyond the edge of an open road or trail; do not pile and burn.
    - To extent possible, lop and scatter in middle ground; do not pile and burn.

(PR) Partial Retention VQO (MA 2a, 2c, 4a, 4c, 4d; and 1b, 3b seen from AT or BRP)
Mitigation techniques:

- Contact landscape architect for assistance in road/landing location in foreground areas where a new bladed skid road, temporary road or landing is needed.

- Screen or blend-in skid/temp. roads and landings where visible within 200 feet of open roads, trails, etc.

- Slash treatment when stands are cut and removed.
    - Burn or lop and scatter slash to within 2 feet of the ground for 100 feet beyond the edge of an open road or trail.
    - No slash treatment necessary in middle ground; burn if needed.

- Log debris treatment when stands are cut and left.
    - To extent possible, lop and scatter in foreground; do not pile and burn.
    - No treatment required in middle ground; pile and burn if needed for beetle suppression.

(M) Modification VQO (MA 1b, 3b, 4d)
Mitigation techniques:

- When adjacent to open roads, trails, etc., screen or blend-in skid/temp. roads and log landings where practical.

- Slash treatment when stands are cut and removed.
    - Burn or lop and scatter slash to within 4 feet of the ground for 50 feet beyond the edge of an open road or trail.
    - No slash treatment necessary in middle ground; burn if needed.

- Log debris treatment when stands are cut and left.
    - To extent possible, lop and scatter in foreground; pile and burn if needed for beetle suppression.

- No treatment required in middle ground; pile and burn if needed for SPB suppression.

Measures to reduce effects to Aquatics, Botanical, and Wildlife Resources

The following mitigating measure will reduce impacts to biological resources. Suppression activities will not occur where Forest concern, Forest sensitive, and federally listed and candidate species occur. These occurrences will be excluded from suppression treatments. Known element occurrences are identified through current inventories. Implementation checks prior to suppression treatments will assure that potential habitats for Forest concern, Forest sensitive, and federally listed and candidate species are avoided..

To comply with the The Federal Endangered Species Act (FESA, 16 USC 1531), National Forest Management Act, (NFMA., 16 USC 1604) and/ or The National Enviromental Policy Act (NEPA., 42 USC 4321), it was determined that the following mitigation is required for alternative "B".

Mitigation Measures Used for Determinations of Effects

To comply with the Federal Endangered Species Act (FESA, 16 USC 1531), National Forest Management Act, (NFMA, 16 USC 1604) and/ or The National Environmental Policy Act (NEPA., 42 USC 4321), it was determined that the following mitigation is required.

Cut and Leave and Cut and Remove Treatments

1) With the exception of *Tsuga caroliniana,* all known element occurrence of T&E, and S Species areas are excluded from activity. To make sure that current information is available, the Forest Botanist should be consulted on each proposed activity area. To mitigate potential effects to *Tsuga caroliniana*, this species should not be cut. Where *Tsuga caroliniana* occurs near trees to be cut and directionally fell trees away from *Tsuga caroliniana* whenever possible.

2) All areas above 4000 ft.(3600 ft. Grandfather RD) require a botanical field check.

3) All Special Interest Areas recognized by the current Forest plan and proposed by North Carolina Natural Heritage Program are excluded from the proposal. (N/P Amendment 5, Land Management Plan, III-190)

4) Directionally fell trees away from rock outcrops and boulder complexes.

Cut and Remove areas (including access roads)

5) Must have a competed biological implementation check. This implementation check will include: Date(s) checked, area(s) checked, Natural Communities or habitats encountered, and detected presence or absence of T&E, and S species. Disclosure includes the presence or likely presence (based upon habitat) of Threatened, Endangered and sensitive species

6) As proposed, areas that are found to contain a Threatened and Endangered and Sensitive (other than *Tsuga carolinensis*) or likely habitat as determined by the biologists excluded from activity.

Pile and Burn Treatment

7) No burning should occur within 100' of perennial streams to avoid potential effects of riparian soil heating, increased water temperature, and increased sediment transport on aquatic resources.

All Treatments

Implementation checks for rare aquatic species presence in streams within or adjacent to stands with both of the following characteristics be conducted by the fisheries biologist:

8) Elevations equal to or greater than 1800 feet. This elevation is considered to be the lower limit of naturally-sustainable trout populations across the Nantahala and Pisgah National Forests based on habitat/fish population data analysis and Ecosystem classification modeling (Hill and Bryan 2000, unpublished).

9) Riparian stands containing only pine species with little or no understory vegetation providing shade to the stream.

10) Cut & Leave treatment within 100' of perennial streams require field implementation checks by botanical, fisheries, and wildlife staff prior to treatment.

Based on the implementation checks it may be necessary to alter the location of operations or to eliminate the area from management to minimize effects to Threatened and Endangered or Sensitive species.

CHAPTER IV

Public Involvement

Scoping for Southern Pine Beetle suppression activities began on July 15, 1999. A letter was mailed to persons on the district mailing list, and seven responses have been received.

The comments received were narrowly focused. Most commentors requested "quick prompt action", and that "control operations be conducted as quickly as possible". The prominent concern was for the Forest Service to control the southern pine beetle before it impacted private land.

Interdisciplinary Team Members

The following individuals comprise the interdisciplinary team, and participated in the formulation and analysis of issues, alternatives, and environmental effects:

Ed Brown, Forest Silviculturist
Linda Randolph, Forester, Appalachian Ranger District, Pisgah National Forest
Eric Crews, Landscape
Kathy Ludlow, Recreation Planner
Sheryl Bryan, Fisheries Biologist, Pisgah National Forest
Sandy Florence, Wildlife Biologist, Pisgah National Forest
Carol Milholen, Forest Planning Assistant
Rodney Snedeker, Forest Archeologist