



U.S. Department of Agriculture
Forest Service
Southern Region

Draft Environmental Impact Statement for Revision of the Land and Resource Management Plan for the Uwharrie National Forest

National Forests in North Carolina



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**Draft Environmental Impact Statement for
Revision of the Uwharrie National Forest
Proposed Land and Resource
Management Plan**
Montgomery, Randolph, and Davidson Counties, North Carolina

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Subject: Uwharrie Plan

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Abstract:

Three alternatives for revision of the Land and Resource Management Plan (LRMP) for the Uwharrie National Forest are described and compared in this Draft Environmental Impact Statement (DEIS). Alternatives A, B, and C were analyzed in detail in this DEIS. Alternative A represents the current LRMP and is also referred to as the 1986 Plan. Alternative B is the alternative preferred by the Forest Service and is the foundation for the Proposed Plan available for review concurrently with this document. Alternative C is a variation of Alternative B developed to address an unresolved issue with equestrian use of the national forest.

This DEIS documents the analysis of all alternatives and displays the environmental effects at a programmatic level. The preferred alternative, outlined in the Proposed Plan, would guide all natural resource management activities on the Uwharrie NF for the next 15 years; would address new information and concerns raised since the 1986 Plan was published; and would meet objectives of federal laws, regulation, and policies.

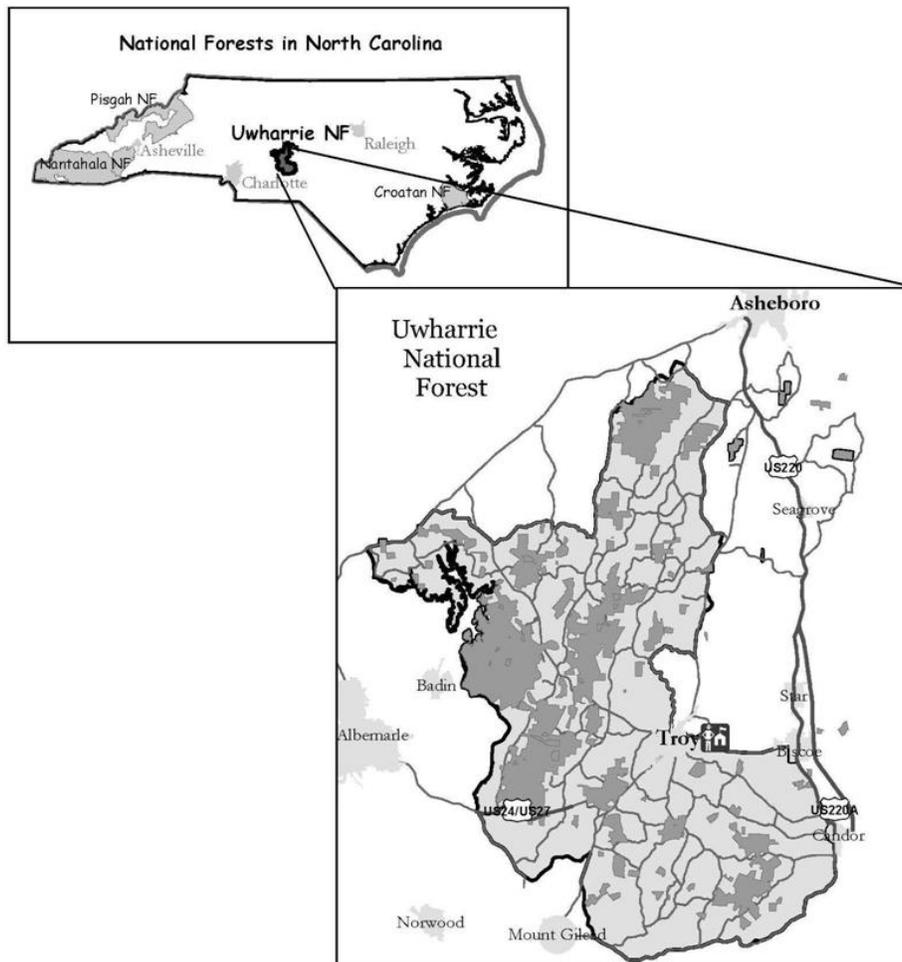


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SUMMARY

This Draft Environmental Impact Statement (DEIS), prepared by the USDA Forest Service, describes three alternatives for managing the land and resources of the Uwharrie National Forest (NF). It describes the affected environment, and discloses environmental effects of the alternatives considered.

Proposed Action

The USDA Forest Service proposes to revise the 1986 Land and Resource Management Plan (the 1986 Plan) for the Uwharrie National Forest. The Proposed Plan updates the goals and desired conditions, objectives, standards and guidelines, and monitoring requirements. In addition, the proposal includes designating or recommending for designation numerous new Special Interest Areas. New management direction is focused primarily around three themes: 1) Restoring the forest to a more natural ecological condition; 2) Better managing heritage resources; and, 3) Providing outstanding and environmentally friendly outdoor recreation opportunities with excellent trails and facilities.

Issues Addressed

Issues, concerns, and opportunities are described in Chapter 1 under the heading *Purpose and Need for Action*. The Proposed Plan was developed to address the issues, concerns, and opportunities identified during the collaborative planning process. Alternatives to the Proposed Plan were developed when unresolved conflicts remained concerning alternative uses of limited resources, or to address issues with significant environmental impacts.

The following concerns were expressed during a comment period that took place following publication of a Notice Of Intent to revise the plan in the spring of 2010. They were addressed either by clarifying or changing language in the Proposed Plan, modifying management area prescriptions in the Proposed Plan, or by developing an alternative to the Proposed Plan.

- (1) The need to clarify management near streams.
- (2) The need to clarify that the OHV trail system would be open to full-size OHVs.
- (3) The need to develop an alternative that continues current policy for equestrians.
- (4) The need to provide special management for potential exemplary longleaf pine stands.

Alternatives Considered

Three alternatives are considered and analyzed in detail:

- A. Alternative A is the 1986 Plan currently in effect.
- B. Alternative B is the Proposed Plan (preferred alternative).
- C. Alternative C is the same as the Proposed Plan except the goal/desired condition "Horseback riding occurs only on a designated system of roads, trails, and areas," is removed.

Effects Analysis

Botanical Resources

Alternatives B and C both emphasize restoring the forest to a more natural ecological condition as a primary theme. Through restoration of native ecosystems, native plant communities would be encouraged and restored across the Uwharrie NF. An emphasis on the creation of woodlands and open prairie conditions would benefit sun-loving plant species such as the federally endangered Schweinitz's sunflower. Compared to Alternative A, the greater amount of prescribed fire proposed with Alternatives B and C would provide additional benefits to fire dependent plant species and communities that may have decreased due to historic fire suppression.

Non-native Invasive Plant Species

Alternatives B and C both include objectives to eliminate non-native invasive plants on a minimum of 100 acres annually. Alternative A does not specifically address non-native invasive plants and would therefore result in a greater potential for new and existing infestations to adversely affect native plant communities.

Wildlife

The restoration of native longleaf pine and oak-hickory ecosystems that is proposed in Alternatives B and C would positively affect all native wildlife species on the Uwharrie NF. While Alternative A would create somewhat more early successional habitat than Alternatives B and C, it does not restore other wildlife habitats to the extent of Alternatives B and C. Alternatives B and C call for restoration of hard mast producing oak-hickory forests and longleaf pine woodlands associated with a number of sensitive and locally rare species on the national forest. Increased prescribed fire proposed in Alternatives B and C would help maintain these habitats.

Aquatic Wildlife

Alternative A, the 1986 Plan, incorporates measures to protect aquatic resources, including the recognition of riparian resources and the need to restore or enhance aquatic habitats (LRMP pages II-4 thru II-6, III-8 thru III-9). The Yadkin-Pee Dee Basinwide Assessment Report identifies the Badin Lake area as an area that has been compromised by sediment or chemical pollutants, and where biological indices reflect the loss of species or groups of species. It is likely the intense and growing recreation use, including the huge number of unimproved streams crossings on the many miles of trails in the area have contributed to the sediment issue. Without remediation, these declines in stream health would continue, potentially jeopardizing the sustainability of the healthy aquatic ecosystem in the Badin Lake area.

Alternatives B and C propose several measures to maintain, protect, and conserve aquatic resources. Maintenance of forested habitats and intact riparian areas would retain quality habitat for all aquatic species. Restoration of native forest communities, such as longleaf pine and oak woodlands would provide subtle habitat improvements for aquatic species, but the greatest effect would be from the maintenance of intact, functioning stream and riparian

systems. Restoration activities proposed in areas where existing uses or historic mining have degraded stream habitats (largely through sedimentation, but also loss of pool habitat and functioning riparian areas) would, over the life of the plan, improve habitat for crayfish species by returning stream conditions to a more stable, functioning condition.

In addition, Alternative B has a goal for equestrian use to occur only on a designated system of roads, trails, and areas. Designing and implementing a sustainable system could reduce sediment coming from the trails currently in use. This should improve aquatic habitat more than Alternatives A or C.

Forest Health

Due to the emphasis in Alternatives B and C on removing loblolly plantations and restoring longleaf pine and oak/hickory communities, long term results from these alternatives would be a forest that is less susceptible to insects and diseases compared to Alternative A.

Air Quality

Alternatives B and C call for more prescribed burning than Alternative A and they also place emphasis on growing season burning. Increased prescribed burning would result in more particulate matter entering the air, and more growing season burning could result in additional ozone formation. Therefore Alternatives B and C could have more impact on air quality than Alternative A. However any increase that occurs is not expected to be great enough to violate existing air quality standards.

Soils

Impacts from compaction, erosion, land use changes and changes to nutrient cycling would be greatest for Alternative A followed by Alternative C. Alternative B would have the least potential for impacts. Loss of productivity would occur from a greater amount of road construction in Alternative A than in Alternatives B and C, which also have the potential for gains in productivity from road obliteration. Alternative B and C have more prescribed burning than Alternative A, which could impact the organic layer and could require more fire line construction. However more prescribed burning could reduce the risk of lost productivity from catastrophic wildfire.

Water Resources

Alternative A calls for more timber harvest and related activity than Alternatives B or C and would therefore have more potential for impacting water resources from these activities. Alternatives B and C would have a greater potential to adversely impact hydrologic conditions on the watersheds from prescribed burning compared to Alternative A; however, the amount of impact is expected to be very minor. Severely burned areas would generally be small patches distributed throughout the burn area in areas where the fuels were the most concentrated, and basically mimicking natural fire effects. Alternative B proposes a goal to move towards designated systems of roads, trails and areas for equestrians and mountain bikers that would provide some management control over where these users camped. With equestrians and mountain bikers restricted to designated systems there would be fewer impacts from dispersed

Summary

primitive camping. With Alternative B all trail uses except for hiking would eventually be on designated systems that would strive for and work towards proper design, location, lay out, and construction techniques so the trail systems are sustainable and minimize their impacts to soil, water and aquatic resources.

Alternative A calls for approximately two miles of new road construction each year, whereas Alternative B and C do not call for road construction and state as a goal, “there is little evidence of new road construction.” Alternatives B and C also call for eliminating all unauthorized roads on the Uwharrie NF over the course of the planning period. Alternative A has no such stipulation. Therefore, with Alternatives B and C the impacts to water resources from roads, in particular unauthorized roads, should be reduced over time.

In summary, Alternative B would result long term in the least adverse impacts and most potential for improving water quality, followed by Alternative C, with Alternative A being the least favorable to water resources.

Climate Change

Climate change may result in an increase in frequency of intense storms, an increase in wildfire risks, and an increase in outbreaks of insects and diseases. By restoring native longleaf pine woodlands and oak-hickory forests where loblolly and shortleaf pine plantations currently exist, Alternatives B and C would result in a national forest less vulnerable to the effects of climate change than Alternative A. Alternative A, which perpetuates the current forest conditions, would provide an environment more susceptible to windthrow and insect and disease outbreaks. Also, Alternatives B and C establish a new streamside management area and new guidelines place restrictions on trail construction close to streams, thus lessening the potential for storm events to result in increased sedimentation from trails.

Roads

Alternative A anticipates approximately 2 miles of system road construction per year and does not call for obliteration of unauthorized roads. Alternatives B and C do not anticipate new system road construction and proposes obliteration of all unauthorized roads over the life of the plan. Therefore, Alternative A would provide more motorized access to the forest than Alternatives B and C. However, since the potential for road maintenance remains the same for all alternatives, Alternative A would likely result in more of a road maintenance backlog, and poorly maintained roads could have other impacts, including more potential for stream sedimentation .

Recreation

Alternatives B and C place much greater emphasis on recreation opportunities than does Alternative A and in particular on the trails across the national forest. The focus on managing a well-designed and sustainable network of trails should result in more positive recreation experiences over the long term. However equestrians who now roam freely would eventually

experience a loss of that opportunity with Alternative B. Mountain bikers would eventually lose the opportunity to roam freely with implementation of Alternatives B or C.

Scenery

Scenery objectives for Alternative A include acres managed for very high to very low scenic integrity. Alternatives B and C include acres managed for very high, high, and moderate categories of scenic integrity, but no acres managed for low or very low. Therefore there would be a higher overall scenic integrity outcome with Alternatives B or C than with Alternative A. Alternative A would have more impacts to scenery from timber harvest and road construction, but less from prescribed fire.

Wilderness

All alternatives would help restore, maintain or enhance wilderness attributes. Alternative B, which has a goal to restrict equestrian use to a designated trail system, could result in a reduction in potential impacts from horse use in the wilderness.

There are no stand-alone potential wilderness areas identified for the Uwharrie NF. However, four tracts totaling approximately 388 acres are potential additions to Birkhead Mountains Wilderness. Two of these tracts are recommended for Wilderness Study in Alternatives B and C.

River Corridors Eligible for Wild and Scenic River Status

Uwharrie River and Barnes Creek remain eligible for study for potential recreational classification. There is limited national forest ownership along these river corridors. Alternatives B and C recognize the eligible corridors as a separate management area, whereas Alternative A does not. Some restrictions on activities are associated with this management area.

Forest Products

Alternative A would provide more timber for the local markets than Alternatives B and C, although the volume provided in B and C is similar to what has actually been harvested in recent years. There currently exists a backlog of loblolly and shortleaf stands that need to be thinned, regenerated, or restored.

Cultural Resources

Cultural resources may be impacted by vegetation management including timber harvest, prescribed burning, and recreation uses. Identification of high-site density areas as Special Interest Areas would be protective of heritage resources.

Alternative A has the most potential for impact from timber harvest and recreation uses. Alternatives B and C have the most potential for impacts from prescribed fire. Alternative B would have the least potential for impacts from recreation due to the goal to have equestrian use restricted to a designated system.

In regard to Special Interest Areas, Alternative A identifies 39 acres of high site density areas for special management whereas Alternatives B and C identify 2,084 acres.

Summary

Local Communities

All alternatives would benefit the local communities by providing a national forest that attracts great numbers of tourists and that provides forest products. The emphasis changes somewhat by alternative with more focus on forest products in Alternative A and more emphasis on outdoor recreation (that would attract tourists) in Alternatives B and C.

Social and Economic Environment

The USDA Forest Service contribution to the local economy varies by alternative. Alternative A, if fully implemented, would provide a slightly higher contribution to the local economy than Alternatives B and C, primarily due to a higher volume of timber sales.

Programs and Plans of other Federal agencies, State and local governments and Indian Tribes

Alternative B and C, with their emphasis on longleaf pine restoration, would be more consistent with other agency and area plans than would Alternative A, since several of these also focus on longleaf pine restoration. In the area of outdoor recreation the Uwharrie NF complements other available recreation opportunities and offers off-highway vehicle routes not available elsewhere in the area.

Environmental Justice

There are no disproportionate environmental or health effects to minority or low-income populations anticipated from any alternative.

CHAPTER 1: PURPOSE AND NEED FOR THE PROPOSED ACTION

This chapter describes the decisions to be made, the general nature of national forest Land and Resource Management Plans (LRMPs or Forest Plans), and the purpose and need for change. It also describes the Proposed Plan that would take the place of the 1986 Plan.

STAGED DECISION MAKING AND PLAN CONTENT

Planning for units of the National Forest System (NFS) involves two levels of decisions. The first is the development of a Forest Plan that provides direction for resource management of the entire planning unit. Forest Plans set out forest-wide and management area direction with standards and guidelines for future decision making and are adjustable through amendment and revision. Forest Plan management area and forest-wide direction are the "zoning ordinances" under which future decisions are made. Forest Plan approval establishes multiple-use goals, desired conditions, and objectives for the planning unit. Plan level actions are approval (16 USC 1604(d) and (j)), amendment (16 USC 1604(f)(4)) and revision (16 USC 1604(f)(5)). Project decisions are not authorized, carried out, or funded by Forest Plan approval, amendments or revisions except as specifically authorized in the Record of Decision.

The second level of planning involves the analysis and implementation of management practices designed to achieve the goals, desired conditions, and objectives of the Forest Plan. Projects and activities are proposed, analyzed, and carried out within the framework of the Forest Plan and must be consistent with it. This second level involves project-specific analysis to meet NEPA requirements for decision making.

Forest Plan approval results in:

1. Establishment of desired conditions, forest multiple-use goals and objectives, (1982 rule provision 36 CFR 219.11(b));
2. Establishment of standards and guidelines applying to future activities, (1982 rule provisions 36 CFR 219.13 to 219.27);
3. Establishment of management areas and management area direction applying to future activities in that management area, including the suitability of lands for resource management, (16 USC 1606(g)(2)(A) and 1982 rule provision 36 CFR 219.11(c));
4. Designation of suitable timber land (16 USC 1604(k) and 1982 rule provision 36 CFR 219.14) and establishment of allowable timber sale quantity (16 USC 1611 and 1982 rule provision 36 CFR 219.16);
5. Wilderness recommendations where 1982 rule provision 36 CFR 219.17 applies; and other recommendations for special designation;
6. Establishment of monitoring and evaluation requirements, (1982 rule provision 36 CFR 219.11(d)).

PURPOSE AND NEED FOR ACTION (PLAN REVISION)

The National Forest Management Act (NFMA) requires that Forest Plans be revised every 10 to 15 years or when conditions on the planning unit have changed substantially. The original plan for the Uwharrie National Forest (Uwharrie NF) was issued in May of 1986, so it is well past the desired age for a Forest Plan. An analysis of the management situation (AMS) revealed social, economic, and ecological factors that have changed since the 1986 Plan was signed. These factors are the issues, concerns, and opportunities used in developing the Proposed Plan. In working together with partners interested in the future management of the national forest, three themes emerged:

1. The desire to restore the national forest to a more natural ecological condition;
2. The desire to better manage cultural resources; and,
3. The desire to provide outstanding and environmentally friendly outdoor recreation opportunities with excellent trails and facilities.

As it turns out, the three themes are closely associated with the most of the social, economic, and ecological change factors identified in the AMS. The change factors are briefly discussed below under the theme with which they are most closely associated.

THEME 1 - RESTORING THE FOREST TO A MORE NATURAL ECOLOGICAL CONDITION

Restoring Native Ecosystems

The 1986 Plan emphasized timber production and one result was loblolly planting. By refocusing the emphasis onto restoration of native ecosystems, vegetation management could include re-introduction of longleaf pine on appropriate sites, and oak-hickory forests on appropriate sites.

Woodlands and open, prairie like conditions also existed in the greater Uwharrie area in the past. These areas supported a variety of sun-loving species that are now rare in the current more closed-canopy conditions. The Endangered Schweinitz's sunflower is one such species. The 1986 Plan did not take this situation into account in setting goals and objectives.

Controlling Non-native Invasive Plants

The 1986 Plan did not emphasize controlling non-native invasive plant species. Setting objectives for addressing these pests would increase our options for sustaining native species and ecosystems.

Consistent Acorn Production

Little oak regeneration has occurred under the 1986 Plan. More active vegetation management may be needed to maintain a more consistent amount of oaks in the age range for prime acorn production capabilities.

Stream Restoration

Opportunities exist to improve stream channel stability and aquatic habitat. The 1986 Plan did not emphasize proactive restoration of streams and aquatic habitats.

THEME 2 - BETTER MANAGING CULTURAL RESOURCES

Protecting, Studying, and Interpreting History

Some of our nation's earliest archeological investigations were conducted in the Uwharrie area. Prehistoric stone tools, projectile point typology and cultural sequences that were identified have become the standards still used today. Artifacts made of Uwharrie volcanic rock have been found along the entire East Coast. The area is also prominent in North Carolina's early historic settlement and gold mining.

The Uwharrie NF's archeological and historical resources are extensive and opportunities for study and interpretation abound. The 1986 Plan did not emphasize these Cultural Resources to the extent appropriate to their importance.

THEME 3 - PROVIDING OUTSTANDING AND ENVIRONMENTALLY FRIENDLY OUTDOOR RECREATION OPPORTUNITIES WITH EXCELLENT TRAILS AND FACILITIES

Growing as a Tourist Destination

There may be tourism-related opportunities to provide more economic benefits to local communities. The 1986 Plan did not place great emphasis on developing a tourism-related infrastructure that would attract dollars to the extent that is possible today.

Trails and Day Use Popularity on the Rise

The Forest, with its lake and river frontage, rolling topography, and facilities, is currently providing a variety of outdoor recreation opportunities that are highly valued by the recreation users. The 1986 Plan did not provide much direction for managing recreation beyond the general application of the Recreation Opportunity Spectrum (defined in the glossary of this document). No direction was provided as to the desired quality of the recreation experiences. The revised plan could place more emphasis on the trails, facilities and day use areas, and recognize their importance to the local social networks.

While the 1986 plan has goals and objectives for the trail system, it predates the increased developments and amounts of use in the Badin area and is lacking in specific, focused attention to the trail system there. It also fails to recognize the importance of the Uwharrie National Scenic Trail.

Transportation System in Need of Improvement

There may be opportunities to improve the existing forest road and trail system, to enhance public access while minimizing visitor conflicts and resource damage. There is great potential for reducing

these resource impacts through innovative partnerships and trail design, as well as potential changes to management and maintenance.

Providing Visitor Information

While the 1986 plan does provide direction for visitor information in regard to trails and cultural resources, this direction is minimal and not a major focus of the management plan. More emphasis on visitor information could increase visitor enjoyment and be a useful tool in controlling visitor impacts.

CROSS-THEME FACTOR – Recognizing Special Places

The 1986 Plan recognizes seven Special Interest Areas that contain rare plant communities. Additional special places with rare plants, unique geologic and scenic features, and/or remarkable cultural resources exist on the national forest that may deserve special recognition.

THE COLLABORATIVE PLANNING PROCESS

In the summer of 2005, a publication summarizing the management situation and need for changing the 1986 Plan was sent to a broad mailing list. Local government officials were invited to meet prior to starting the collaborative public involvement process to develop plan components. A meeting also occurred between USDA Forest Service officials and representatives of the local Hmong community, and the Catawba Indian Nation was contacted.

The public collaborative planning process to develop plan components consisted of 10 subsequent meetings and two field trips during 2005 and 2006 with 40 to 100 participants per meeting. Other federal and state agency representatives, local officials, adjacent landowners, non-governmental organization and user group representatives, members of the academic community, and other interested individuals participated. At each meeting participants had the opportunity to learn something about the forest resources, give suggestions for plan components, review and refine work from the previous meeting.

An initial Proposed Plan was issued for comment in 2007. Shortly after this the federal regulations regarding forest planning were successfully challenged in court, which put the Uwharrie NF planning process on hold. New regulations came out in 2008 and the Proposed Plan was issued for comment a second time in early 2009. The 2008 planning regulations were also successfully challenged in court and the Uwharrie NF planning process was stopped a second time. In 2010, using the 1982 planning regulations, a Notice of Intent to revise the 1986 Plan was published, with the Proposed Plan published concurrently under the title *Preliminary Draft Land and Resource Management Plan*.

Very similar comments were received each time the Proposed Plan was issued, with the exception that Off-highway vehicle enthusiasts submitted many more comments in response to the 2010 NOI. Generally, comments have been very favorable. Those comments that reflect remaining concerns, such as those from the equestrian community (see below), were used by the planning team to modify or clarify language or plan components, or to develop an alternative to the Proposed Plan.

Significant Issues (those that could have significant environmental impacts)

No significant issues are identified beyond those that comprise the Purpose and Need and are incorporated into the Proposed Plan.

Unresolved conflicts concerning alternative uses of limited resources

Comments received in response to the Notice of Intent (NOI) to Revise the Land and Resource Management Plan (LRMP) and Prepare an Environmental Impact Statement (Federal Register March 11, 2010 pp. 11508-11511) indicated several areas of concern regarding potential LRMP direction. Some of these concerns were addressed through clarification of language in the draft EIS or Proposed Plan. One is addressed through development of an alternative to the Proposed Plan while one is addressed by creating an additional management area in the Proposed Plan.

Concerns addressed through clarification of language:

Management of the Streamside Forest: The width of streamside “buffers” was of concern. Plan direction for Streamside Forests has been checked for consistency and clarified.

Off-Highway Vehicle recreationists were concerned that “Full-size OHV’s” should not lose access to the OHV trail system. Plan language has been added to clarify that the OHV trail system is for full-size OHV’s as well as other OHV types, which represents no change.

Management of traditional wildlife openings is the subject of some debate. The Proposed Plan would change the focus from creating new openings to evaluating existing openings and relocating poorly sited ones. Creation of additional openings could occur if a need is determined, but is not required.

Treatment to eliminate non-native invasive plant species (NNIS plants) is also the subject of some debate when the plant in question is a popular food for wildlife. While the plan has a goal to keep NNIS plants at “low levels that do not interfere with native plant reproduction and distribution,” it does not specify species to be treated. Since targeted species could change over time, decisions regarding specific species to be treated are best left to future project decisions rather than being identified in the Proposed Plan. Therefore no change was made to Proposed Plan language.

A concern addressed through developing an alternative to the Proposed Action

The 1986 LRMP did not limit where horseback riding could occur. The Proposed Plan has as a goal restricting this use to a designated system of roads, trails, and areas. While there is some support within the community of equestrians for managing use and impacts, there is also strong opposition to requiring that they stay on a designated system. Part of the concern has to do with making sure the physical needs of the animals are met, part is a concern that special places currently accessible by horseback might not be in the future. Many equestrians take issue with the limitations of the current mapped trail system and do not want the existing system to be all that is “designated.” Most want to maintain the current freedom to explore.

The need to place limits on where equestrians can ride arises from several factors:

- Water quality impacts from horses breaking down stream banks and churning up debris;
- The very high concentration of historic, prehistoric, and archaic archeological sites on the Uwharrie NF that presents a high potential for horseback riders to unknowingly uncover and possibly damage artifacts;
- There is the potential for equestrians to unknowingly impact rare plants and plant communities including the Endangered Schweinitz's sunflower;
- Due to poor visibility from curvy roads and frequent dusty road conditions there is a potential for motor vehicle/horse accidents when riders are on open roads, sometimes several abreast.

The intent of the “designated system” goal in the Proposed Plan is that an Uwharrie NF-wide trails planning process would occur subsequent to the LRMP that would look at existing trails as well as potential new trails and areas. The intent is not to limit use to the current trail system.

To respond to this issue, an alternative will be considered that is that same as the Proposed Plan except equestrian use would remain as it is in the 1986 Plan with no restrictions on cross-country travel.

A concern addressed through creation of an additional management area

Special Interest Areas (SIA) are areas with unique or rare botanical, zoological, geological, historical, scenic and/or recreational values. Several exemplary areas of rare Piedmont Longleaf Pine plant community are identified as Special Interest Areas in the Proposed Plan. Additional areas were identified by planning process participants as potential additional Piedmont Longleaf Pine examples that could be included as Special Interest Areas. These areas were considered and excluded from SIA status during the collaborative planning process; however they remain important to some participants.

To respond to this issue the Proposed Plan includes a Longleaf Pine Restoration management area where emphasis would be to restore potential and maintain existing examples of this plant community. Plan guidelines would include direction that activities in these areas would not cause loss of desired characteristics as described for this plant community.

CHAPTER 2: ALTERNATIVES, INCLUDING PROPOSED ACTION

ALTERNATIVES CONSIDERED IN DETAIL

ALTERNATIVE A – CONTINUATION OF THE 1986 PLAN

In 1986 the *Land and Resource Management Plan 1986-2000* for the Croatan and Uwharrie National Forest was published. A revised Croatan NF Land and Resource Management Plan (LRMP) was signed in December of 2002, effectively negating that portion of the 1986 Plan that pertained to the Croatan NF. The 1986 Plan is available electronically and may be viewed or downloaded from the National Forests in North Carolina website.

Forest Goals and the Desired Condition of the Forests from the 1986 Plan (p. III-1):

Goals:

- Provide a forest environment for the public to enjoy;
- Provide goods and services that satisfy short-term public demands while improving program efficiency and long-term healthy condition of the forest environment;
- Provide the quality of habitat for wildlife and fish that is unique to Federal lands;

Desired Future Conditions:

- The attributes of all existing special interest areas including Wilderness, research natural areas, and areas registered by the North Carolina Natural Heritage Program will be maintained;
- A high level of visual quality and a wide variety of recreational opportunities will be provided;
- Plant and animal diversity will be maintained, viable populations of all native plants and animals will be maintained or increased, and suitable habitat for animals depending on old growth forests will be increased;
- Threatened, endangered, and sensitive plant and animal species will be protected and population recovery goals reached to the extent practicable;
- Special habitats, including savannas and longleaf pine/scrub oak communities, will retain their distinct characteristics;
- Water quality and soil productivity will be maintained; Riparian areas, floodplains, wetlands, and existing ecosystems will be perpetuated;
- A continuous supply of wood products will be provided;
- Cultural resource sites will be protected, significant sites nominated to the National Register of Historic Places, and public interpretation will be provided for appropriate sites; and
- The amount of National Forest System land will be increased through purchase, donation, and exchange of key tracts.

The 1986 Plan identified 10 Management Areas:

- MA1 – Commercial timber and car-touring areas;
- MA2 – (Croatan NF wildlife emphasis) Not applicable;
- MA3 – Commercial timber and hiking;
- MA4 – Old timber and hiking. Trees harvested for wood and wildlife habitat;
- MA5 – (Croatan pocosin management) Not applicable;
- MA6 – Administrative sites and areas under special use permits (not identified on the map);
- MA7 – Developed recreation sites (not identified on the map);
- MA8 – Congressionally designated Wilderness;
- MA9 – (A waterfowl impoundment on the Croatan) Not applicable;
- MA10 – (Three lakes on the Croatan) Not applicable.

A map displaying the locations of the management areas for the 1986 Plan (Alternative A) is included as an attachment to this document.

Numerous objectives, standards and guidelines are associated with the Goals, Desired Future Conditions, and Management Area direction and can viewed in the 1986 Plan online.

ALTERNATIVE B – PROPOSED PLAN [PREFERRED ALTERNATIVE]

This alternative was developed through a collaborative process during 2005 and 2006, and modified based on public comments received in 2010.

A Preliminary Draft Revised Land and Resource Management Plan was made available on the National Forests in North Carolina website during the time the Notice of Intent was out for comment in early 2010. This preliminary draft was essentially the same as the Proposed Plan that had been issued twice before, slightly modified to conform to different planning regulations. Some additional changes were made based on comments received in response to the 2010 Notice of Intent, but the overarching themes and most of the specific language from the original proposed plan remains intact.

FOREST GOALS AND DESIRED CONDITIONS OF THE FOREST FROM THE PROPOSED PLAN

Vegetation-Related Goals/Desired Conditions

1. Woodlands and open forests with small canopy gaps, interspersed with glades and Piedmont prairies, occupy portions of the forest where they occurred historically. These forests contain mixed ages with old trees and old forest conditions, as well as canopy openings that provide habitat for federally listed, sensitive and locally rare species.
2. Plant communities that were more common in the past occur on appropriate sites across the forest. Examples include longleaf pine woodlands, shortleaf pine woodlands, and oak-hickory forests.
3. Non-native invasive species are at low levels that do not interfere with native plant reproduction and distribution. New outbreaks are not spreading. Equestrians understand the need to use weed-free hay and straw.

4. Schweinitz's sunflowers (federally listed as Endangered since 1991) that historically occurred across the Piedmont of North and South Carolina are restored on appropriate sites across the forest (longleaf pine woodlands, dry-oak hickory forests, mafic hardpan woodlands, and xeric forests). Other rare plant species are sustaining or increasing in number of occurrences or the extent of the occurrences.
5. Biological diversity is evident across the forest, and is further enhanced by a system of botanical special interest areas. All plant communities found on the Uwharrie are represented in this system, including rare plant communities and the species they support. These botanical special interest areas are intact and fully functioning; without evidence of unnatural erosion or non-native invasive species, and with intact hydrologic systems.
6. Regenerating hardwoods are evident following disturbances in tree canopies (canopy gaps) in multi-age deciduous forests and mixed pine-hardwood forests.
7. Forests are in a healthy condition. Most trees are in good health, well-formed, and with little evidence of widespread insect and/or disease damage. A healthy forest includes some dead and dying trees and hollow den trees used by wildlife. A healthy forest also contains various size patches of disturbance that provide habitat components desired by a variety of wildlife, and space and light for young trees ("regeneration").
8. The composition, structure and processes of ecological systems are improving. [The desired composition, structure and process for each system are described in detail in the Proposed Plan]

Fire as a Process and Tool

1. There is increasing evidence of prescribed fire used to restore the structure, composition, and ecosystem processes in ecological systems. Forest ecosystems are well-adapted to fire occurrence.
2. The composition, structure and density of vegetation reduces potential fire behavior, including the rate of spread, flame length, spotting potential, and the likelihood of a surface fire transitioning to crown fire.
3. There is defensible space around communities and the risk of catastrophic wildfire is low.
4. Lightning caused fires are allowed to play their natural ecological role as long as they do not pose unmitigated threats to life and property.
5. The fire return interval mentioned in the descriptions of ecological systems is an approximation of how frequently fire might have burned through the system in the past before the mid - 20th century emphasis on fire suppression. Prescribed fire and wildfire typically would burn in a mosaic pattern and would be generally low intensity. Flame heights of 1-2 feet in oak-hickory forests would be sufficient to kill seedlings and saplings of thin-barked species such as red maple, sweetgum, and tulip poplar which would otherwise compete with the more fire resistant oaks and hickories. Similarly, flame heights of 2-5 feet in longleaf pine and shortleaf pine forests would favor these more fire resistant pines while reducing midcanopy shrubs and hardwoods and providing more favorable conditions for

sun-loving grasses and herbs. [The desired fire return interval is detailed in the Proposed Plan]

Wildlife-Related Goals/Desired Conditions

1. Habitat is present for the diversity of native animal species typical of the Piedmont ecoregion - vertebrates, invertebrates, game and non-game, and including reptiles and amphibians.
2. Wildlife fields and openings in the forest are predominantly filled with native and desired noninvasive non-native grasses, herbs, and shrubs of species that native wildlife use for food. Fields and openings are dispersed across the forest and do not occur within 150 yards of developed recreation areas.
3. Some non-native, non-invasive plants such as grains are growing in a small portion of wildlife openings in order to provide the wildlife viewing and hunting opportunity experience desired by forest visitors.
4. Den trees, snags, and downed wood are evident in most stands, supporting diverse populations of wildlife that use these habitat components. However, the amount of dead wood is limited near private land developments to reduce the potential of a high severity wildland fire in the wildland urban interface.
5. Suitable habitat for red-cockaded woodpecker (federally listed as Endangered) occurs on mature longleaf pine or pine woodland sites.
6. An abundance of hard and soft mast is available across the national forest. Mature oaks and hickories are abundant and well distributed on appropriate sites across the Uwharrie NF, producing abundant crops of acorns and hickory nuts in most years. Regenerating hardwoods (such as oaks and hickories) are evident in tree canopy gaps in multi-age forests to provide for a continuous supply of hard mast. Native fruit producing shrubs and trees are evident in many areas.
7. Ephemeral pools, ponds, swamps, seeps, bogs, and other wetlands are frequent throughout the national forest and visited by many wild animals. Conditions are secure for animals such as amphibians that use these habitats for reproducing.
8. Breeding, wintering and migration, staging and stopover habitat for migratory birds is provided in ways that contribute to their long term conservation.

Soil, Water and Fisheries-Related Desired Conditions

1. Aquatic ecosystems are diverse, with properly functioning streams providing high quality habitat for all native aquatic species, including non-game species.
2. Fish are plentiful in streams and lakes. Water is clean and clear of trash and pollutants, and there is in-stream habitat for fish to hide, spawn, and find food.
3. Road crossings allow for passage of fish and other aquatic animals up and down stream corridors except when there is a need to prevent non-native invasive species from moving upstream.

4. Non-native aquatic species do not threaten national forest lakes, rivers, or streams.
5. Native fresh water mussel communities are diverse and represented by multiple age-classes, with signs of reproduction evident. Appropriate habitats support sustainable populations of native freshwater mussels, including those that are federally-listed, regionally-sensitive, or locally rare. Non-native mussel species are not negatively impacting native species.
6. Streambanks are dominated by native riparian vegetation, including trees capable of adding large woody debris for hydrologic stability and instream habitat. Aquatic habitat is diverse and free of unnatural sediments. Pool habitats are frequent and provide cover for many species of fish. Vegetated streamside areas are effective in providing shading to the streams and filtering sediments produced by all land management activities.
7. Stream channels are connected to their floodplains so that high streamflow events can be processed through the ecosystem without creating gullies or eroding stream banks. Man-made dikes and deposition are absent, allowing the stream to flood out of its banks and onto the floodplain in a natural way.
8. Stream channels degraded by historic mining are exhibiting improved biological and hydrological conditions.
9. Bogs and seeps are maintaining or increasing their size through natural hydrologic processes and fire regimes.
10. Soil productivity is sustained through nitrogen and carbon fixation, mineral release from parent material, decaying organic matter, and translocation of nutrients. Erosion and compaction are infrequent occurrences.

Cultural Resource-Related Goals/Desired Conditions

1. Cultural resources are protected from loss. Significant sites are stabilized, treated, managed and preserved for their historical research value.
2. All known heritage resource sites are evaluated for significance.
3. Visitors to the Uwharrie NF have opportunities to learn about the past, and how to protect cultural resources, through interpretive programs and information.
4. Archeological sites are available for scientific research.
5. A Heritage Program Plan for the Uwharrie NF is complete.

Outdoor Recreation - Related Goals/Desired Conditions

1. Outstanding recreation opportunities draw visitors to the Uwharrie NF, provide opportunities for visitors to experience natural forest settings while enjoying physical activities with family and friends, and provide economic benefits to the local communities. Conflicts among users are rare.
2. Expanded recreation opportunities are provided outside the Badin Lake area.

- The following approximate amount of acres are maintained in each of the following Recreation Opportunity Spectrum (ROS) classes, as shown on the Recreation and Scenery Settings Map:

Table 2-1. Recreation Opportunity Spectrum classes on the Uwharrie NF

ROS Class*	Description	Acres
SPNM	Semi-primitive Non-motorized/ Very high scenic integrity	5,160
RN2S	Roaded natural/ Less accessible by open roads/ High scenic integrity	11,144
RN2	Roaded natural/ Less accessible by open roads/ Moderate scenic integrity	20,660
RN1S	Roaded natural/ More accessible by open roads/ High scenic integrity	7,280
RN1	Roaded natural/ More accessible by open roads/ Moderate scenic integrity	6,570

*See the Glossary for a more complete definition of each ROS class.

- For the Badin Lake Recreation Area: the recreation sites are well maintained; the information and fee boards are up-to-date and provide appropriate information to the public; user conflicts on trails, roads, and within the recreation area are minimized; recreation impacts to the natural resources and cultural resources are reduced through improved conservation education programs, signage, and interaction of Forest Service employees with the users of the national forest.

Trail-Related Goals/Desired Conditions

- Exceptional trails are available for hikers, horseback riders, off-roaders, mountain bikers, hunters, and anglers. The trails are designed, constructed, and maintained so that a variety of levels of challenge is available and other forest resources such as soil and water are protected.
- The trail system has trails of varied lengths, including loop trails and trails with multiple access points, and may connect with trails on other ownerships. Trail users are well-informed about the trails and about ways to minimize their impacts on the environment during their visits. Many trails have vistas – points along the trails that allow for long-range views.
- Trails are safe and safe vehicle parking is nearby. Trails and trailheads are well marked and easy to find; trails that cross roads are well marked for safety at all intersections. There are few hazard trees. For added safety, horse use and OHV use occur on separate trails.
- Recreation use is dispersed across the Uwharrie NF and there is good trail access for visitors to both northern and southern portions of the national forest.
- The 50-mile Uwharrie National Recreation Trail is complete and marked for hikers. That portion on National Forest System lands has high scenic integrity.
- Mountain biking occurs only on roads and designated trails and areas in several parts of the Forest. Mountain biking does not occur on roads signed as closed to bikes.

7. Horseback riding occurs only on a designated system of trails, roads, and areas. Riders are informed about how to ride safely in traffic. Horse trails are well designed and maintained to provide varied user experiences (easy to more difficult) while minimizing resource damage. Trails do not usually coincide with roads and crossings occur at designated locations. While trails avoid wet areas, access is available to horse watering areas. While on the horse trails, visitors seldom see evidence of litter, concentrated manure, or erosion and sediment transport into streams.
8. OHV use occurs only on a designated system. An OHV trail system exists that is well designed and maintained to provide varied user experiences (easy to more difficult) while minimizing resource damage. Trails are available for full-size OHVs (greater than 50 inches in width) as well as other types of off-highway vehicles. Designated OHV routes are clearly defined on maps and on the ground, and off-highway vehicles are operating only on designated routes during the established open season. Little sediment can be seen entering streams from the OHV system, and trails are free of litter.
9. Well-trained partners and volunteer groups are working to maintain or improve the trail systems.

Facility-Related Goals/Desired Conditions

1. Developed recreation areas such as campgrounds, restrooms, showers, and a shooting range are clean, safe, and in good repair. Campgrounds are available, convenient, and appropriately designed for a variety of Forest visitors.
2. Parking areas and trailheads exist for users at convenient locations and are well-designed for their intended use, including parking for vehicles towing trailers to the OHV area and horse trails. Forest users are parking in a safe manner along roads: not blocking roads, and not impacting adjacent landowners.
3. Trash receptacles are located at high-use areas. Forest visitors are informed to pack out their own trash and as a result generally leave the forest cleaner than they found it.
4. Facilities in flood prone areas will have designated boundaries and signage to alert the public to potential danger during high storm events.

Water-Based-Recreation-Related Goals/Desired Conditions

1. Access to the water is available for water-oriented activities such as canoeing, kayaking, power boating, fishing, waterfowl hunting, and horse watering. These access points are located in areas that do not degrade the aquatic resources and provide safe, reliable access for users of all abilities where practical.
2. A water-based trail provides recreationists with floating opportunities on the Uwharrie River and may connect with trails on other ownerships.
3. Fish habitats are healthy and sustainable, promoting a positive angling experience.
4. The outstandingly remarkable scenic, historic, and cultural values of the Uwharrie River and the outstandingly remarkable fish and wildlife values of Barnes Creek are evident on those portions that traverse the Uwharrie National Forest.

Cross-Theme Goals/Desired Conditions

Wilderness-Related Goals/Desired Conditions

1. The wilderness provides a primitive recreation opportunity, exhibits little evidence of modern human disturbance, and is remote from the sights and sounds of 21st-century civilization such as traffic from roads. Natural processes such as succession, decomposition and natural regeneration, and disturbance factors such as fire, wind, and water shape vegetation. Large areas of uninterrupted habitat provide a safe haven for animals. Wilderness streams can be used as a reference for comparing water quality to other parts of the forest.
2. Visitors to the area include nature enthusiasts, hikers, hunters, and researchers. No facilities are present other than directional signs. Motorized or mechanical vehicles, equipment, or devices are absent. Information signs are not seen within the wilderness boundary.
3. Lightning caused fires are allowed to play their natural ecological role as long as they occur within prescribed parameters and do not pose unmitigated threats to life/and or private property, particularly in the wildland urban interface. Prescribed fire helps replace the natural fires interrupted by human activity outside the wilderness boundaries.

Scenery-Related Goals/Desired Conditions

1. Scenery is natural appearing and generally consists of older, multi-storied, closed-canopy forests, or park like or semi-open forests, except in young regeneration areas, woodlands, prairie-like openings, glades, and wildlife openings.
2. Viewpoints along roads and trails reveal mid- and long-distance views of attractive environments.
3. The Uwharrie National Forest is free of litter and refuse.
4. Integrity categories (refer to the Recreation and Scenery Settings map):

Table 2-2. Scenic Integrity Categories

Scenic Integrity category*	Acres
Very High	5,160
High	18,424
Moderate	27,230

*See Glossary for definitions of Scenic Integrity levels

[The very high scenic integrity acres are the Birkhead Mountains Wilderness. The high scenic integrity acres include, among other areas, all the Special Interest Areas (see Chapter 4), and the Uwharrie National Recreation Trail corridor.]

Visitor Information-Related Goals/Desired Conditions

1. Visitors have access to accurate maps and detailed information so they can have a safe, positive experience in the forest. Information on trails includes distances, difficulty, and trailhead locations.

2. Up-to-date information such as in brochures or visitor guides is widely distributed and available at other area attractions such as the zoo, and at area visitor/welcome centers.
3. Visitors have access to natural and cultural history information, including interpretive exhibits. Information on both aquatic, terrestrial, heritage, and wilderness resources is available.
4. Visitors are informed about ways to lessen their impact on the environment, including the importance of staying on trails; minimizing impacts to soil, water, vegetation and wildlife; not littering in the forest or leaving trash at campsites, parking areas, or the rifle range.

Road-Related Goals/Desired Conditions

1. Roads open to public vehicles are safe for forest visitors in non-4-wheel-drive vehicles and for emergency vehicles: there are no gullies, washouts, or slides; there are adequate turnouts or passing areas and adequate sight distances; the road surface is relatively smooth. Some heavily traveled Forest roads are paved. Some roads may be open seasonally to provide recreation opportunities.
2. Many existing roads are not open to public motorized vehicles, to reduce human disturbance to wildlife and reduce maintenance costs. Roads **not** open to public motor vehicles are available for use by hikers. Mountain bikers and horseback riders use these only if they are a part of the relevant designated system. The road surface is free of gullies and is generally covered with native materials or native grasses and forbs. The road edges are intact and not broken by excessive traffic of forest visitors. During rain events, water is able to seep into the soil gradually without causing erosion.
3. There is little evidence of new road construction. Unauthorized roads are nonexistent.
4. A negligible amount of sediment from roads is reaching streams.

Lands Goals/Desired Conditions

1. Uwharrie National Forest land base is sufficient to protect wilderness values; provide habitat, refuges and corridors for native wildlife; provide special areas to improve ecological integrity; provide views and vistas; and provide a variety of outdoor recreation opportunities.
2. The land base is adequate to accommodate completion of the Uwharrie National Recreation Trail.
3. The land base is adjusted to provide adequate access for water-based recreation, including access to the Uwharrie River.
4. The land base is mostly contiguous to allow for better resource management; however isolated tracts with special resource values are also a part of the land base.

Special Uses Goals/Desired Conditions

1. Permanent structures associated with special uses are centrally located or concentrated on existing sites or designated corridors, minimizing the number of acres encumbered by special use authorizations.

Minerals and Energy Goal/Desired Condition

1. Minerals and energy developments meet legal mandates to facilitate production of mineral and energy resources on the national forest in a manner that minimizes adverse impacts to surface and groundwater resources, and that do not detract from meeting other desired conditions applicable to the area.

Human Health and Safety

1. Management activities, facilities, roads and trails are designed and managed in such a way that human health and safety is a primary consideration.

The Proposed Plan identifies the following Management Areas:

General Forest: the largest part of the Uwharrie, “general forest” contains common forest types in typical conditions and is generally suitable for typical multiple-uses.

Longleaf Pine Restoration Area: Most of the southeastern part of the forest. Within this management area management actions would retain, restore, or enhance the longleaf pine community when the following conditions are encountered:

- Presence of existing remnant longleaf
- Presence of Piedmont longleaf associated forbs and grasses such as little bluestem and indiagrass
- Dry ridge or south facing slope

Special Interest: Areas with unique or rare botanical, zoological, geological, historical, scenic and/or recreational values.

Wilderness: An area of land designated by Congress as part of the National Wilderness Preservation System. Birkhead Mountain Wilderness within the boundaries of the Uwharrie National Forest was established in 1984.

Potential Wilderness Additions: Four small and/ or recently acquired tracts adjacent to Birkhead Mountains Wilderness. Existing wilderness character would be maintained or enhanced.

Streamside Forest: For the Uwharrie NF, a 100-foot zone on both sides of all perennial streams, and all alluvial forest (an area of alluvial deposition such as a flood plain or delta).

Developed Recreation Sites: Outdoor recreation areas requiring significant capital investment in facilities to handle a concentration of visitors on a relatively small area. Examples are campgrounds and picnic areas.

Eligible Wild and Scenic River Corridors: A zone one-quarter mile on either side of those portions of the Uwharrie River and Barnes Creek that are contained within the boundaries of the Uwharrie National Forest are managed to protect the “Outstandingly Remarkable Values” for which they were determined eligible for Wild and Scenic River designation (such designation – conferred by Congress – has not occurred).

Schweinitz's Sunflower Habitat Management Areas: Portions of the Uwharrie NF classified as having the ecological attributes that make it most conducive to restoring Schweinitz's sunflower.

The Badin Lake Recreation Area: This refers to the area on the Uwharrie National Forest that is adjacent to the east side of the Narrows Reservoir and Badin Lake, west of NC Highway 109 North, south of SR 1156 (Blaine Road) and north of the confluence of the Uwharrie River and the Yadkin-Pee Dee River. This area is special to the Piedmont Region of North Carolina for the recreational opportunities it offers to the people of North Carolina the nation.

A map displaying the locations of the land classifications for the Proposed Plan is included in the Graphics Supplement.

Numerous objectives, standards and guidelines are associated with the goals/desired conditions. See the Proposed Plan for details.

ALTERNATIVE C

Alternative C is the same as Alternative B except for the following changes:

Replace Trail-Related Goal/Desired Condition #7 in Alternative B with the following:

1. Horse trails are well designed and maintained to provide varied user experiences (easy to more difficult) while minimizing resource damage. Trails do not coincide with roads and trails will cross roads at designated locations. While trails avoid wet areas, access is available to horse watering areas. While on the horse trails, visitors seldom see evidence of litter or erosion and sediment transport into streams. Riders are informed about how to ride safely in traffic.

ALTERNATIVES CONSIDERED NOT ANALYZED IN DETAIL

A broad range of alternative plan contents were considered in the process of developing a Proposed Plan. Many of those alternatives that were considered were then eliminated from detailed study. The following describes those alternatives that were eliminated from detailed study, and the reasons for their elimination.

An Alternative that Maximizes Timber Production

Under this alternative, the maximum amount of acres suitable for timber production would be available for timber harvest scheduling, while still meeting minimum management requirements for the other resources. An analysis determined that under such a scenario, a first decade harvest level of 18,642 thousand cubic feet (MCF) could be produced, with a long-term sustained yield of 29,366 MCF.

It was determined that this alternative should not be considered in any further detail because it would not meet the purpose and need to revise or the concerns raised by the public and partners: restore longleaf pine and oak-hickory ecosystems; provide better management for cultural

resources, or; provide better outdoor recreation management with improved trail systems. It would also not provide for additional Special Interest Areas to highlight and protect the unique features of the Uwharrie NF.

An Alternative with only the Minimum Level of Management

Under this alternative, only the minimum level of management needed to maintain and protect the unit as a part of the National Forest System would be accomplished. No acres would be classified as suitable for timber production, no trees would be harvested, and no timber would be produced. The only management of the recreation facilities, roads and trails would be that needed to prevent any resource damage, or that needed to address the safety of forest visitors.

It was determined that this alternative should not be considered in any further detail because it would not meet the purpose and need to revise or the concerns raised by the public and partners: restore longleaf pine and oak-hickory ecosystems; provide better management for cultural resources, or; provide better outdoor recreation management with improved trail systems. It would also not meet the legal requirements of the Multiple Use Sustained Yield Act and National Forest Management Act to provide for multiple uses and benefits of the national forests.

Developing the Proposed Action and Alternatives to the Proposed Action

The process of developing the proposed action, and alternatives to the proposed action, focused first on defining common ground among the interested parties and narrowing the initially broad possibilities for plan content to those elements generally agreeable to most participants in the planning process. The concept was to broadly formulate potential alternative plan components, but fully analyze only those alternatives that combined generally agreed upon plan components with elements where no general agreement was possible.

A broad array of possible goals and objectives, standards and guidelines, and monitoring items were considered through the collaborative process, filtered and modified by participants in successive meetings, until a reasonable set of generally agreed upon plan components was achieved. General agreement was established for the overall planning themes: restoring native ecosystems, better management of cultural resources, and the importance of outdoor recreation, specifically well-managed trails and facilities.

The appropriateness of the goal to require equestrians to use only designated trails was one element where clearly no general agreement was possible. This element became the driver for an alternative that would be fully analyzed and considered.

In the development of the Proposed Action, alternative points of view were expressed and considered for a number of resource topics; among them were the suitability of areas for timber production, choosing areas to be included in the Special Interest Areas category, and the appropriate size for openings in oak-hickory forests. These topics were not carried forward as alternatives to be considered in detail but were addressed in other ways, for example: providing additional information, modifying proposed plan language, or adding management prescriptions.

Keeping the Restoration “Theme” but keeping all the lands as “not suitable for timber production”

Some collaboration participants did not view the national forests as appropriate for timber production, while others did. Since timber is a legally recognized use of the national forest and national direction provides a methodology for determining suitability (CFR 219.14), an alternative keeping the restoration theme but identifying the entire Uwharrie NF as “not suitable for timber production” was considered but not carried forward for full analysis. While this alternative would have content similar to the Proposed Action (Alternative B), it would not provide a cost-efficient means to accomplish the restoration objectives (see 36 CFR 219.12(f)(8)). The use of timber management activities provides a cost-efficient mechanism to meet multiple needs and uses. Harvesting of the timber currently on-site is needed to accomplish the restoration objectives, and selling the timber that is harvested can then help off-set the costs of the restoration management needs. In addition, timber management funds can be used to help meet the restoration objectives and without that source of funding fewer acres can be treated.

An alternative where all longleaf pine communities are not suitable for timber production

A closely related idea put forth was whether or not to consider longleaf pine restoration areas as “suitable.” As was identified above in the previous paragraph, the use of timber management activities provides a cost-efficient means to accomplish restoration management objectives, and timber management can be used as a source of funding to help pay for the restoration needs. Under this proposal, any restoration activities would likely proceed at a much slower pace than desired. Restoration would likely proceed at a much slower pace than desired if the areas are classified as not suitable for timber production. Therefore while considered, a separate alternative was not fully analyzed. Instead the concept of a “longleaf pine restoration management area” was incorporated into management prescriptions for Alternatives B and C. This management area, while still suitable for timber production, would specify that timber management would support longleaf pine community restoration on appropriate sites.

An alternative that maximizes Special Interest Areas and incorporates Archeological Zones

The Special Interest Areas (SIAs) concept was popular with planning process participants as everyone seemed to have a favorite spot to nominate for consideration. With only about 51,000 acres, the Uwharrie NF is still the largest area land open to the public in the North Carolina Piedmont. Seen as a limited resource in its entirety, areas of the national forest with rare or unique biological, physical, or cultural attributes are recognized by planning participants as needing appropriate management to retain their special qualities. However different people have varying ideas about what is rare or unique. For example, do areas that “could be or could become” rare or unique warrant SIA status? At what scale does the rare

or unique attribute apply? Should every instance of a regionally rare plant community be regarded as special if there are many concentrated in an area, or only those with the most reference-like conditions? How many areas with special status are “enough?” On a landscape such as the Uwharrie NF that proliferates with cultural resource sites, should large areas with potentially high archeological site densities be delineated and multiple uses restricted a priori?

The selection process for what could be identified for Special Interest Area management included three broad categories of proposals:

1. Proposed botanical SIAs – 48 areas were nominated that, if designated, would be registered with the state Natural Heritage database. These went through an initial filter to determine which actually contained high quality ecological communities and/or rare species. Areas that came through this filter were presented to the collaborative planning process participants.
2. Proposed cultural resource areas likely to contain high densities of archeological sites.
3. Miscellaneous proposed special areas nominated by collaborative planning process participants. This included unique geological and recreation resources, as well as sites that overlapped the previous two categories.

Additional information and comments from the participants in the collaborative planning process indicated that the potential SIAs, especially the proposed archeological zones, were too extensive and would likely constrain multiple use management unnecessarily. As a result, a second screening process determined the essential core areas that became the 34 SIAs proposed in Alternatives B and C. This screening process looked for overlaps of the three categories of proposals, which were common, and added other well-known or at least verified and often named sites that most participants would agree are rare or unique on the national forest.

Respecting the place-based knowledge of many of the collaborative planning process participants, Alternatives B and C incorporate the 34 generally agreed upon SIAs. The remaining 14 proposed botanical SIAs were not considered further because they were not considered to have existing, known unique or rare features but instead contained communities in need of restoration or in some cases high quality examples of well-represented communities. In the case of proposed archeological zones, areas without known concentrations of potentially significant sites were not included in the SIAs unless they overlapped with other SIA categories.

Oak-Hickory Regeneration Openings

The appropriate size for oak-hickory regeneration openings was debated throughout the planning process. Participants offered ideas ranging from a maximum of one-quarter acres to just stating an undefined desire for “small openings.” The final plan direction for desired

opening size (1/2 – 2 acres in size) was based on information concerning the minimum size demonstrated for effective regeneration in the scientific literature. Larger sizes of openings were not considered further because, although practical from an operational point of view, larger openings were not desired by the planning participants and were not deemed necessary for successful regeneration in this community.

A Badin Lake Recreation Area Visitor Center

One idea that did not move forward was to state in the plan a desire to have a staffed visitor center near the entrance to the Badin Lake Recreation Area. This was not considered further because information indicated the likelihood of receiving the budget to implement such an action was highly unlikely. Should such funds become available in the future, an amendment to the plan (if necessary) could be conducted.

Wildlife Openings

Management of traditional wildlife openings was the subject of some debate. Alternatives B and C would change the management focus from creating new openings to evaluating existing openings and relocating poorly sited ones. The creation of additional openings is included in Alternative A (the 1986 Plan). If it is determined that sometime in the future additional wildlife openings are needed, management prescriptions would not be prohibited by any alternative.

Treating Non-Native Invasive Plant Species

Treatments to eliminate non-native invasive plant species (NNIS plants) was the subject of some debate when the plants in question are popular food for wildlife. Alternatives B and C have a goal to keep NNIS plants at “low levels that do not interfere with native plant reproduction and distribution”. However, the alternatives do not specify which species to be treated. Specifying specific plants to be treated was not considered further since information indicates specific species to be treated at any given site could change over time and therefore species-specific decisions are best left to future project planning.

Increasing the Rate of Restoration Activities

An alternative that would include objectives to meet the desired restored conditions at a faster rate than that considered in Alternatives B and C was not considered in more detail because information indicates it is not anticipated that funding and personnel would be available at any time during the planning period to do so. Effects analysis of such an alternative would be misleading since implementation could not occur as planned.

Developing a Separate Alternative Responsive to the RPA (Resources Planning Act) Program

The planning regulations at 36 CFR 219.12(f)(6) (1982) requires that at least one alternative will need to be developed “which responds to and incorporates the RPA Program tentative resource objectives for each forest displayed in the regional guide”.

The last RPA Program was developed in 1995. The requirement for a “RPA Program” was replaced in the Government Performance and Results Act of 1993 (GPRA) with a requirement for the Agency to develop a Strategic Plan. Currently, the Forest Service Strategic Plan (2007 Version) provides broad overarching national guidance for forest planning and national objectives for the Agency. All of the alternatives considered in detail in this EIS incorporate these broad strategic objectives.

COMPARISON OF THE ALTERNATIVES

The types of management areas, approach to various issues, concerns, and opportunities, and levels of output of various goods and services that would result from the alternatives are displayed in the tables that follow. These tables do not provide a comprehensive comparison but instead summarizes how the alternatives treat a selection of topics of most interest. Maps of the alternatives are attachments to this document.

Table 2-3. Comparing the Types of Management Areas (MA) Specified in the Alternatives (Approximate acres)

Management Area	Alternative A	Alternative B	Alternative C
MA1 – Commercial timber and car-touring areas	13,000	None	None
MA3 – Commercial timber and hiking	16,000	None	None
MA4 – Old timber and hiking. Trees harvested for wood and wildlife habitat	16,000	None	None
General Forest	None	16,474	16,474
Special Interest Areas	1,422	5,396	5,396
Longleaf Pine Restoration Management Area	None	15,094	15,094
Badin Lake Recreation Area	None	10,926	10,926
Streamside Forest	Not an MA	6,800	6,800
Eligible Wild and Scenic River Corridors	Not an MA	2,443	2,443
Developed recreation sites	Yes – acres not calculated	Yes– acres not calculated	Yes– acres not calculated
Congressionally designated Wilderness	5,160 acres	5,160	5,160
Potential Wilderness Additions	None	388	388

Table 2-4. Comparing the Expected Actions and Outcomes of the Alternatives

Topic	Alternative A	Alternative B	Alternative C
Activities to restore native ecosystems:			
<i>By timber harvest and regeneration</i>	--	266 acres/yr.	266 acres/yr.
<i>By thinning trees</i>	--	400 acres/yr.	400 acres/yr.
<i>By restoring Schweinitz's sunflower</i>	--	5 to 13 subpopulations/ 15 year planning period	5 to 13 subpopulations/ 15 year planning period
<i>By treating non-native invasive plants</i>	--	100 acres/yr.	100 acres/yr.
Longleaf pine restoration management emphasis	*see note below	15,094 acres**	15,094 acres**
Activities to provide a continuous supply of wood products:			
<i>By timber harvest and regeneration</i>	543 acres/yr.	Not emphasized***	Not emphasized
<i>By thinning trees</i>	245 acres/yr.	Not emphasized	Not emphasized
<i>Allowable Sale Quantity (10-year max)</i>	18.7 MMCF!	11.6 MMCF	11.6 MMCF
Prescribed burning:			
<i>For fuels reduction/site preparation</i>	1,460 acres/yr.	--	--
<i>For wildlife habitat improvement</i>	1,540 acres/yr.	--	--
<i>For ecosystem restoration (can also provide fuels reduction and wildlife habitat improvement)</i>	--	Range: 3,000 to 6,000 acres/yr.	Range: 3,000 to 6,000 acres/yr.
Wildlife openings	Emphasis on constructing more	Emphasis on site evaluation	Emphasis on site evaluation
Stream channel improvement	No specific objective	1,500 linear feet/15 years	1,500 linear feet/15 years
Aquatic habitat improvement	No specific objective	1,500 linear feet/15 years	1,500 linear feet/15 years

Topic	Alternative A	Alternative B	Alternative C
Number of Special Interest Areas (SIAs)	7	34	34
Number of Cultural Resources SIAs	0	14	14
Cultural Resources as a management theme	No	Yes	Yes
Excellent trails & Facilities as a management theme	No	Yes	Yes
Goal: OHV's only on designated system	Yes	Yes	Yes
Goal: Horses only on designated system	No	Yes	No
Goal: Mountain bikes only on designated system	No	Yes	Yes
Anticipated system road construction	2 miles/yr.	None	None

* Alternative A directs: Favor longleaf over loblolly pine as the management type where it presently exists as at least 30% or more of the dominant stem density where the site is suitable.

**Alternatives B and C direct for the 15,094 acres in Longleaf Pine Restoration MA: Retain, restore, or enhance the longleaf pine community when the following conditions are encountered: Presence of existing remnant longleaf; presence of Piedmont longleaf associated forbs and grasses such as little bluestem and indiagrass; dry ridge or south-facing slope.

***Though not emphasized, a continuous supply of wood products would result from restoration activities.

! MMCF= Million Cubic Feet

Table 2-5. Summary Comparison of the Environmental Consequences of the Alternatives

Topic	Alternative A	Alternative B	Alternative C
Plants	Less recovery of native ecosystems than B & C	Recover of 1500 acres longleaf pine community and 3000 acres of oak-hickory community.	Recover of 1500 acres longleaf pine community and 3000 acres of oak-hickory community.
Terrestrial Wildlife	More habitats created for game species. Species viability maintained.	More habitats created for non-game species. Species viability maintained.	More habitats created for non-game species. Species viability maintained.
Aquatic Wildlife	Species viability maintained.	Species viability maintained. Rare mussels reintroduced.	Species viability maintained. Rare mussels reintroduced.
Forest Health	More susceptibility to insects and disease than B & C.	Less susceptibility to insects and disease than A. Same as C.	Less susceptibility to insects and disease than A. Same as B.
Air	Air Quality Standards met.	Air Quality Standards met.	Air Quality Standards met.
Soil	Little loss of soil productivity. Erosion from unmanaged recreation more prevalent than in B & C	Little loss of soil productivity. Erosion from unmanaged recreation less than A & C.	Little loss of soil productivity. Erosion from unmanaged recreation less than A but more than B.
Water	State water quality standards met (except mercury*) Sediment from unmanaged recreation likely to continue.	State water quality standards met (except mercury*) Sediment from unmanaged recreation would be reduced.	State water quality standards met (except mercury*) Sediment from unmanaged recreation likely to be reduced, but not as much as in B.
Climate Change	No mitigating management	Mitigating management by restoring native ecosystems, more Rx burning, treatment of non-native invasives, & stream restoration.	Mitigating management by restoring native ecosystems, more Rx burning, treatment of non-native invasives, & stream restoration.
Roads	Greater motorized access provided.	Less motorized access provided.	Less motorized access provided.
Recreation	OHVs on designated system, otherwise open to hiking, mountain biking and equestrian use. User experience not emphasized.	Forest open to hiking; OHVs, equestrians, and mountain bikes on designated system. User experience emphasized.	Forest open to hiking and equestrians; OHVs, and mountain bikes on designated system. User experience emphasized.

Topic	Alternative A	Alternative B	Alternative C
Scenery	Less scenic environment provided than in B or C.	More scenic environment provided than A. Slightly more scenic than C.	More scenic environment provided than A. Slightly less scenic than B.
Wilderness	Wilderness values protected.	Wilderness values protected. Potential additions identified.	Wilderness values protected. Potential additions identified.
Eligible Wild & Scenic Rivers	Managed to retail Outstandingly Remarkable Values.	Managed to retain Outstandingly Remarkable Values. A more natural appearing corridor in the long term.	Managed to retain Outstandingly Remarkable Values. A more natural appearing corridor in the long term.
Forest Products	ASQ 18 MMCF**	ASQ 11 MMCF	ASQ 11 MMCF
Cultural Resources	Protection but no emphasis on research & interpretation. Fewer acres in SIAs than B & C	Protection plus emphasis on research & interpretation. More acres in SIAs than A	Protection plus emphasis on research & interpretation. More acres in SIAs than A, same as B.
Local Communities	More emphasis on benefits from timber than B or C	More emphasis on benefits from recreation than A	More emphasis on benefits from recreation than A
Social & Economic Environment	Slightly higher income to communities than B or C	Income to communities slightly lower than A or C	Income to communities slightly less than A, slightly higher than B
Consistency with other Programs & Plans	Less consistent than B or C	More consistent than A	Same as B
Environmental Justice	Principles fulfilled	Principles fulfilled	Principles fulfilled

* Mercury issues are state wide and not attributable to national forest management.

**ASQ = Allowable sale quantity = volume that may be harvested in ten years; MMCF = million cubic feet

CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

BOTANICAL RESOURCES

AFFECTED ENVIRONMENT

The Uwharrie NF is located within the Southern Appalachian Piedmont Ecological Section, a broad area over 42 million acres in size that lies between the Coastal Plain and Blue Ridge Mountains. The Uwharrie NF proclamation boundary overlaps two ecological subsections within the Piedmont: the Carolina Slate Belt and the Southern Triassic Uplands. The forest proclamation boundary also overlaps a portion of the Sand Hills Ecological Section, although no National Forest System (NFS) lands have yet been acquired within the Sand Hills.

The North Carolina Piedmont is the most extensively modified of the state's regions due to over three centuries of intensive land use which changed most of the original native habitats. Nearly the entire region has been farmed or timbered in the past, resulting in most of the area being in some stage of reforestation through the process of plant succession. The forest vegetation of the Piedmont is dominated by a mixture of oaks and hickories, with an understory of dogwood, red maple, sourwood, and black gum. The herbaceous flora is generally sparse and of relatively low diversity.

The earliest historical accounts from European explorers and traders describe a Piedmont landscape not of endless closed-canopy forest, but with large open woodlands, savannas and prairies. Many disturbance factors likely interacted to account for this including hurricanes, tornadoes, ice and wind storms, lightning and Native-American caused fires. Many of the plants that are rare today, such as the endangered Schweinitz's sunflower, are those that are more abundant in open, sunny conditions.

During most of the 20th century, fires were suppressed and many agricultural lands were allowed to return to forest. This resulted in a denser, more closed canopy forest condition across the landscape than what might have existed in previous centuries.

Forest Structure

Approximately half of the 50,814 acres Uwharrie NF is dominated by pines and about half is dominated by hardwoods. Loblolly and shortleaf are the most common pines; chestnut oak, white oak, and southern red oak are the most common hardwoods. The USDA Forest Service has traditionally described forest land by identifying the most common dominant tree species in an area. These descriptors are called "forest types" and are tracked in corporate databases. There are 22 forest types identified on the Uwharrie NF. The most extensive forest types are white-oak-red oak-hickory and loblolly pine. Together they cover one-half of the Uwharrie NF. Other common

forest types include (in order of decreasing abundance): shortleaf pine, white oak - black oak - yellow pine, shortleaf pine-oak, longleaf pine, and chestnut oak - scarlet oak - yellow pine. There is a higher percentage of pine forest to the south and of hardwood forest to the north. About 749 acres are non-forested openings, water, or have not been inventoried for forest type. The table below displays the approximate acreage of each forest type on the Uwharrie NF.

Table 3-1. Existing acreage by forest type on the Uwharrie NF.

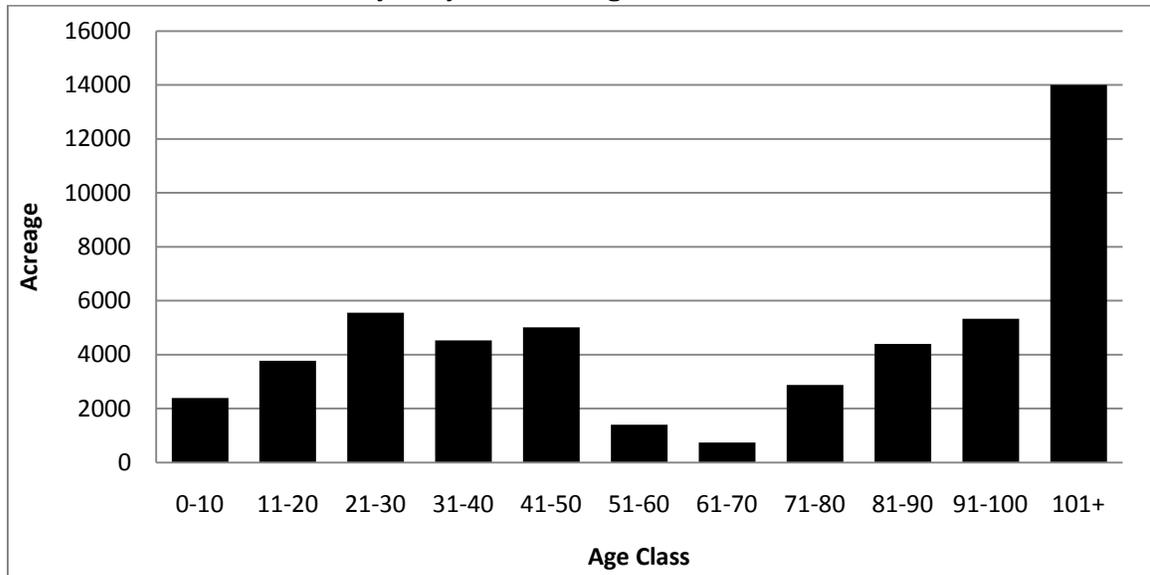
Forest Type	Approximate Current Acres
Longleaf Pine	2,605
Loblolly Pine	11,540
Shortleaf Pine	8,232
Virginia Pine	370
Virginia Pine-Oak	93
Shortleaf Pine-Oak	1,964
Loblolly Pine-Hardwood	757
Southern Red Oak-Yellow Pine	1,042
Chestnut Oak-Scarlet Oak-Yellow Pine	1,837
Bottomland Hardwoods	540
White Oak-Black Oak-Yellow Pine	2,483
Post Oak-Black Oak	14
Chestnut Oak-Scarlet Oak	357
Chestnut Oak	687
White Oak-Red Oak-Hickory	15,994
White Oak	292
Northern Red Oak	83
Yellow Poplar-White Oak-Red Oak	1,002
Laurel Oak-Willow Oak	27
Yellow Poplar	53
Sweetgum-Yellow Poplar	81
Elm-Ash-Sugarberry	11
Not classified or water	749
TOTAL	50,814

When stands of trees are inventoried they are assigned an age. Forests on the Uwharrie NF are relatively young, but disproportionately older than surrounding private forest. Hardwood dominated forest types are generally older than mixed pine-hardwood or pine dominated forest types. Hardwoods average 88 years in age, mixed pine-hardwoods average 82 years, while pine averages only 44 years in age. The most extensive older stands are mapped as white oak-red oak-hickory and they represent approximately 10% of the land base.

Figure 3-1 displays the age class distribution of forested stands on the Uwharrie NF. Overall, middle-aged stands (age 50-70) are underrepresented while younger and older stands are over-represented. The large number of stands less than 50 years in age and the narrow range of middle-aged stands is likely due to the period when active forest management began on the Uwharrie NF in 1961 – the year the Uwharrie NF was established. Since this time, about 8,200 acres of loblolly pine

and about 3,500 acres of shortleaf pine have been planted and/or young stands have been acquired. This trend has decreased greatly in the past decade as silvicultural operations have moved to more thinning of existing stands and less regeneration harvest.

Figure 3-1. Acres of Uwharrie NF by ten year forest age classes



Ecological Systems

Another way to describe forests is in terms of “ecological systems.” Ecological systems represent recurring groups of biological communities that are found in similar physical environments and are influenced by similar dynamic ecological processes, such as fire or flooding. They are intended to provide a classification unit that is readily mapped, often from remote imagery, and readily identifiable by conservation and resource managers in the field (NatureServe 2010). When cross-walked with existing forest type inventories and environmental models, their mapped distribution provides the basis for evaluating current and desired conditions for plant communities on the Uwharrie NF. The cross-walk between forest type and ecological system is documented in the *Terrestrial Species Viability Evaluation* in the project record.

Twelve ecological systems were defined for the Uwharrie NF. These ecological systems were analyzed to determine the effects of each alternative. The Species Viability Evaluation (available in the project record) provides detailed information regarding how these systems were defined and evaluated. The ecological systems are:

- Xeric Oak Forest
- Dry Oak-Hickory Forest
- Dry-mesic Oak-Hickory Forest
- Southern Piedmont Mesic Forest
- Southeastern Interior Longleaf Pine Woodland
- Shortleaf Pine-Oak Woodland
- Successional Forest (Loblolly and Shortleaf pine)

- Streamside Forest
- Southern Piedmont Glade and Barrens
- Southern Piedmont Mafic Hardpan Woodland
- Piedmont Seepage Wetland
- Southern Piedmont / Ridge and Valley Upland Depression Swamp

Each ecological system is described below:

Xeric Oak Forest: These forests on high ridges and knolls (commonly called monadnocks) are dominated by mature (> 80 years in age) chestnut oak with a patchy canopy (60-80% canopy closure); common associates include post oak, southern red oak, and pignut hickory. Canopy gaps are more frequent than in other ecological systems and the midstory is patchy and open. The shrub layer is scattered and the herb layer sparse, with less than 30% cover. Typical understory species include hillside blueberry and woodland tick-trefoil, but may be dominated by mountain laurel. Fire return interval is 7-20 years and consists of surface fires of mixed severity with flame heights mostly less than two feet with some fires occurring in the growing season.

Dry Oak-Hickory Forest: These forests on convex, exposed hillsides have a relatively open tree canopy (60%-80% closure) and are dominated by mature (> 80 years in age) dry site oaks or a mixture of oaks and up to 30% cover of shortleaf pine in upper crown positions. Small canopy gaps (½ - 2 acres in size) are dominated by oak and hickory seedlings or saplings or by grasses and herbs. Southern red oak, white oak, or post oak dominate the hardwood species. Other characteristic overstory trees include white ash, pignut hickory, redbud, winged elm, and Carolina shagbark hickory. Shrubs range from sparse to moderately dense and the herb layer, although generally sparse, can be well developed in canopy gaps. Typical understory species include deerberry, farkleberry, whorled milkweed, northern oak grass, broomsedge, and little bluestem. Fire return interval is 7-20 years and consists of surface fires of mixed severity with flame heights mostly less than two feet with some fires occurring in the growing season.

Dry-mesic Oak-Hickory Forest: These mid to lower slope forests on concave landforms have a relatively open to mostly closed mature tree canopy (60-90% canopy closure). Small canopy gaps (½ - 2 acres in size) are dominated by oak and hickory seedlings or saplings or by grasses and herbs. Forests are dominated by mixtures of oaks and hickories, with white oak the most common species along with northern red oak, black oak, mockernut hickory, shagbark hickory and red hickory. Red maple, sweetgum, and tulip poplar may be present but not in abundance. Shortleaf pine may be common. The shrub layer ranges from sparse to moderately dense and typically includes squaw-huckleberry, rattlesnake plantain, and little bluestem. The herb layer, although generally sparse, can be well developed in canopy gaps and includes ebony spleenwort, Carolina supplejack, black-edge sedge, and common foamflower. Fire return interval is 7-20 years and consists of surface fires of mixed severity with flame heights mostly less than two feet with some fires occurring in the growing season.

Southern Piedmont Mesic Forest: These forests are in sheltered topographic positions with closed (80-100% canopy closure), mature (> 80 years in age) canopies dominated by

mesophytic trees. American beech is nearly always present. Other characteristic species include northern red oak, tulip poplar, and red maple; white ash and shagbark hickory occur on higher pH soils. The herb layer is dense and may include black cohosh, bloodroot, maidenhair fern, and Christmas fern. Fire return interval is 12-20 years and consists of surface fires of mixed severity with flame heights mostly less than one foot with some fires occurring in the growing season.

Southeastern Interior Longleaf Pine Woodland: These woodlands or open forests (25-60% canopy closure) are dominated by longleaf pine with occasional shortleaf pine and oaks, or codominated by longleaf and shortleaf pine with occasional oaks. They are multi-aged (25%-60% tree cover) with canopy gaps occasionally as large as ¼ acre in size: ½ to 2 acres in size on sites suitable for Schweinitz's sunflower. Characteristic hardwood associates may include: post oak, southern red oak, and blackjack oak. The mid-canopy is very sparse and the understory shrub layer may include hillside blueberry, New Jersey tea, and common chinquapin. The herb layer is nearly continuous, diverse, and includes characteristic species such as little bluestem, splitbeard bluestem, Virginia goat's-rue, yellow Indian grass, poverty oat-grass, and silky oat-grass. Fire return interval is three to five years and consists of surface fires of mixed severity with two to five foot flame heights and some fires occurring in the growing season.

Shortleaf Pine-Oak Woodland: These woodlands on very exposed slopes have open canopies (25-60% canopy closure) dominated by shortleaf pine, Virginia pine and chestnut oak or by shortleaf pine, blackjack oak and chestnut oak. Other characteristic trees include: blackgum, white oak, scarlet oak, black oak on soils derived from felsic rock and persimmon or white ash on soils derive from mafic rock. The shrub layer may be dense and include farkleberry, horsesugar, and mountain laurel. The herb layer is diverse and typically includes little bluestem, silky oat grass, butterfly pea, starved witch-grass, and Elliott's broomsedge. Fire return interval is three to five years and consists of surface fires of mixed severity with two to five foot flame heights and some fires occurring in the growing season. Stand replacement fire may occur on an 80-100 year interval.

Successional Forest (Loblolly and shortleaf plantations): Successional forests in this context refer to forests that were historically managed "plantations" (usually loblolly or shortleaf pine) that were originally planted for timber and fiber production. The Uwharrie NF consists of a disproportionately higher amount of successional forest than would normally exist in intact, naturally regenerating ecological systems. Successional forests grow up after landscape disturbances but may not be well-adapted to the site over the long-term.

Southern Piedmont Glade and Barrens: These cliffs, bluffs, and other rock outcrops are dominated by open woodlands (< 25% canopy closure) to nearly treeless plant communities with highly variable composition. The open woodland canopy may be dominated by Virginia red cedar and winged elm with eastern red maple and Virginia pine. Other woody species include fringetree, pignut hickory, sand hickory, white ash, farkleberry, hillside blueberry, persimmon, and winged sumac. The sparse to moderate herb layer is typically dominated by little bluestem. Other common grasses include silky oat grass, Indian grass, and starved witch grass. Flowering herbs include whorled milkweed, long-stalked aster, and cross-vine. Many additional woodland

community types are possible in this system. Fire return interval is five to seven years and consists of surface fires of low severity with one to two foot flame heights.

Southern Piedmont Mafic Hardpan Woodland: These upland flats on soils with a perched water table are open woodlands (25-60% crown closure). The canopy is dominated by somewhat stunted post oak and blackjack oak and characteristic species such as Carolina shagbark hickory, persimmon, and black oak. A variety of other characteristic overstory trees may be present including Carolina shagbark hickory, white ash, pignut hickory, white oak, and black oak. Typical midstory and understory trees include Virginia red cedar, persimmon, redbud, and winged elm. The understory shrub layer is sparse and the herb layer continuous. Fire return interval is three to five years and consists of surface fires of low severity with one to two foot flame heights.

Southern Piedmont / Ridge and Valley Upland Depression Swamp: These seasonal to intermittently flooded upland flats have a closed forest canopy (60-100% canopy closure) dominated by willow oak or codominant with or replaced by overcup oak, swamp chestnut oak, or sweetgum. Shrubs are sparse but may include black highbush blueberry, highbush blueberry, buttonbush, and inkberry. The understory is also sparse but typically includes sphagnum moss, buttonbush, sedges or lamp rush. Fire return interval is highly variable and is dependent upon seasonal and yearly water fluctuations. Low severity surface fires with < 1 foot flame heights originate outside of this wetland.

Upland pools are also included in this ecological system. Upland pools lack significant tree cover except on their edge and are thought to be geologically successional to upland depression swamps.

Piedmont Seepage Wetland: Streamside seepage areas are imbedded within forests and have a scattered to closed tree canopy (60-100% canopy closure) that may include sweetgum, black gum, sweetbay, and persimmon. The understory may contain American holly, common winterberry, American strawberry bush, Virginia sweetspire, Southern wild raisin, tag alder, and ti-ti. The herb layer is diverse and may include royal fern, blaspheme-vine, and muscadine. Common spicebush and yellow root may occur along well-developed stream channels.

Hillside Seepage Bogs are imbedded in forests and woodlands and have patchy to open canopies (60-80% canopy closure) that may include swamp red maple, tulip poplar, sweetgum, or longleaf pine. Characteristic shrubs include evergreen bayberry, blue huckleberry, Southern blackhaw, and tag alder. The herb layer is diverse and may contain: yellow pitcher plant, purple pitcher plant, bushy broomsedge, ship nuthatch, and sphagnum moss. Fire return interval is highly variable and is dependent upon seasonal and yearly water fluctuations. Low severity surface fires with < 1 foot flame heights originate outside of these wetlands.

Streamside Forest: These forests provide shading, stability to stream banks, a source of coarse wood for in-stream habitat, and special habitat components such as cover and travel corridors for wildlife. They consist of a 100-foot corridor on each side of perennial streams as well as all alluvial forests. Fire return interval is 12-20 years and consists of surface fires of mixed severity

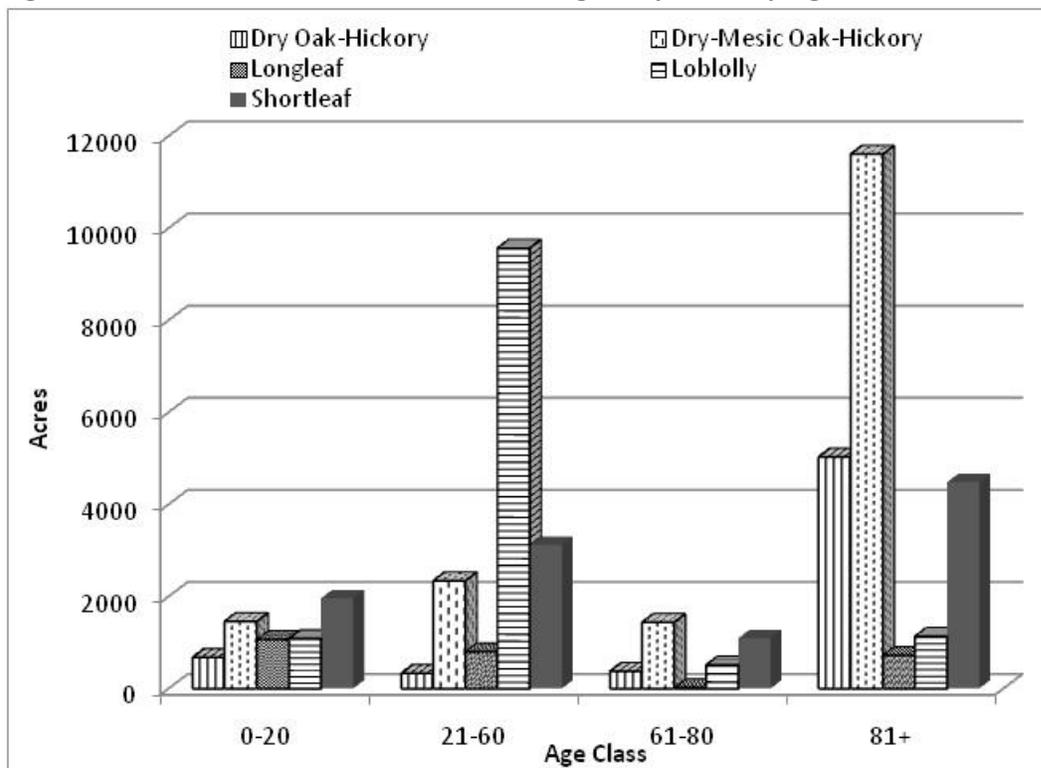
with flame heights mostly less than two feet with some fires occurring in the growing season. Some sites are subject to flooding.

In the floodplains of small to medium-sized streams, where flooding and alluvial processes have some, but limited influence on vegetation, the canopy, subcanopy, shrub, and herbaceous layers are often well-developed. Widespread species such as sweetgum and tulip poplar may be common along with upland species as well as characteristic alluvial species such as sycamore and river birch. These small stream forests may also be dominated by American beech, white oak, red oak, and green ash, with a fairly dense streamside shrub layer that includes ti-ti and mountain laurel, and an herb layer dominated by galax, wood anemone, northern green-and-gold, yellow yam, and sedges.

In floodplain terraces and levees along larger streams and rivers, the forest canopy is nearly complete (80-100% canopy closure) to somewhat open and dominated by tulip poplar, sweetgum with water oak, sycamore, river birch, loblolly pine, and cherrybark oak. The understory is dominated by ironwood, silverbell, and common pawpaw. Giant cane often forms dense thickets. Vines are frequently prominent. Aquatic and emergent communities of active and abandoned beaver ponds are imbedded with this ecological system.

Figure 3-2 displays existing age class distribution of a selection of ecological systems on the Uwharrie NF.

Figure 3-2. Acres of Select Uwharrie NF Ecological Systems by Age Class



Threatened, Endangered, Sensitive and Locally Rare Plant Species

Ecological habitats and plant associations on the Uwharrie NF include a diversity of plant species, including species which are recognized as federally threatened or endangered, sensitive and locally rare. A list of rare species (T&E, sensitive, and locally rare) on the Uwharrie NF was identified based on criteria developed in the Species Viability Evaluation. Fifty-nine rare plant species fall into one of three categories based on national, regional, and local protection: federally listed, regionally sensitive, or locally rare. Twenty-five rare plant species have documented occurrences on the Uwharrie NF and an additional 34 rare species have suitable habitat on the national forest but do not have documented occurrences. Table 14 of the Species Viability Evaluation provides habitat relationships for each T&E, sensitive, and locally rare species.

Federally Listed Species

Federally listed species include endangered species, which are in danger of extinction throughout a significant part of their range, and threatened species, which are likely to become endangered in the foreseeable future throughout all or a significant portion of their range. There are three plant species listed by the Department of Interior, U.S. Fish and Wildlife Service as threatened or endangered whose ranges include the Uwharrie NF plan area; smooth coneflower (*Echinacea laevigata*), Michaux's sumac (*Rhus michauxii*), and Schweinitz's sunflower (*Helianthus schweinitzii*) (Species Viability Evaluation). Schweinitz's sunflower is the only species that has been documented on the Uwharrie NF, with a total of twenty-six separate occurrences of this species as of 2010 (Table 3-2).

Sensitive Species

Global conservation status ranks (G-ranks) reflect an assessment of the condition of a species or ecological community across its entire range. Basic rank definitions are:

Rank	Definition
GX	Presumed Extinct (species)— Not located despite intensive searches and virtually no likelihood of rediscovery. Eliminated (ecological communities)—Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species.
GH	Possibly Extinct (species)— Missing; known from only historical occurrences but still some hope of rediscovery. Presumed Eliminated— (Historic, ecological communities)-Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration, for example, American Chestnut (Forest).
G1	Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

- G2** Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
- G3** Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
- G4** Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
- G5** Secure—Common; widespread and abundant.

The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks (NatureServe 2010b). National ranks also follow a similar status ranking system.

Regionally sensitive species are believed to have viability concerns throughout the Southern Region and generally exhibit a global rank of G3 or T3 or lower or a national rank of N3 or lower. The regionally sensitive species list was last updated in 2001. These species often require management actions to prevent listing under the Endangered Species Act. There are 13 regionally sensitive plant species with suitable habitat on the Uwharrie NF (Species Viability Analysis). These include 11 vascular plants, one bryophyte (moss), and one lichen. Six of these species have documented occurrences on the Uwharrie NF, with a total of 56 separate recorded occurrences as of 2010 (Table 3-2).

Locally Rare Species

Locally rare plant species are less globally restricted but typically grow at the periphery of their range or are disjunct from their primary range. Forty-three locally rare species have suitable habitat on the Uwharrie NF (Table 3-5). They include 42 vascular plants and one bryophyte. Eighteen of these species have known occurrences on the Uwharrie NF, with a total of fifty-five separate recorded occurrences as of 2010 (Table 3-2).

Table 3-2. Categories and life forms of rare plant species selected for the Uwharrie NF

	T & E	Regionally Sensitive	Locally Rare	Totals	Vascular plants	Mosses	Lichens
Documented species	1	6	18	25	24	0	1
Species with suitable habitat on the Uwharrie NF	2	7	25	34	32	2	0
Documented occurrences	26	56	55	137	136	0	1

ENVIRONMENTAL CONSEQUENCES

Forest Structure

Forest structure is evaluated based on changes to the relative amounts of forest types and age class distributions.

With implementation of Alternative A, the relative amounts of forest types would be expected to remain constant, with a high amount of offsite loblolly and shortleaf pine. Alternatives B and C propose restoration treatments that would increase the amounts of oak-dominated forest types and longleaf pine forest type while decreasing offsite loblolly and shortleaf pine.

Figures 3-3 and 3-4 show the projected short and long term change in age class structure under each alternative. Alternative A results in a more even age class distribution in the long term compared to Alternatives B and C. Alternatives B and C would result in a shift to more older forest in the long term, while effectively reducing the abundance of loblolly and shortleaf pine in the 20-60 year age class and increasing the acreage of oak-hickory and longleaf in younger age classes.

Figure 3-3. Short and Long-term acreage within each age-class under Alternative A

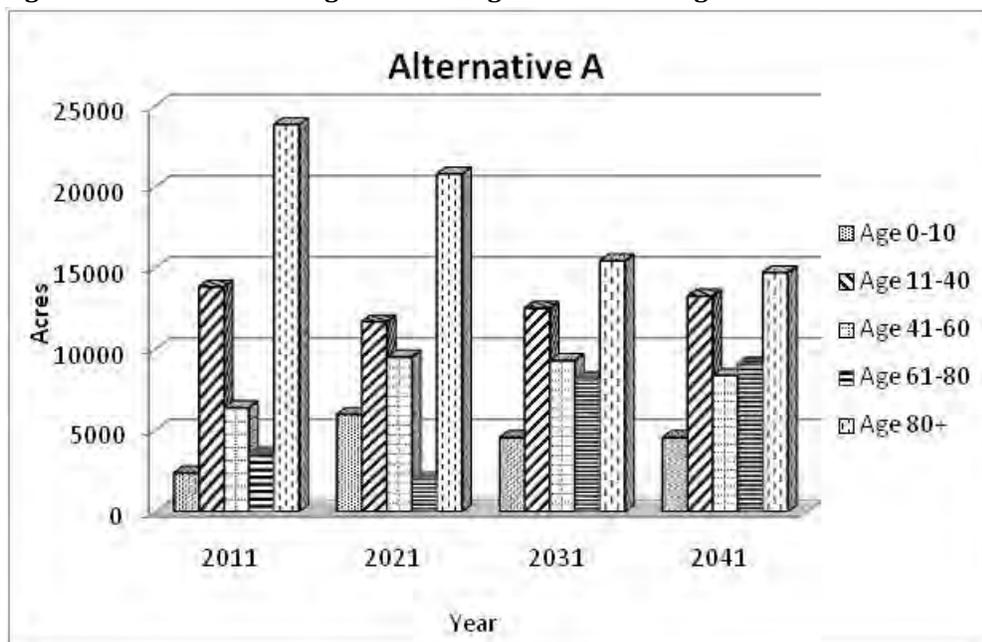
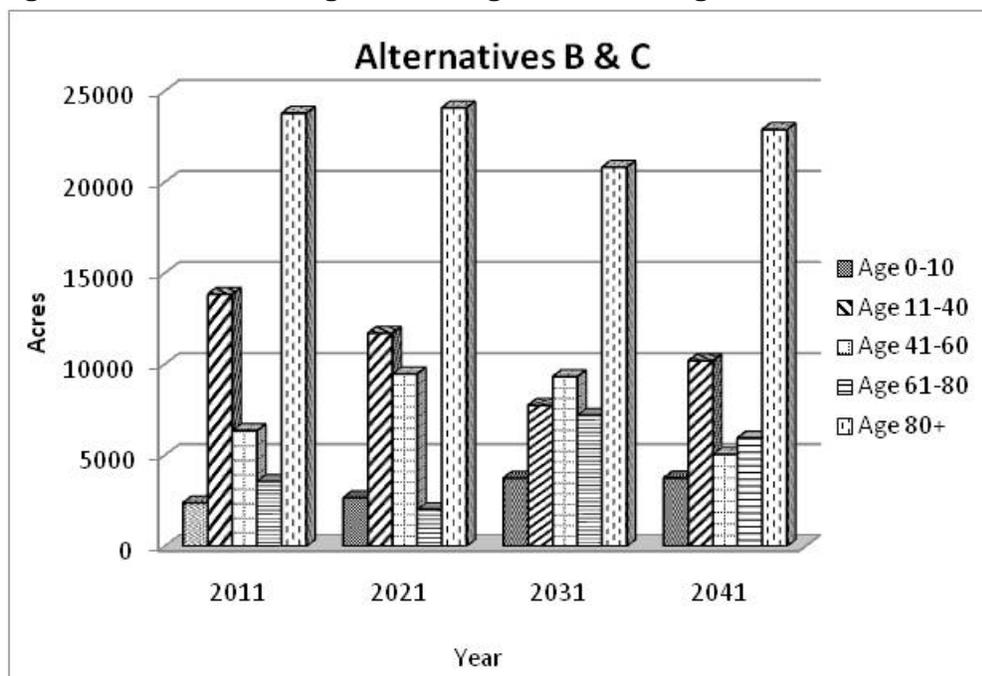


Figure 3-4. Short and Long-term acreage within each age-class under Alternatives B and C

Ecological Systems

In order to evaluate ecological sustainability, indicator measures were identified to evaluate each of the twelve described ecological systems. Indicator measures include: species composition, canopy structure, and fire regime. Each of these indicators are measurable, have been significantly influenced by past management actions, and are subject to management control in the future.

Indicator measures

- Species composition is measured as the percent of national forest acreage for a given ecological system dominated by species characteristic of the ecological system on ecologically appropriate sites. Additionally, it includes the percent of national forest acreage where non-native invasive species infestations are either absent or if present, do not impact the ecological system. A fully functioning ecosystem should have no more than 5 percent non-native invasive species (NNIS) and a small percentage of native species not typically found in the ecological system. For example, an optimal longleaf pine woodland would contain longleaf pine at greater than 70 percent composition in the overstory, longleaf pine seedlings and saplings in the understory, no greater than 10 percent loblolly pine or sweetgum, less than 5 percent NNIS, and greater than 70 percent composition of grasses and forbs in the understory layer.
- Canopy structure is measured as the percent of national forest acreage at the desired canopy closure for a given ecological system approximated by the number of acres thinned or having basal area reduced through natural disturbance within the last decade. This indicator is used to evaluate the proportion of forests that have the structure, i.e., canopy closure that facilitates the development and maintenance of species characteristic of the

system. For example, an optimal longleaf pine woodland would consist of 40-60 percent canopy cover with treeless canopy gaps up to ¼ acre.

- Fire regime is measured as the percent of national forest acreage that has received prescribed fire on multiple occasions within the last 15, 20, or 30 years (time period specific to system) under appropriate conditions for a given ecological system. This indicator is used to evaluate the condition of subcanopy and understory tree, shrub, herb, and grass species and the role of disturbance regimes to maintain canopy gaps and thin midcanopy trees to favor species best adapted to the site. For example an optimal longleaf pine woodland would experience a prescribed fire or wildfire every 4-6 years and every third burn would occur during the growing season, optimally April through July.

Effects to ecological systems

During the past ten years there has been an increase in management to improve the composition and structure of forests and to increase the role of fire as an ecological process on the Uwharrie NF. While Alternative A does not preclude restoration activities that would improve structure and composition, neither does it promote it. Off-site loblolly and shortleaf plantations would continue to persist on the Uwharrie NF and there would be a minimal amount of longleaf pine woodlands. The ecological condition for most indicator measures would likely remain unimproved because existing thinning and prescribed burning objectives are not high enough to reduce the backlog of forests needing management, and because there are no defined objectives for restoring native plant communities. Under Alternative A, native ecological systems would continue to be vulnerable to degradation. This is especially true for those rare ecological systems not addressed in the 1986 Plan, such as Southern Piedmont Glades and Barrens, Shortleaf Pine-Oak Woodlands, Southern Piedmont Mafic Hardpan Woodlands, Piedmont Seepage Wetlands, and Southern Piedmont/Ridge and Valley Upland Depression Swamps. In addition, ecological systems that have declined in the past, such as Southeastern Interior Longleaf Pine Woodlands, would show little improvement.

Alternatives B and C propose restoration of the forest to a more natural ecological condition including establishment of site-appropriate vegetation through increased thinning and prescribed fire (Table 3-3). The primary emphasis is on restoring longleaf pine woodlands and oak-hickory on sites that are currently occupied by loblolly and shortleaf plantations. Alternatives B and C do not differ from one another in terms of proposed vegetation objectives, standards, and guidelines. Both alternatives would effectively improve species composition, canopy structure, and fire regimes in primarily the longleaf pine woodland, xeric oak, and oak-hickory ecological systems. Increased prescribed fire during the growing season would result in a more open understory and improved herbaceous diversity in these systems as well.

Under implementation of Alternatives B and C, loblolly and shortleaf pine plantations would be the primary emphasis areas for restoration of longleaf pine and oak-hickory. Currently, shortleaf and loblolly plantations make up roughly 40 percent of the Uwharrie NF, and by the end of the third decade they would comprise less than 25 percent.

Within the streamside forests, vegetation management would occur primarily to restore longleaf pine woodlands and dry-mesic oak-hickory forests where loblolly or shortleaf pine currently exist. Within headwater areas, prescribed burning would be increased to maintain or restore the fire-adapted ecological systems. NNIS control work would be emphasized within these areas since the targeted restoration areas are some of the more disturbed habitats across the Uwharrie NF. In areas influenced by alluvial processes, the greatest change in species composition would be as a result of NNIS projects which would improve species diversity over the long-term.

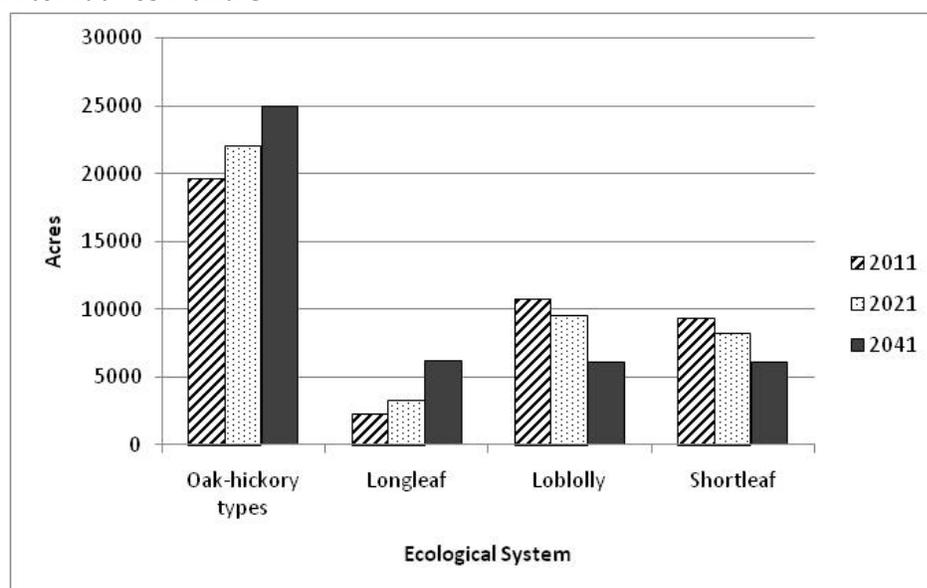
Five rare ecological systems on the Uwharrie NF that combined make up less than 3 percent of the forested area include; 1) Shortleaf pine-oak woodlands; 2) Southern Piedmont glade sand barrens; 3) Southern Piedmont mafic hardpan woodlands; 4) Piedmont seepage wetlands, and; 5) Southern Piedmont/Ridge and valley upland depression swamps. While Alternatives B and C propose little to no active restoration in these rare ecological systems, they would be maintained and would benefit from the increased frequency of prescribed fire. Increased fire would effectively improve understory species composition and improve canopy structure over the long-term.

Table 3-3. Proposed Forest Plan Objectives and projected acreage of ecological systems by alternative.

Ecological System	Existing Acreage	Restored in 15 yrs	Thinned in 15 yrs	Prescribed Burning in 15 yrs	End of 1st decade	End of 3rd decade	End of 1st decade	End of 3rd decade
Xeric oak	19,624	0	0	1200	19,624	19,624	22,096	24,934
Dry oak-hickory		2,000-2,380	225	5,500				
Dry-mesic oak-hickory		1,000-1,150	150	2,500-4,800				
Southern Piedmont mesic	1,219	0	0	no target	1,219	1,219	1,219	1,219
Southeastern interior longleaf pine woodland	2,308	1,500	375	3,200	2,308	2,308	3,352	6,214
Shortleaf pine-oak woodland	<20	0	0	30	<20	<20	<20	<100
Successional Forest (Shortleaf)	9,397				9,397	9,397	8,301	6,109
On longleaf sites		0	200	600				
On oak-hickory sites		0	1075	3,500				
Successional Forest (Loblolly)	10,798				10,798	10,798	9,597	6,089
On longleaf sites		0	1150	3,000				
On oak-hickory sites		0	1850	4,000				
Streamside forest	6,800	0	950	1,500-4,000	6,800	6,800	6,800	6,800

Ecological System	Existing Acreage	Restored in 15 yrs	Thinned in 15 yrs	Prescribed Burning in 15 yrs	End of 1st decade	End of 3rd decade	End of 1st decade	End of 3rd decade
					Alt B and C management			Alternative A
Southern Piedmont glades and barrens	<100	0	0	<100	<100	<100	<100	<100
Southern Piedmont mafic hardpan woodland	17	0	0	30	17	17	17	17
Piedmont seepage wetland	200	0	0	200	200	200	200	200
Southern Piedmont/ Ridge and valley upland depression swamp forest	<40	0	0	no target	78	78	78	78

Figure 3-5. Short and long-term projection of ecological systems under implementation of Alternatives B and C.



Alternatives B and C both identify management areas for longleaf pine restoration and for Schweinitz's sunflower habitat. Both management areas would focus restoration efforts on returning the systems to ecological conditions suitable for longleaf pine and Schweinitz's sunflower.

Alternatives A and C differ from Alternative B in regards to whether horses would eventually be required to stay within a designated system (Alternative B), or whether they are permitted to ride cross-country and on unauthorized trails (Alternatives A and C). Cross country horseback riding is not likely to have an effect on most of the ecological systems except for streamside forests, upland depression swamps, and seepage wetlands. These systems are particularly vulnerable to disturbance caused by erosion, sedimentation, and non-native invasive species. Streamside forests are most impacted where trail crossings are unmanaged, resulting in erosion of the stream bank and trampling of riparian vegetation. Alternative B would offer more protection of streamside vegetation and wetlands in the long term because horses would eventually be restricted to designated trails and areas that are managed to protect natural resources.

Effects to TES and Locally Rare species

Protection of federally threatened and endangered species and maintenance of all native species is required under regulations contained in the Endangered Species Act (ESA), the National Forest Management Act (NFMA), and Forest Service Manual (FSM) 2670. These regulations and guidelines require 1) site specific analysis of proposed projects on rare species, 2) consultation with the US Fish and Wildlife (USFWS) when there are potential affects to federally proposed or listed T&E species, and 3) that proposed actions do not result in a trend toward formal listing by the USFWS.

All alternatives include the protection of documented rare species. However, they differ in the extent to which they restore or maintain rare plant species habitats. Alternative A does not emphasize restoration of rare species, rather it emphasizes maintenance and reaching population goals, even though there is no mention of any population goals of rare species on the Uwharrie NF. Alternative A relies on project level analysis and mitigation measures to maintain rare species habitats. In contrast, Alternatives B and C emphasize restoration through the identification of specific management area prescriptions for longleaf restoration, botanical Special Interest Areas, and Schweinitz's sunflower restoration.

Plant species rarity is in part due to limited habitat on the Uwharrie NF. For example, southern anemone (*Anemone berlandieri*) and the lichen *Xanthoparmelia monticola* only occur within glades in the Piedmont, and glades are rare across the Uwharrie NF. Ravine sedge (*Carex impressinervia*), Piedmont aster (*Eurybia mirabilis*), and dissected toothwort (*Dentaria dissecta*) are confined to alluvial or bottomland forests, habitats that are very scarce on the Uwharrie NF.

Many other rare plant species on the Uwharrie NF are affected by vegetation structure which influences micro-environmental conditions such as light and percent humidity at the forest floor. The greatest number of documented rare species and species with potential habitat on the Uwharrie NF are those that require an open plant community structure with variable sized canopy openings in a woodland habitat. Among the species preferring these conditions are the federally listed Schweinitz's sunflower (*Helianthus schweinitzii*), sensitive Georgia aster (*Symphyotrichum georgianum*), and the locally rare smooth sunflower (*Helianthus laevigatus*), wild quinine (*Parthenium auriculatum*), and Heller's rabbit-tobacco (*Pseudognaphalium helleri*). Open canopy conditions can occur within habitats influenced by either felsic (feldspar and silicate bearing) or mafic (magnesium and iron bearing) rock, both of which can have a differing suite of associated plant species. Mafic woodland habitats are much less abundant than felsic woodland habitats on the Uwharrie NF.

Open habitats on the Uwharrie NF have been greatly influenced by historic fire suppression which has resulted in a closed midstory layer, dense shrub growth, and an increase in fire intolerant tree species such as red maple and sweet gum. The Species Viability Evaluation (available in the project record) details the limiting factors for all the rare plant species present on the Uwharrie NF.

Impacts to rare plant species typically increase with increased ground-disturbing activities. This is particularly true of activities that occur in small or rare habitats. Activities which increase plant competition, decrease flower or seed production, decrease vegetative regeneration, or increase the likelihood of non-native plant infestations may have negative impacts on rare plants. Conversely,

species that thrive in high light conditions may benefit from disturbances such as prescribed fire which often decreases plant competition, stimulates seed germination, prepares seed bed microsites, and releases nutrients. Alternatives B and C propose more prescribed fire than Alternative A and would therefore have a greater benefit to sun-loving plant species such as Schweinitz's sunflower.

A number of rare ecological systems contribute to the diversity of plants on the Uwharrie NF. Unique geologic conditions or hydrologic attributes create many of these rare systems, such as barrens, seepage wetlands, and upland depression swamps. One way to provide for biological diversity is to recognize rare ecological systems and some of the best examples of the more common ecological systems as botanical Special Interest Areas (SIAs). Sustaining these rare ecological systems would also provide habitat for the remaining locally rare species not associated with open canopy conditions.

The three plan alternatives differ in the amount of acreage that is identified as SIAs. In SIAs, ground disturbing activities would be designed to maintain the areas' special characteristics and species. Alternative B and C designate 5,396 acres in SIAs compared to 1,422 acres in Alternative A. The additional acres in Alternatives B and C provide protection for more rare plant species and more documented occurrences (Table 3-4). Three times as many rare plant species have documented occurrences within SIAs proposed in Alternatives B and C compared to Alternative A.

Table 3-4 Comparison of rare plant species associated with Special Interest Areas

	Acreage in Special Interest Areas	T&E Species	Sensitive Species	Locally Rare Species	Total Species	Number of Occurrences
Alt. A	1,422	0	1	6	7	7
Alt. B	5,396	1	4	11	16	27
Alt. C	5,396	1	4	11	16	27

In order to characterize the effects from the three alternatives, all 59 rare plant species were grouped into the following five categories based on habitat preferences and management needs:

- 1) Open mafic substrate (including rock outcrops): species that occur in rare habitats associated with mafic or substrates and open canopy conditions,
- 2) Open felsic substrate: species that occur in habitats with felsic substrates and open canopy conditions,
- 3) Closed mesic forests: species associated with closed canopy mesic hardwoods,
- 4) Permanent wetlands: species associated with rare wetland habitats, and
- 5) Semi-permanent ponds: species dependent on seasonally-wet, typically forested habitats.

The delineation of the groups and how species were categorized is detailed in the Species Viability Evaluation, and Table 3-5. Instead of choosing one species as a surrogate or "indicator" species for the group, the species group will be considered further in the planning process to evaluate the effects of plan alternatives on rare species.

Table 3-5. Rare plant species and their associated habitat groups

Scientific Name (Common Name)	Open Mafic Substrate	Open, Felsic Substrate	Closed Mesic Forests	Permanent wetlands	Semi- permanent Ponds
Threatened or Endangered Vascular Plants					
<i>Echinacea laevigata</i> (Smooth coneflower)	X				
<i>Helianthus schweinitzii</i> (Schweinitz's sunflower)		X			
<i>Rhus michauxii</i> (Michaux's sumac)	X				
Regionally Sensitive Plants					
<i>Acmispon helleri</i> (Carolina birdfoot-trefoil)		X			
<i>Amorpha schwerinii</i> (Piedmont Indigo-bush)		X	X		
<i>Berberis canadensis</i> (American barberry)	X				
<i>Carex impressinervia</i> (Ravine sedge)			X		
<i>Danthonia epilis</i> (Bog oatgrass)				X	
<i>Eurybia mirabilis</i> (Piedmont aster)			X		
<i>Fothergilla major</i> (Large witch-alder)		X		X	
<i>Heuchera caroliniana</i> (Carolina alumroot)			X		
<i>Lindera subcoriacea</i> (Bog spicebush)				X	
<i>Solidago plumosa</i> (Yadkin river goldenrod)	X				
<i>Symphotrichum georgianum</i> (Georgia aster)		X			
Regionally Sensitive Nonvascular Plants					
<i>Scopelophila cataractae</i> (Agoyan cataract moss)		X			
<i>Xanthoparmelia monticola</i> (a rock-shield lichen)	X				
Locally Rare Vascular Plants					
<i>Anemone berlandieri</i> (Southern Anemone)	X				
<i>Arabis missouriensis</i> (Missouri rockcress)	X				
<i>Baptisia alba var alba</i> (Thick-pod white wild indigo)		X			
<i>Baptisia australis var. aberrans</i> (Prairie blue wild indigo)	X				
<i>Callitriche terrestris</i> (Terrestrial water-starwort)					X
<i>Cardamine dissecta</i> (Dissected toothwort)			X		
<i>Carex bushii</i> (Bush's sedge)		X		X	
<i>Celastrus scandens</i> (American bittersweet)			X		
<i>Cirsium carolinianum</i> (Carolina thistle)	X				
<i>Collinsonia tuberosa</i> (Piedmont horsebalm)			X		
<i>Desmodium fernaldii</i> (Fernald's Tick-trefoil)		X			
<i>Dichanthelium annulum</i> (Ringed witchgrass)	X				
<i>Dichanthelium boreale</i> (Northern witch grass)		X			

Scientific Name (Common Name)	Open Mafic Substrate	Open, Felsic Substrate	Closed Mesic Forests	Permanent wetlands	Semi- permanent Ponds
<i>Dodecatheon meadia</i> var. <i>meadia</i> (Eastern shooting star)	X				
<i>Echinacea purpurea</i> (Purple coneflower)	X				
<i>Gillenia stipulata</i> (American ipecac)	X				
<i>Helenium brevifolium</i> (Littleleaf sneezeweed)				X	
<i>Helianthus laevigatus</i> (Smooth sunflower)		X			
<i>Hexalectris spicata</i> (Crested coralroot)	X				
<i>Liatris aspera</i> (Rough Blazing Star)	X				
<i>Lilium canadense</i> ssp. <i>editorum</i> (Red Canada lily)				X	
<i>Matelea decipiens</i> (Glade milkvine)	X				
<i>Parthenium auriculatum</i> (Glade wild quinine)	X				
<i>Pellaea wrightiana</i> (Wright's cliffbrake)	X				
<i>Plantago cordata</i> (Heartleaf plantain)				X	
<i>Polygala senega</i> (Seneca Snakeroot)	X				
<i>Pseudognaphalium helleri</i> (Heller's rabbit tobacco)	X	X			
<i>Quercus austrina</i> (Bluff oak)	X				
<i>Ruellia purshiana</i> (Pursh's wild-petunia)	X				
<i>Salvia azurea</i> (Azure Sage)		X			
<i>Sedum glaucophyllum</i> (Cliff Stonecrop)	X				
<i>Silphium terebinthinaceum</i> (Prairie rosinweed)	X				
<i>Smilax hugeri</i> (Huger's Carrion-flower)			X		
<i>Solidago radula</i> (Western rough goldenrod)	X				
<i>Solidago rigida</i> var. <i>glabrata</i> (Southeastern bold goldenrod)	X				
<i>Stachys</i> sp. 1 (Yadkin Hedge nettle)			X		
<i>Stewartia ovata</i> (Mountain camellia)			X		
<i>Symphotrichum laeve</i> var. <i>concinnum</i> (Smooth blue aster)	X				
<i>Tradescantia virginiana</i> (Virginia spiderwort)			X		
<i>Tridens chapmanii</i> (Chapman's redbtop)		X			
<i>Trifolium reflexum</i> (Buffalo Clover)		X			
<i>Viola walteri</i> (Prostrate Blue Violet)	X		X		
Non-vascular Locally Rare Plants					
<i>Weissia sharpii</i> (moss)	X				
Total Number of Species in Habitat Group	29	15	12	7	1

A) Species associated with communities on mafic substrates and rock outcrops requiring open canopy conditions

The species identified in this group typically occur in open canopy patches within woodlands, small rock outcrops, or glades. Ten rare plants have documented occurrences within this habitat group on the Uwharrie NF and an additional 19 species have suitable habitat within this group on the national forest. Species in this habitat group are sun-loving and have declined in the past due to competition from other vegetation. Many of the currently documented species, such as glade quinine (*Parthenium auriculatum*) or Carolina thistle (*Cirsium carolinianum*), are persisting along roadside habitats and are susceptible to damage from road maintenance, such as grading, mowing and/or herbicide applications.

Table 3-4 compares the three alternatives in regards to the number of rare plant species occurrences within proposed or existing special interest areas. For Alternative A, four rare species associated with mafic substrates occur within SIAs. In comparison, six species with nine separate locations occur within the SIAs proposed in alternatives B and C. Therefore Alternatives B and C may result in less conflict between project proposals and impacts to rare species. Any management within the SIAs would be designed to avoid impacts to or to benefit the rare species and habitats.

Alternative A does not propose to restore or maintain oak-hickory woodlands. In contrast, both Alternatives B and C emphasize improvement of community composition, structure, and ecological processes by proposing restoration activities on 200 acres annually of oak-hickory habitat. With Alternatives B and C, suitable habitat for sun-loving species would be improved to a greater degree compared to Alternative A. This would result in a greater potential for restoration of the ten rare plants with known occurrences in these habitats and improved suitable habitat for an additional 19 rare species.

Alternative A allows for approximately 3,000 acres of prescribed fire for fuel reduction, site preparation and wildlife habitat improvement. Recent prescribed fires have improved suitable habitat for five of the rare species that occur in this habitat group. Alternative A would continue to implement prescribed fire thereby improving suitable habitat for these and the other woodland species. Alternatives B and C propose to increase prescribed fire up to 6,000 acres per year. This 100% potential increase in burning could increase suitable habitat for species associated with mafic-substrate as well as improve habitat for species that occur on rock outcrops.

Alternative B has as a goal for all trail uses except hiking (motorized OHV, mountain biking, horseback riding) to be only on designated trails and roads (unless a road is posted as closed to that use) or in designated areas. A designated trail systems would help ensure proper design, location, lay out, and construction techniques so the trail systems are sustainable and minimize impacts to rare species. Alternatives A and C do not propose restricting horseback riding to a designated trail system or area and would therefore potentially result in greater adverse impacts to rare species from trampling and soil compaction.

B) Species associated with communities on felsic substrates requiring open canopy conditions

Similar to plant species in the first habitat group, species within this habitat group also occur in open canopy patches within broader ecological systems. This habitat provides habitat for 15 rare plants, nine of which have documented occurrences on the Uwharrie NF. This habitat group includes the federally listed species Schweinitz's sunflower.

Alternative A provides protection for one rare species that occurs in this habitat group within special interest areas. In comparison, five species occur within the proposed special interest areas in Alternatives B and C. Alternatives B and C would result in less conflict between project proposals and impacts to these rare species.

Alternatives B and C propose plan components for restoration of habitat and maintaining ecosystem diversity which would benefit species in the woodland habitat group on felsic substrates. The oak-hickory felsic ecological systems have the greatest gap between the existing acres and the potential acres across the national forest with 17,040 acres existing and 28,350 acres desired. As previously stated for mafic habitat species, the increased prescribed burning would also help to restore and maintain this habitat.

Both Alternatives B and C propose to designate 2,307 acres across 12 areas to manage for suitable habitat for Schweinitz's sunflower. Management within these areas may include transplanting of plants currently at risk, restoration of woodlands within longleaf pine and oak-hickory habitats adjacent to known sunflower occurrences, and increased prescribed fire including growing season fires. In contrast, Alternative A does not address restoration of this federally endangered plant. With implementation of either Alternative B or C, the Uwharrie NF could eventually provide the greatest amount of suitable habitat for this species across its range.

The impacts from horseback riding on rare species occurring on felsic substrates does not differ from the discussion detailed above for species associated with mafic substrates.

C) Species associated with closed mesic forests

Mesic hardwood forests are not rare on the Uwharrie NF but are not common either. Closed mesic hardwoods provide suitable habitat for 12 rare plant species, nine of which have been documented on the Uwharrie NF. This group includes one species, Piedmont indigo-bush (*Amorpha schwerinii*), which also occurs within more open habitats and seems to be tolerant of varying levels of light.

In Alternative A four rare species have known occurrences within special interest areas of closed mesic hardwood forest habitat. In comparison, seven species of this habitat group occur within the special interest areas proposed in Alternatives B and C. Alternatives B and C would result in less conflict between project proposals and impacts to these rare species.

Alternative A does not identify specific woodland restoration goals and as a result would have a greater likelihood of proposing vegetation projects that would conflict with restoration of this habitat compared to Alternatives B and C.

As previously stated, neither Alternative A nor C propose moving towards a designated trail system for horseback riding. It is likely that impacts to rare plant species in this habitat group would occur from cross country horseback riding. The greatest impact from nonsystem trail creation would likely be to species of the closed mesic forest group. Species such as ravine sedge (*Carex impressinervia*), dissected toothwort (*Cardamine dissecta*), and Piedmont horsebalm (*Collinsonia tuberosa*) require full canopy cover and would likely be impacted by trampling and uprooting of plants. There are three recorded locations in the Badin Area where damage has already occurred to ravine sedge and dissected toothwort. These impacts would be less with Alternative B because it has as a goal for all trail uses except hiking (motorized OHV, mountain biking, horseback riding) to be on designated trails and roads or in designated areas. Prior to designating an area or trail, rare plant surveys would be completed and rare plant locations would be avoided.

D) Species associated with permanent open wetlands

Seeps and bogs are extremely limited across the Uwharrie NF. They provide suitable habitat for three sensitive and four locally rare plants, however, there are currently no documented occurrences of rare species on any of the open wetlands on the Uwharrie NF. The regionally sensitive witch-alder, *Fothergilla major*, can occur in wetlands but is more typically found in openings associated with felsic substrate on the Uwharrie NF.

All three alternatives protect some of the identified wetland habitats through designation of special interest areas. Four wetlands with a total of 33 acres are protected under Alternative A. Alternatives B and C would designate wetlands in four additional areas and double the total acreage in special interest areas.

Alternative A has a goal to “perpetuate existing wetlands” whereas Alternatives B and C contain goals and more detailed desired conditions for wetlands as well as direction to maintain or increase the size of bogs and seeps. This greater recognition in B and C should result in enhancement of these ecosystems beyond mere “perpetuation.”

While rare wetlands would be infrequently encountered by cross country horseback riders with the implementation of either Alternatives A and C, the potential for long-lasting impacts to sensitive wetland soils is much greater compared to other habitats on the Uwharrie NF. Alternative B proposes a goal to restrict horseback riding to a designated system and would, by design, avoid impacts to wetlands and the associated plant species.

E) Species associated with seasonally wet semi-permanent ponds

Vernal pools and seeps are also rare on the Uwharrie NF. No rare plant species are currently known to occur within these typically forested wetlands. One rare plant species, the terrestrial water-starwort, *Callitriche terrestris*, could occur within these habitats but has no documented occurrence on the Uwharrie NF.

The three alternatives do not differ in the number of protected sites with known vernal pools or seeps. However Alternatives B and C provide goals, desired conditions and standards for wet areas

beyond what is in Alternative A. So B and C would likely result in more positive outcomes for these areas than Alternative A.

With implementation of either Alternative A or C cross country horse riders could greatly impact species associated with semi-permanent pools. Alternative B proposes a goal to restrict horses to a designated trail system and would, by design, avoid impacts to wetlands and their associated plant species.

CUMULATIVE EFFECTS

Ecological Systems

The analysis of ecological systems was conducted with a model for the Uwharrie NF as well as the North Carolina Piedmont region and a four county region surrounding the Uwharrie NF. Montgomery County, where most of the Uwharrie NF is located, is about 80 percent forested, more than any other county in the NC Piedmont. The extent of forest land in the four county area has been relatively stable during the past 20 years although it has increased about 19 percent in Davidson County and decreased by nearly the same amount in Stanly County (Brown 1990, 2003, Hutchins 1984).

Ecological systems on many private lands have greatly departed from their natural range of variation due to urban development, farming, and short-rotation timber production. The loss of intact rare communities on private land is expected to continue in the future. While forest land has remained relatively stable in recent decades, that is likely to change at some point in the future, which would make the Uwharrie NF's conservation contribution even more meaningful.

The extent of climate change effects on ecological systems and vegetation on the Uwharrie NF may be difficult to predict but there are some strongly supported trends that are expected to occur. An increase in the frequency and intensity of disturbance events such as intense storms, wildfires, and insects and disease will all have effects on the plant community though to what degree is still relatively uncertain. While disturbance events are a natural and vital part of southern ecosystems, it is the change in frequency, intensity, duration, and timing exceeding the natural range of variation that is a concern (Marques 2008). Unexpected interactions among multiple disturbances occurring at the same time add to the level of uncertainty.

Scientists have indicated that a changing climate can affect the future biodiversity and alter the function of the forest ecosystems that support these services and products (U.S. Climate Change Science Program, SAP 4.3, May 2008). Species distributions may shift, some species are likely to decline while others expand, and whole new communities may form. In general, biological productivity of southeastern forests will likely be enhanced by increased levels of carbon dioxide; however the extent of growth stimulation is proportional to soil nitrogen availability, and southern forests are often nutrient impoverished due to past land use. Limits on water availability may also offset carbon dioxide benefits if there is a decline in precipitation or if there is greater moisture stress due to high air temperatures. Forest productivity increases may also be offset, however, by escalating damage from forest pests and more extreme weather disturbances as described above. At least two ecosystem models run under the Canadian climate change scenario suggest a 25-50%

increase in fires, and a shift of some southeastern pine forests to pine savannas and grasslands due to moisture stress. Hardwoods are more likely to benefit from increased carbon dioxide and modest temperature increases than pines, since pines have greater water demands than hardwoods on a year round basis. Without management adaptations, simulations using the Hadley model show pine forest productivity will likely increase 11 percent by 2040 and then exhibit a declining trend. Hardwood productivity will likely continue to rise, with projections of a 22 percent increase by 2040 and 25 percent by 2100.

While current climate conditions now associated with southeastern forests are expected to change, the assemblages of species that will occur naturally under climate change is still unknown and will require more detailed modeling for biodiversity forecasts. One of the basic elements of forest-wide desired conditions for ecosystem diversity is that native ecological systems occupy appropriate sites.

Alternatives B and C both propose restoration treatments that aim to restore longleaf pine and oak-hickory on appropriate sites. Recent studies indicate that longleaf is less damaged from storms than loblolly, appears to have less insect and pathogen problems, has greater fire resistance, can grow as fast as or faster than loblolly pine after the grass stage, and as a result may sequester more carbon (Johnsen and Nelson 2008). Based on native site conditions, longleaf pine would be expected to have higher resilience to a changing climate that is warmer, drier, and likely to have higher fire hazards. Restoration of other native ecosystems such as shortleaf pine-oak woodland, oaks-hickory forest, glades and barrens would also move the forest toward desired conditions while enhancing resilience of the ecological systems.

Rare Plant Species

All of the rare species that occur in openings on mafic and felsic substrates occur in habitats that are adapted to fire or slightly protected (rock outcrops). While intense fires might result in short-term negative effects the long-term benefits of increasing patch openings for these light-loving species will be beneficial in the long run. In contrast, the increased intensity of fire could result in reduction of the forest canopy and midstory in mesic hardwoods and have potentially negatively impacts to rare species associated with them. Rare wetlands would not be impacted by more intense fires since the intensity of the fire would be diminished in the wetter soils and the associated plants are light-loving species.

Negative impacts from intense fires could also impact rare plant species associated with seasonally wet seeps or pools within forested habitats if they resulted in changes to the local hydrology. These negative impacts would be moderated since the flame intensities would be diminished given the higher relative humidity directly surrounding these wetlands. All three alternatives do not differ in the potential to affect these communities and create long-term impacts. Alternatives B and C may mitigate the intensity of the fires as a result of biomass reduction in the overstory and midstory and an emphasis on woodland restoration.

The increased risk of fire could increase outbreaks of some non-native invasive plant species (NNIS) such as *Sericea lespedeza*, *bicolor lespedeza*, princess tree, and tree-of-heaven. Alternative A does not address control of NNIS except at the project level. In contrast, Alternatives B and C

propose to treat infestations threatening rare plant species and therefore would result in fewer infestations over time.

Increased outbreaks of insects and diseases may result in more openings in forested habitats. This could be beneficial to sun-loving species associated with woodlands while negatively impacting those species that grow in the shaded understory. None of the alternatives differ in potentially diminishing these impacts, although the increased woodland restoration associated with Alternatives B and C would tend to diminish the risk of insect infestations.

NON-NATIVE INVASIVE PLANTS SPECIES

AFFECTED ENVIRONMENT

Non-native invasive species (NNIS) are a problem throughout the southeast (Miller 1997), and a major ecological problem worldwide (Williamson 1996). They are considered a major threat to the integrity of native communities as they out-compete native vegetation for space and resources (White and Bratton 1980). Numerous NNIS have been recorded on the Uwharrie NF, many of which are highly invasive within the North Carolina Piedmont. Table 3-6 includes some of the most invasive species known to occur on the Uwharrie NF and areas immediately adjacent to the forest. While other NNIS may occur with scattered distributions on the forest, the listed species are recognized as having either significant infestations or a high potential to spread and impacts native communities.

Table 3-6. Non-native invasive plants on the Uwharrie NF

Scientific Name	Common Name	Presence
<i>Ailanthus altissima</i>	Tree-of-heaven	Scattered distribution
<i>Albizia julibrissin</i>	Mimosa	Scattered distribution
<i>Ampelopsis brevipedunculata</i>	Porcelain-berry	Scattered distribution
<i>Arthraxon hispidus</i>	Basket grass	Abundant
<i>Broussonetia papyrifera</i>	Paper Mullberry	Documented in County
<i>Cayratia japonica</i>	Bushkiller	Documented in adjacent County
<i>Celastrus orbiculatus</i>	Oriental Bittersweet	Documented in County
<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	Spotted Knapweed	Documented in County
<i>Cirsium vulgare</i>	Bull Thistle	Moderately distributed
<i>Commelina communis</i>	Asiatic Dayflower	Isolated distribution
<i>Coronilla varia</i>	Crown vetch	Moderately distributed
<i>Dioscorea polystachya</i>	Chinese Yam	Documented in County
<i>Elaeagnus umbellata</i>	Autumn Olive	Scattered distribution
<i>Hedera helix</i>	English Ivy	Scattered distribution
<i>Kummerowia striata</i>	Japanese clover	Moderately distributed
<i>Ligustrum sinense</i>	Privet	Abundant
<i>Lonicera japonica</i>	Japanese honeysuckle	Abundant

Scientific Name	Common Name	Presence
<i>Lonicera standishii</i>	Standish's honeysuckle	Locally Abundant
<i>Lonicera tartarica, morrowii, maackii</i>	Bush honeysuckles	Scattered distribution
<i>Lespedeza bicolor</i>	Bicolor lespedeza	Abundant
<i>Lespedeza cuneata</i>	Sericea lespedeza	Abundant
<i>Microstegium vimineum</i>	Japanese stilt grass	Abundant
<i>Miscanthus sinensis</i>	Chinese Silver Grass	Isolated distribution
<i>Paulownia tomentosa</i>	Princess Tree	Scattered distribution
<i>Persercaria perfoliata</i>	Mile-a-minute	Piedmont County
<i>Pueraria montana var. lobata</i>	Kudzu	Isolated distribution
<i>Pyrus calleryana</i>	Callery Pear	Adjacent County
<i>Reynoutria japonica</i>	Japanese Knotweed	Documented in County
<i>Rosa multiflora</i>	Multiflora rose	Abundant
<i>Scheedonorus arundinaceus</i>	Tall Fescue	Moderately distributed
<i>Solanum viarum</i>	Tropical Soda Apple	Documented in adjacent County
<i>Sorghum halepense</i>	Johnson grass	Moderately distributed
<i>Vinca minor</i>	Lesser periwinkle	Isolated distribution
<i>Wisteria sinensis</i>	Chinese Wisteria	Isolated distribution
<i>Youngia japonica</i>	Asiatic Hawk's-beard	Moderately distributed

NNIS are readily dispersed along roads and trails. A 2004 NNIS inventory on the Uwharrie NF found that 94 percent of the plots analyzed had invasive species present on the roadside edge while only 45 percent of the plots in the forest interior had invasive species. A few species such as Japanese stilt grass are frequently abundant along roads and trails but also continue to thrive in low light conditions of the forest interior.

Some rare plant populations are at risk of being out-competed by NNIS. For example, an abundance of non-native bush honeysuckles in the Badin Lake area is affecting populations of Schweinitz's sunflower and Georgia aster. Non-native invasive legume species such as sericea lespedeza and bicolor lespedeza are spreading into recovering longleaf pine and oak-hickory woodlands with the recent increase in burning. Open rare communities, such as glades or rock outcrops, are particularly at risk from NNIS given the abundant light in these habitats. Other uncommon mesic communities, such as mesic hardwood forest or Piedmont alluvial forest, are at risk due to the moist growing conditions that are conducive to the spread of NNIS. All these uncommon or rare communities have a disproportionately large number of rare species.

Non-native invasive plant species also pose a threat to maintained wildlife openings on the Uwharrie NF. Many non-native invasive grass species such as fescue and lespedeza are highly invasive in wildlife openings reducing the quality of desirable non-native or native forage for wildlife.

ENVIRONMENTAL CONSEQUENCES

Factors favoring the spread of NNIS include the amount of disturbed open conditions, including roadsides, disturbance associated with timber harvest, and conditions created through wildfire or the use of prescribed fire. Factors reducing the spread of NNIS include management objectives for treating NNIS in an effort to eliminate encroachment, and reducing sources of NNIS coming into the national forest.

Alternative A does not emphasize controlling non-native invasive plant species. With implementation of Alternative A there would be an opportunity to treat species at the project level but there would be little emphasis on setting forest wide priorities for treatment. Alternative A would also lead to more ground disturbance from road construction and maintenance, and more areas impacted by timber harvest. However this alternative would result in less open woodland conditions and fewer acres disturbed by prescribed fire than Alternatives B and C.

Alternatives B and C set objectives for addressing the spread of non-native invasive species across the national forest with an emphasis on treating areas that support populations of Schweinitz's sunflower (federally endangered), or other rare species, and areas with rare or high quality plant communities. Potential treatments of NNIS may include chemical, mechanical, and/or cultural methods.

Alternatives B and C would result in fewer acres disturbed by timber harvest but more affected by prescribed burning. Also, B and C create more open woodland conditions, which would tend to provide better conditions for the spread of NNIS. On the positive side, in addition to treatment objectives in B and C, these alternatives contain a goal to promote use of weed-free hay by equestrians, and there would be fewer disturbances from road construction.

In Alternatives A and C equestrian use and its management would remain the same as it is currently managed. Equestrians would be allowed to ride cross country, on user created trails, as well as on roads and designated trails. While research shows that horses are not an important source for the introduction of non-native invasive species there is increased soil disturbance in the interior of the forest with cross-country equestrian use (Gower 2006). Dispersed recreation in the forest interior has the potential to create soil conditions favorable to the establishment of NNIS. In contrast, Alternative B has a goal to restrict equestrians to a designated system which would potentially lessen introduction of NNIS from this source.

In summary, the spread of NNIS would continue to be a challenge with any alternative. However with the objective for treatment and goals to better manage recreation use, less road construction and less timber harvest, Alternatives B and C would overall tend to reduce the spread of NNIS more than Alternative A, with B having the greatest potential for reducing the spread.

CUMULATIVE EFFECTS

With an increased emphasis on restored ecological systems and the management of non-native invasive species on the Uwharrie NF, it is expected that the cumulative impacts from invasives would be reduced with the implementation of Alternative B or C compared to current management under Alternative A. The high rates of growth and expansion of invasive plants, including those on

private ownerships occurring adjacent to the forest, will continue to make control of non-native invasive plants on federal land a large and expensive challenge.

Climate change is expected to intensify the issue of non-native invasive plants across the Uwharrie NF. Projected increases in carbon dioxide are expected to stimulate the growth of most plant species, and some invasive plants are expected to respond with greater growth rates than non-invasive plants (Dukes 2000; Ziska and George 2004; Moore 2004). The projected increase in storm events will also increase the potential for NNIS to invade newly disturbed areas. While many native species may be restricted in their range and not adaptable to changing conditions, NNIS are often opportunistic species that thrive in disturbed areas, have the ability to establish quickly, and are not usually limited by pollinators or seed dispersers (Vila et al, *in press accepted*).

WILDLIFE

AFFECTED ENVIRONMENT

The National Forest Management Act requires that national forests be managed to sustain native plant and animal diversity in the plan area. The Uwharrie NF has diverse native vegetation that serves as food for many wildlife species. Vegetation types on the forest include hard mast producers such as oaks and hickories, and soft mast such as grapes, berries, succulent stems, and herbaceous plants. Additional critical habitat elements that the Uwharrie NF provides are structural components such as snags, dens and downed wood that provide cover, as well as nesting and denning opportunities for wildlife species.

The Uwharrie NF fills a specific niche by providing older forest conditions and open grassy/forb habitat, both of which are less likely to occur on adjacent private forestland. Within the Piedmont landscape, the Uwharrie NF is unique because nearly 40% of the forest is over 80 years of age while surrounding forestland is generally younger. Most privately owned property surrounding the Uwharrie NF is rural with residential areas scattered amongst agriculture fields and production forestlands. The Uwharrie NF also provides a significant amount of hard mast production, with oak or hickory on about half of the forest. In the past, tree harvesting and prescribed fire have been implemented to ensure the natural regeneration of mast species on the forest.

The Uwharrie NF is home to over 200 terrestrial wildlife species. Most of the 60 mammalian species in North Carolina are present in the Piedmont, with black bear as the notable exception. Extensive reptile and amphibian collections on the Uwharrie NF have documented the presence of approximately 60 species. With the exception of a few bird species, most of the birds in North Carolina occur in the Piedmont, with over eighty bird species detected during annual spring bird surveys on the Uwharrie NF. These numbers are an indication of the diversity of habitats and species on the Uwharrie NF.

The North Carolina Wildlife Resources Commission reports that the Uwharrie NF has the highest hunter use per acre of any gamelands in the state. Deer hunting is a traditional use of the Uwharrie NF with at least 15 white-tailed deer per square mile and some areas having over 30 deer per

square mile. Turkey, squirrel, rabbit, quail, and dove are also traditionally hunted species on the Uwharrie NF.

Waterfowl hunting on the Uwharrie NF is mostly confined to the shores of Badin Lake, the Uwharrie River, and the Little River areas. Mallards, black ducks, pintails, Canada geese and wood ducks can be found on Badin Lake. Wood ducks can be found on the Uwharrie and Little Rivers and on small ponds and streams across the Piedmont. However, because the Uwharrie is not located in a major flyway, ducks are not abundant on the forest.

The following species groups included in this analysis:

- Management Indicator Species
- Wildlife Demand Species
- Threatened, Endangered, Sensitive, and Locally Rare Species
- Migratory Birds

MANAGEMENT INDICATOR SPECIES

Planning regulations require that certain species be selected to gauge the effects of the alternatives on wildlife (CFR 219.19 (a)(1)). Referred to as Management indicator species (MIS), they are used in this analysis to reflect effects of the alternatives on ecological communities of management interest, or groups of species dependent on certain habitat elements. In selecting MIS, emphasis has been placed on species that are closely associated with habitats of interest and species that can produce meaningful data about the effects of forest management activities on a few major communities of interest.

Five Management Indicator Species have been identified for the Uwharrie NF. They are the pileated woodpecker, *Dryocopus pileatus*, the brown-headed nuthatch, *Sitta pusilla*, the Acadian flycatcher, *Empidonax virescens*, the northern bobwhite quail, *Colinus virginianus*, and the scarlet tanager, *Piranga olivacea*.

Pileated Woodpecker

The pileated woodpecker has been selected as the species to indicate management effects to snag dependent wildlife species. This bird species is known to inhabit deciduous, coniferous and mixed forests across its range, however it prefers deciduous forests in the southeast. The pileated woodpecker is a snag dependent species that uses no less than four cavities per year making it an excellent species by which to gauge management effects on snags. Based on breeding bird surveys conducted on the Uwharrie NF from 1997-2008 (USDA 2010) the pileated woodpecker population on the Uwharrie NF is currently stable to slightly increasing.

Brown-headed Nuthatch

The brown-headed nuthatch has been selected as the species to indicate management effects in longleaf pine woodlands. The primary habitat for this bird species in the coastal plain is the longleaf pine ecosystem (NatureServe 2010). The brown-headed nuthatch relies on cavities, especially in longleaf pine trees, making this species an excellent indicator of management for

longleaf pine forests. This species has not been recorded often in breeding bird surveys conducted on the Uwharrie NF from 1997-2008 (USDA 2010), however limited data suggests that the brown-headed nuthatch population, which is relatively small, is stable.

Acadian Flycatcher

The Acadian flycatcher has been selected as the species to indicate management effects in streamside forests. This bird species requires habitat near streams in mature deciduous and mixed forests (NatureServe 2010) making it a good indicator of forest management in these forest types. Based on breeding bird surveys conducted on the Uwharrie NF from 1997-2008 (USDA 2010) the Acadian flycatcher population on the Uwharrie NF is stable to slightly increasing.

Northern Bobwhite Quail

The northern bobwhite quail is a management indicator species that has also been selected to indicate management effects for wildlife demand species. This bird species inhabits early successional and open woodland habitats (NatureServe 2010). Early successional habitat was more prevalent on the landscape in the early to mid 1900's due to the abundance of agriculture. This habitat is found less often today and quail are often hunted in open woodland situations, similar to that of the longleaf pine forest found historically across the southern part of the Uwharrie NF. Hunting demand for this species makes it a good candidate as a wildlife demand species. This species' dependence on early successional and open woodland habitats makes it a good indicator for these habitat components. Based on breeding bird surveys conducted on the Uwharrie NF from 1997-2008 (USDA 2010) the northern bobwhite quail population on the Uwharrie NF is slightly decreasing.

Scarlet Tanager

The scarlet tanager has been selected as the species to indicate management effects in dry oak and oak-hickory forests. This bird species relies on deciduous forests, especially in areas with a fairly closed canopy, dense understory and high shrub diversity (NatureServe 2010). This species relies on dry oak and oak-hickory forests which makes it a good indicator for management in these forest types. Based on breeding bird surveys conducted on the Uwharrie NF from 1997-2008 (USDA 2010) the scarlet tanager population on the Uwharrie NF is stable.

WILDLIFE DEMAND SPECIES

Wildlife Demand species were chosen for this analysis to indicate effects of management on commonly hunted game species. Effects to game species habitat are influenced by the amount of early successional habitat, availability of mast, and the impacts of human disturbance (primarily roads and motorized trails) on brood rearing habitat.

Four species were chosen to represent hunter demand on the Uwharrie NF. These species are white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), northern bobwhite quail (*Colinus virginianus*), and the eastern gray squirrel, (*Sciurus niger*).

White-tailed Deer

The white-tailed deer population on the Uwharrie NF has been stable to increasing for the last several years which is a recovery from its near extirpation at the turn of the century. This recovery is due to increased hunting regulations, removal of predators from the system, restoration of forest lands, and the ability of the species to adapt to urban environments. This species was traditionally hunted for its meat and hides by Native Americans and later by European settlers which led to its near extirpation in North Carolina. Today the white-tailed deer is the most heavily hunted game animal in NC and on the Uwharrie NF. Data for the 2010 hunting season shows that over 2,700 deer were taken in Montgomery County.

Wild Turkey

The wild turkey population on the Uwharrie NF is currently stable to increasing which is a recovery from its near extirpation in the mid 1900's. This recovery is due to restoration efforts by the state of NC which began in 1953 and ended in 1990. This restoration effort was followed by increased hunting regulations and intense harvest monitoring. This species has traditionally been hunted across the southeast for its meat and feathers and today it is a very popular game species that attracts hunters to the Uwharrie NF. Data for the 2010 spring turkey season shows that 50 turkeys were taken on the Uwharrie NF.

Northern Bobwhite Quail

The northern bobwhite quail population on the Uwharrie NF is slightly decreasing due to the loss of early successional and open woodland habitats on the Uwharrie NF and on adjacent private lands. Traditionally this species has been hunted for its meat and its feathers. Quail are currently more common in the eastern part of NC than they are in the Piedmont region.

Eastern Gray Squirrel

The eastern gray squirrel was once the most desired game mammal in NC, however today it is the second most hunted wildlife after white-tailed deer. Gray squirrels are adapted to urban, rural and forested settings, allowing them to thrive regardless of availability of forestlands. On the Uwharrie NF the gray squirrel population is stable to increasing.

THREATENED, ENDANGERED, SENSITIVE, AND LOCALLY RARE WILDLIFE SPECIES

Analysis of terrestrial animals for this forest plan revision identified 22 Threatened, Endangered, sensitive, or locally rare (TES & LR) species with ranges that include the Uwharrie NF plan area. There are three species listed as federally threatened or endangered, four sensitive species and 15 locally rare species, (Table 14 of the Species Viability Evaluation in the project record). These species and their associated habitats were analyzed in depth in the Species Viability Evaluation.

Threatened and Endangered Species

Threatened and Endangered (T&E) species are federally listed and protected under the Endangered Species Act. Three T&E wildlife species, the red wolf, eastern cougar, red-cockaded woodpecker

have ranges that include the Uwharrie NF plan area. The red wolf and eastern cougar have been extirpated from the Southern Piedmont and the Uwharrie NF due to human persecution, hybridization and lowered prey numbers in the 1800's. The red-cockaded woodpecker did occur at one time on the Uwharrie NF however it has not been documented since 1979.

Sensitive Species

Sensitive species are species that are identified on the Regional Forester's Sensitive Species List. Forest Service policy directs that the viability of sensitive species be considered in all planning on national forest system lands (FSM 2670.22). Four Sensitive species were identified to have ranges that include the Uwharrie NF. They are the bald eagle, Bachman's sparrow, migrant loggerhead shrike and the eastern small-footed bat. Bald eagles are commonly seen foraging on the Uwharrie NF and while they have been known to occur on the Uwharrie NF in the past and nesting sites are available along the lakeshore and major rivers, there are currently no known bald eagles on the Uwharrie NF. The Bachman's sparrow and migrant loggerhead shrike have no known occurrences on the Uwharrie NF, however suitable habitat is present for these species. The eastern small-footed bat has been found in one location on the Uwharrie NF.

Locally Rare Species

Locally rare species are those for which management actions may be needed or desirable to achieve ecological or other multiple-use objectives. Locally rare species are determined by reviewing state ranked species S1 or S2 that may occur on the Uwharrie NF. Forest Service biologists reviewed the NC Natural Heritage Program's List of Rare Animal Species of North Carolina (NCDENR 2008) and the NC Natural Heritage Program's List of Rare Plant Species (NCDENR 2010) to determine which species meet the requirements for locally rare on the Uwharrie NF. There are 15 locally rare wildlife species that have documented occurrences or have suitable habitat on the Uwharrie NF (Table 3-7)

Table 3-7. Locally Rare Species on the Uwharrie NF

Species	Occurrence on the Uwharrie NF
Sharp-shinned hawk	no known occurrence
Southeastern myotis	no known occurrence
Star-nosed mole	no known occurrence
Mole salamander	2 locations
Eastern tiger salamander	no known occurrence
Slender glass lizard	no known occurrence
Southern hognose snake	no known occurrence
Eastern coral snake	no known occurrence
Barrens daggermoth	no known occurrence
<i>Heterocampa varia</i> (A notodontid moth)	no known occurrence
<i>Hyperstrotia aetheria</i> (A noctuid moth)	no known occurrence
Dusky roadside-skipper	no known occurrence
Two-spotted skipper	no known occurrence
Edwards' hairstreak	no known occurrence
Northern barrens tiger beetle	no known occurrence

MIGRATORY BIRDS

Migratory birds have become a focus of conservation concern due to evidence of declining population trends for many species. Because migratory birds cover such large areas, their conservation is dependent on the distribution of suitable habitats across large regions. Currently, national forests provide some of the largest blocks of forested habitat when viewed at a physiographic area scale. As habitat quality and quantity continues to change on many privately-owned lands due to conversion to urban and suburban land uses, national forest lands will become even more important to migratory birds in the future. Efforts by the Forest Service to coordinate closely with partners in bird conservation and to incorporate proactive conservation measures into forest plan revisions are designed to ensure national forests continue to support at-risk migratory birds.

The U.S. Fish and Wildlife Service Migratory Bird Office created the list of Birds of Conservation Concern (BCC) to fulfill a 1988 mandate to “*identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973*” (USFWS 2008). This list was reviewed and nine species that were not already being considered in the planning process were identified as either occurring on, having suitable habitat on, or migrating through the Uwharrie NF. These species and their known occurrences on the Uwharrie NF are listed in Table 3-8. The brown-headed nuthatch was also listed as a bird of conservation concern but is being considered as a management indicator species for this analysis. Occurrence data was taken from annual breeding bird surveys that have been conducted on the forest for over 10 years.

Table 3-8. USFWS BCC Occurrences on the Uwharrie NF

Birds of Conservation Concern	Status Global/NC	Occurrences Documented in Annual Breeding Bird Survey on the Uwharrie NF
<i>Asio flammeus</i> (Short-eared Owl (nb))	G5/SUB, S3N	0
<i>Caprimulgus vociferus</i> (Whip-poor-will)	G5/S5B	2
<i>Cistothorus platensis</i> (Sedge Wren)	G5/SUB, S4N	0
<i>Hylocichla mustelina</i> (Wood Thrush)	G5/S5B	222
<i>Vermivora pinus</i> (Blue-winged Warbler)	G5/S2B	3
<i>Dendroica discolor</i> (Prairie Warbler)	G5/S5B, S1N	64
<i>Dendroica cerulea</i> (Cerulean Warbler)	G4/S2B	0
<i>Oporornis formosus</i> (Kentucky Warbler)	G5/S4B	27
<i>Euphagus carolinus</i> (Rusty Blackbird (nb))	G4/S3N	0

nb – non-breeding on the Uwharrie NF

ENVIRONMENTAL CONSEQUENCES

Indicators of effects to wildlife habitat used in this analysis include:

- Management of snags
- Management of stream sides
- Creation of early-successional habitat
- Restoration of longleaf pine woodlands and oak-hickory ecosystems
- Amount of prescribed fire

Table 3-9. Management Affecting Selected Wildlife Species – Comparison of Alternatives

Action	Alternative A	Alternative B	Alternative C
Management of Snags	Snags retained	Snags retained	Snags retained
Management of Stream sides	Best Management Practices; 33 foot equipment exclusion zone	Best Management Practices; 33 foot limits on vegetation removal; Streamside Forest is a recognized management area and not suitable for timber production (except pine plantations); Limits on road and trail construction near streams	Best Management Practices; 33 foot limits on vegetation removal; Streamside Forest is a recognized management area and not suitable for timber production (except pine plantations); Limits on road and trail construction near streams
Annual creation of early successional habitat	543 acres	266 acres	266 acres
Annual woodland restoration	0 acres	Up to 300 acres	Up to 300 acres
Annual prescribed burning	Up to 3,000 acres	Up to 6,000 acres	Up to 6,000 acres

EFFECTS TO MANAGEMENT INDICATOR SPECIES

Pileated Woodpecker

Under the 1986 Plan the pileated woodpecker population on the Uwharrie NF was stable to slightly increasing, most likely encouraged by snag retention standards and presence of mature forests. If Alternative A is chosen it is likely that this population trend would continue.

If Alternative B is selected, snag retention standards would still occur, however the removal of off-site tree species during restoration activities would likely lead to the creation of more snags and improved habitat for the woodpecker. Additionally, the restoration of site appropriate forest types would include an increase in hardwood forests which are preferred by the pileated woodpecker in

the southeast. Selection of Alternative B would increase pileated woodpecker habitat thereby potentially increasing its population on the Uwharrie NF.

Alternatives B and C do not differ in terms of snag retention and creation or restoration of deciduous forests, therefore the implementation of Alternative C would also lead to increased pileated woodpecker habitat and a potential increased population of this species on the Uwharrie NF.

Brown-headed Nuthatch

Under the 1986 Plan the brown-headed nuthatch population on the Uwharrie NF was small but stable, most likely due to existing longleaf pine forests. If Alternative A is chosen this population would continue to remain stable.

If Alternative B is selected, restoration of longleaf pine forests and pine woodlands would lead to increased brown-headed nuthatch habitat and would potentially increase the population of this species on the Uwharrie NF.

Alternatives B and C do not differ in terms of ecological restoration; therefore implementation of Alternative C would also lead to increased brown-headed nuthatch habitat and would potentially increase the population of this species on the Uwharrie NF.

Acadian Flycatcher

Under the 1986 Plan the Acadian flycatcher population on the Uwharrie NF has been stable to slightly increasing, most likely due to protection of streamside forests through best management practices (BMPs). If Alternative A is chosen, this population trend would continue as BMPs would still be followed.

Alternative B calls for restoration of site-appropriate species and continued use of BMPs. There is also guidance not in Alternative A that sets limits on how close new or rerouted roads and trail should be to streams. These directions in Alternative B would lead to increased Acadian flycatcher habitat and would potentially increase the population of this species on the Uwharrie NF.

Alternatives B and C do not differ in terms of ecological restoration, BMPs, or limits on roads and trails near streams, therefore implementation of Alternative C would also lead to increasing Acadian flycatcher habitat and would potentially increase the population of this species on the Uwharrie NF.

Northern Bobwhite Quail

Three management actions that vary by alternative and would affect this species habitat are: (1) creation of early successional habitat, also called zero to ten year old forest; (2) restoration of open woodland communities; and (3) amount of prescribed fire to maintain open woodlands.

Under the 1986 Plan the northern bobwhite quail population on the Uwharrie NF has been slightly decreasing, most likely due to loss of early successional and open woodland habitats on national

forest lands and adjacent privately owned lands. Alternative A calls for more timber harvest and regeneration than Alternatives B and C, which results in creation of early successional habitat. However, restoration of pine woodlands is not an objective of Alternative A and maintenance of open woodlands through prescribed fire would be less in this alternative.

If Alternative B is selected, creation of early successional habitat would occur at a slower pace than in Alternative A, however, this would be more than offset by restoration of pine woodlands and increased maintenance through the use of prescribed fire. This would lead to increased northern bobwhite quail habitat and would potentially increase the population of this species on the Uwharrie NF.

Alternatives B and C do not differ in terms of ecological restoration, creation of early successional habitat, or the use of prescribed fire; therefore implementation of Alternative C would also lead to benefits to northern bobwhite quail habitat.

Scarlet Tanager

Under the 1986 Plan the scarlet tanager population on the Uwharrie NF has been stable, most likely due to the presence of mature oak and dry oak forests with a closed canopy and a diverse shrub layer on the national forest. If Alternative A is chosen the population of scarlet tanager would continue to be stable.

If Alternative B is selected, restoration of oak forests would lead to increased scarlet tanager habitat and would tend to increase the population of this species on the Uwharrie NF.

Alternatives B and C do not differ in terms of ecological restoration, creation of early successional habitat, or the use of prescribed fire; therefore implementation of Alternative C would lead to increased scarlet tanager habitat and would tend to increase the population of the species on the Uwharrie NF.

EFFECTS TO WILDLIFE DEMAND SPECIES

White-tailed Deer

White-tailed deer are abundant in the NC Piedmont. They prefer a mixture of young and older forests, old fields, and croplands. Deer are primarily browsers, feeding on leaves and twigs of a variety of plants, plus acorns and other seeds (hard mast), fruits, and herbs.

Under the 1986 Plan the white-tailed deer population on the Uwharrie NF has been stable to increasing, most likely due to the presence of appropriate habitats on the national forest. Alternative A calls for 543 acres per year of regeneration harvest that would result in early successional habitat for browse and some fruit. Additional creation of wildlife fields would provide herbs, and existing oaks and hickories would provide hard mast. With Alternative A, the current population trend would likely continue as similar habitat conditions would continue therefore providing similar hunting opportunities.

If Alternative B is selected, restoration of deciduous woodlands would increase mast producing trees, but early successional habitat creation would be reduced to 266 acres per year. Additional wildlife fields are not called for. With these offsetting management actions, the population is more likely to be stable than increasing.

Alternatives B and C do not differ in terms of management actions that would affect this species, therefore implementation of Alternative C would have the same effects as Alternative B.

Wild Turkey

Wild turkey are a common species and their population is increasing in the NC Piedmont. They prefer forests with openings, burned areas, and savannas. These areas support low herbaceous or grassy ground cover and insects needed for brood-rearing. Acorns are a favorite; but a wide array of mast, buds, fruits, grasses, seeds, insects, green vegetation, and small animals are consumed regularly.

Under the 1986 Plan the wild turkey population on the Uwharrie NF have been stable to increasing, most likely due to the presence of forested conditions and open woodland habitats on national forest lands and adjacent privately owned lands. While Alternative A creates more early successional habitat than Alternatives B and C and more wildlife openings, Alternative A does not restore hard mast producers and does not emphasize creation and maintenance of open woodland conditions. Alternatives B and C also increase prescribed fire up to 100% over Alternative A. The combination of actions in Alternatives B and C would continue to support an increasing wild turkey population to a greater degree than Alternative A.

Eastern Gray Squirrel

Eastern gray squirrels are common across the Uwharrie NF. They prefer mature hardwood and mixed pine/hardwood forests. They eat acorns and other tree nuts, buds, flowers, fruits, seeds, and mushrooms.

Under the 1986 Plan the eastern gray squirrel population on the Uwharrie NF has been stable to increasing, most likely due to the presence of mature hardwood and mixed pine/hardwoods on the national forest. If Alternative A is chosen, this population trend would continue as similar conditions would be provided.

If Alternative B is selected, restoration of deciduous woodlands would increase mast producing trees, leading to increased eastern gray squirrel habitat, an increase in the population of this species on the Uwharrie NF, and increased hunting opportunities for the species.

Alternatives B and C do not differ in terms of ecological restoration, therefore implementation of Alternative C would lead to increased eastern gray squirrel habitat, an increase in the species population on the Uwharrie NF, and increased hunting opportunities for the species.

Northern Bobwhite Quail

See discussion on Northern Bobwhite Quail above under the Management Indicator Species section. Alternatives B and C would lead to increased northern bobwhite quail habitat over Alternative A,

increase in the species population on the Uwharrie NF, and increase hunting opportunities for the species.

EFFECTS TO TES AND LOCALLY RARE SPECIES

Threatened and Endangered Species

Red Wolf

The red wolf has been extirpated from the Uwharrie NF for many years and is not likely to return to the area anytime in the foreseeable future without substantial reintroduction efforts. These efforts are currently being conducted on the Albemarle Peninsula in eastern North Carolina; however they are not currently planned for the Piedmont region of the state. The Uwharrie NF does have some suitable habitat for this species. If Alternative A is chosen this red wolf habitat would remain intact and viable, however potential habitat expansion would not happen.

If Alternative B is selected the existing suitable habitat would be improved through ecosystem restoration. The implementation of Alternative B would lead to increased quality habitat and an increased opportunity to provide a home to more red wolves than Alternative A, if they are reintroduced in the future.

Alternatives B and C do not differ in terms of ecosystem restoration, therefore implementation of Alternative C would also lead to increased quality habitat and an increased opportunity to provide a home to more red wolves than Alternative A, if they are reintroduced in the future.

Eastern Cougar

The eastern cougar has been extirpated from the Uwharrie NF for many years and is not likely to return to the area anytime in the foreseeable future without substantial reintroduction efforts. These efforts are not currently underway in any part of the eastern US. The Uwharrie NF does have some suitable habitat for this species. If Alternative A is chosen this eastern cougar habitat would remain intact and viable, however potential habitat expansion would not happen.

If Alternative B is selected the existing suitable habitat would be improved through ecosystem restoration. The implementation of Alternative B would lead to increased quality habitat and an increased opportunity to provide a home to more eastern cougars than Alternative A, if they are reintroduced in the future.

Alternatives B and C do not differ in terms of ecosystem restoration, therefore implementation of Alternative C would also lead to increased quality habitat and an increased opportunity to provide a home to even more eastern cougars if they are reintroduced in the future.

Red-cockaded Woodpecker

The red-cockaded woodpecker depends on the southern yellow pine ecosystem and is one of the most heavily managed for T&E species in the Southeast. Intense efforts are being done to recover this species are in other areas of the Piedmont including the Sandhills National Wildlife Refuge and

Fort Bragg Army Installation. The red-cockaded woodpecker has not occurred on the Uwharrie NF since 1979. It is unlikely that this species will fly the 30 miles necessary to reach the Uwharrie NF from existing subpopulations, however it is not an absolute impossibility. Recovery of the red-cockaded woodpecker on the Uwharrie NF would require translocation of birds from other donor subpopulations. This is not currently planned for the Uwharrie NF in the recovery plan for this species. It is possible that one day many years from now there may be an opportunity to include the Uwharrie NF in the recovery efforts for this species, however currently the Uwharrie NF does not have enough suitable habitat to support more than one cluster. If Alternative A is implemented existing red-cockaded woodpecker habitat would remain intact and viable, however potential habitat expansion would not occur.

If Alternative B is selected suitable habitat for the red-cockaded woodpecker would be improved through ecosystem restoration of longleaf pine. The implementation of Alternative B would lead to increased habitat creating an increase in opportunity for red-cockaded woodpeckers if they are reintroduced in the future.

Alternatives B and C do not differ in terms of ecosystem restoration, therefore implementation of Alternative C would also lead to increased habitat and an increased opportunity for red-cockaded woodpeckers if they are reintroduced in the future.

Sensitive and Locally Rare Species

Sensitive and locally rare species were placed into six different groups based on their habitat associations. These groups are:

- 1) Open mafic substrate (including rock outcrops): species that occur in rare habitats associated with mafic or substrates and open canopy conditions,
- 2) Open felsic substrate: species that occur in habitats with felsic substrates and open canopy conditions,
- 3) Closed mesic forests: species associated with closed canopy mesic hardwoods,
- 4) Permanent wetlands: species associated with rare wetland habitats, and
- 5) Semi-permanent ponds: species dependent on seasonally-wet, typically forested habitats.
- 6) Open water: species dependent on open water bodies.

The effects to these species will be discussed in terms of the potential effects to these habitats.

Table 3-10 shows the species and their habitat associations.

Table 3-10. Habitat groups for Sensitive and Locally Rare Wildlife Species on the Uwharrie NF

Scientific Name (Common Name)	Open Mafic Substrate	Open, Felsic Substrate	Closed Mesic Forests	Rare wetlands	Semi- permanent Ponds	Open Water
Sensitive Bird Species						
<i>Aimophila aestivalis</i> (Bachman's sparrow)		X				
<i>Haliaeetus leucocephalus</i> (Bald eagle)						X
<i>Lanius ludovicianus migrans</i> (Migrant loggerhead shrike)		X				
Sensitive Mammal Species						
<i>Myotis leibii</i> (Eastern small-footed bat)	X	X	X			

Scientific Name (Common Name)	Open Mafic Substrate	Open, Felsic Substrate	Closed Mesic Forests	Rare wetlands	Semi- permanent Ponds	Open Water
Locally Rare Bird Species						
<i>Accipiter striatus</i> (Sharp-shinned hawk)	X	X				
Locally Rare Mammal Species						
<i>Myotis austroriparius</i> (Southeastern myotis)	X		X			
<i>Condylura cristata pop. 1</i> (Star-nosed mole)				X		
Locally Rare Reptile and Amphibian Species						
<i>Ambystoma talpoideum</i> (Mole salamander)				X		
<i>Ambystoma tigrinum tigrinum</i> (Eastern tiger salamander)				X	X	
<i>Ophisaurus attenuatus</i> (Slender glass lizard)	X	X			X	
<i>Heterodon simus</i> (Southern hognose snake)		X				
<i>Micrurus fulvius</i> (Eastern coral snake)		X				
Locally Rare Insect Species						
<i>Acronicta albarufa</i> (Barrens daggermoth)	X	X				
<i>Heterocampa varia</i> (A notodontid moth)		X				
<i>Hyperstrotia aetheria</i> (A noctuid moth)		X				
<i>Amblyscirtes alternata</i> (Dusky roadside-skipper)		X				
<i>Euphyes bimacula</i> (Two-spotted skipper)				X		
<i>Satyrium edwardsii</i> (Edwards' hairstreak)	X					
<i>Cicindela patruela</i> (Northern barrens tiger beetle)		X				
Total Number of Species in Habitat Group	6	12	2	4	2	1

Open Mafic Substrate

Mafic substrates with open canopy conditions are predominately oak-hickory woodlands, however it also includes glades, barrens, bluffs and riverside rock outcrops. This group of species is heavily dependent on open canopy conditions. Alternative A does allow for some management in oak-hickory forests however it does not encourage efforts that would maintain existing oak-hickory woodlands or open canopy conditions to restore oak-hickory woodlands. Implementation of this alternative would not lead to increased or improved habitat for the six sensitive and locally rare species that are associated with oak-hickory woodlands.

Alternative B focuses on ecosystem restoration and targets some pine and pine-oak forests for restoration to oak-hickory woodlands. Implementation of this alternative would lead to improved or increased habitat for the six sensitive and locally rare species that are associated with oak-hickory woodlands.

Alternatives B and C do not differ in terms of ecosystem restoration, therefore implementation of Alternative C would also lead to improved or increased habitat for the six sensitive and locally rare species that are associated with oak-hickory woodlands.

Open Felsic Substrate

Felsic substrates with open canopy conditions include oak-hickory woodlands and Piedmont longleaf pine woodlands on these substrates. Alternative A does allow for some management in oak-hickory forests however it does not encourage efforts that would maintain existing oak-hickory woodlands or open canopy conditions to restore oak-hickory woodlands. This alternative does not include any restoration of off-site species to longleaf pine or maintenance in existing longleaf pine forests to create longleaf pine woodlands. Implementation of this alternative would not lead to increased or improved habitat for the 12 Sensitive and Locally Rare species that are associated with oak-hickory woodlands or Piedmont longleaf pine woodlands.

Alternative B focuses on ecosystem restoration and targets some pine and pine-oak forests for restoration to oak-hickory woodlands along with restoration of longleaf pine woodlands. Implementation of this alternative would lead to improved or increased habitat for the 12 Sensitive and Locally Rare species that are associated with oak-hickory woodlands or Piedmont longleaf pine woodlands.

Alternatives B and C do not differ in terms of ecosystem restoration, therefore implementation of Alternative C would also lead to improved or increased habitat for the 12 Sensitive and Locally Rare species that are associated with oak-hickory woodlands or Piedmont longleaf pine woodlands.

Closed Mesic Forests

None of the alternatives have specific goals or activities associated with closed mesic hardwood forests that would have impacts to this habitat type. Implementation of these alternatives would not restrict available habitat for the two sensitive and locally rare species that are associated with mesic forests. There would be no difference among the alternatives in habitat for mesic-forest associates.

Rare Wetlands

Rare wetlands are most likely affected by sediment runoff from ground disturbing activities, especially from poorly located or improperly installed trails such as unplanned or unauthorized horse trails or from use as watering locations for horses. Alternative A does not specifically address rare wetlands except in adherence to best management practices. Implementation of Alternative A would not limit use from horseback riders and has the potential to negatively affect rare wetlands and the four sensitive and locally rare species that depend on them through trampling and compaction.

Alternatives B and C both contain goals and desired conditions for these wetlands as well as standards and guidelines for road, trail, and fireline construction that would limit potential impacts to these resources beyond what is in Alternative A.

Alternative B also has a goal to eventually limit horses to a designated system. The assumption is that designated trails would be located and properly installed and maintained away from rare wetlands and provide substantial protection to these habitats from horseback riders.

Implementation of Alternative B would protect these habitats from any negative effects from these users and be beneficial to the four sensitive and locally rare species that depend on them.

Alternative C does not have a goal to limit horseback riding to a designated trail system or designated areas. In regard to potential negative impacts from equestrian use Alternative C would have the same potential for adverse impacts to the rare wetlands and species that depend on them as Alternative A.

Semi-permanent Ponds

Semi-permanent ponds are most likely to be affected by sediment runoff from ground disturbing activities, especially from poorly located or improperly installed trails such as unplanned or unauthorized horse trails or from use as watering locations for horses. Alternative A does not specifically address semi-permanent ponds except in adherence to BMPs which protect these wet areas. Implementation of Alternative A will not limit use from horseback riders and has the potential to negatively affect semi-permanent ponds and the two sensitive and locally rare species that depend on them.

Alternatives B and C both contain goals and desired conditions for these wetlands as well as standards and guidelines for road, trail, and fireline construction that would limit potential impacts to these resources beyond what is in Alternative A.

Alternative B also has a goal to eventually limit horses to a designated system. These trails would be located and properly installed and maintained away from semi-permanent ponds and provide substantial protection to them from horseback riders. Implementation of Alternative B would protect these habitats from any negative effects from horseback riders and be beneficial to the two sensitive and locally rare species that depend on semi-permanent ponds.

Alternative C does not have a goal to limit horseback riding to a designated trail system. In regard to potential negative impacts from equestrian use Alternative C has the same potential as Alternative A to negatively affect semi-permanent ponds and the two sensitive and locally rare species that depend on them.

Open Water

Permanent open water bodies are most likely affected by sediment runoff from ground disturbing activities, especially from poorly located or improperly installed trails such as user created horse trails or from use as watering locations for horses. All alternatives protects open water bodies through adherence to BMPs; however, alternatives A and C do not restrict horseback riding to designated trails and have the potential to contribute sediment to open water bodies such as Badin Lake. The bald eagle is the only species in the wildlife habitat group that depends on open water habitat and would not be affected by an increase in sedimentation to open water because there would still be an adequate supply of fish as a food source.

Alternative B has a goal to limit horseback riding to a designated trail system and designated areas. These trails would be located and properly installed and maintained away from open water bodies and provide substantial protection to them from horseback riders. Implementation of Alternative B would protect open water habitat from any negative effects associated with sedimentation.

Mole Salamander

Analysis conducted as part of the Species Viability Evaluation (available in the project record) lists TES and locally rare species and the relative importance that the Uwharrie NF provides for sustaining each species. The mole salamander is the only wildlife species that lists the Uwharrie NF as having a high relative importance for sustainability. Mole salamander populations have been documented in at least two Special Interest Areas which are identified under all alternatives. The viability of the mole salamander can be ensured through protection of these Special Interest Areas.

EFFECTS TO MIGRATORY BIRDS

Short-eared owl

The short-eared owl depends on fields, savannas and woodlands near water. This species is not known to occur on the Uwharrie NF but there is suitable habitat. Alternative A does not specifically address these habitats and implementation of Alternative A would likely lead to unchanging conditions in these habitats. It would not increase or improve the quality of existing potential habitat for this species on the Uwharrie NF.

Alternative B focuses on ecosystem restoration and implementation of this alternative would increase woodland habitat and therefore increase opportunities on the Uwharrie NF for the short-eared owl.

Alternatives B and C do not differ in terms of ecosystem restoration, therefore implementation of Alternative C would also lead to increased opportunities for the short-eared owl on the Uwharrie NF.

Whip-poor-will

The whip-poor-will relies on open woodlands and early successional forests on the Uwharrie NF. Alternative A does not specifically address woodlands, however it does provide substantial opportunities for creation of early successional forest. Implementation of Alternative A would increase early successional forest habitat for whip-poor-wills but would not improve woodland habitat for this species.

Alternatives B and C focus on ecosystem restoration and implementation of this alternative would provide less early successional forest but more open woodlands.

Sedge Wren

The sedge wren depends on grasslands, savannas and marshes. This species is not known to occur on the Uwharrie NF. There is suitable habitat on the forest but it is limited. Alternative A does not

specifically address these habitats and implementation of Alternative A would likely lead to unchanging conditions in these habitats. It would not increase or improve the quality of existing potential habitat for this species on the Uwharrie NF.

Alternative B focuses on ecosystem restoration and implementation of this alternative would provide increased open conditions although not true savannas. It is possible that implementation of this alternative may provide new opportunities on the Uwharrie NF for the sedge wren.

Alternatives B and C do not differ in terms of ecosystem restoration, therefore implementation of Alternative C may also provide new opportunities for the sedge wren on the Uwharrie NF.

Wood Thrush

The wood thrush relies on deciduous and mixed forests with a dense canopy and well developed understory. This species is found regularly on the Uwharrie NF in these habitats. Alternative A does not focus activities in these habitats, therefore implementation of Alternative A would likely not change existing conditions or populations of wood thrush.

Alternative B focuses on ecosystem restoration especially the removal of off-site pine plantations and restoration to deciduous and mixed forest. Implementation of Alternative B would increase habitat for the wood thrush and lead to increasing populations on the Uwharrie NF.

Alternatives B and C do not differ in terms of ecosystem restoration, therefore implementation of Alternative C would also increase habitat for the wood thrush and lead to increasing populations on the Uwharrie NF.

Blue-winged Warbler

The blue-winged warbler can be found along edges of pastures, woodlands, streams and swamps in the Uwharrie NF. Alternative A does not focus activities in woodlands; however it does protect streams and swamps through adherence to BMPs. Implementation of Alternative A would likely not change the existing habitats or the population of the blue-winged warbler on the Uwharrie NF.

Alternative B focuses on ecosystem restoration especially of open woodland habitats and still requires the adherence to BMPs. Implementation of Alternative B would increase habitat for the blue-winged warbler and lead to increasing populations on the Uwharrie NF.

Alternatives B and C do not differ in terms of ecosystem restoration or adherence to BMPs therefore implementation of Alternative C would also increase habitat for the blue-winged warbler and lead to increasing populations on the Uwharrie NF.

Prairie Warbler

The prairie warbler is found on the Uwharrie NF where it relies on early successional forests. Alternative A provides substantial opportunities for creation of early successional forest. Implementation of Alternative A would increase habitat for prairie warblers and maintain existing population trends.

Alternative B focuses on ecosystem restoration and implementation of this alternative would provide early successional forests but at a lower rate than Alternative A.

Alternatives B and C do not differ in terms of ecosystem restoration and creation of early successional habitat, therefore implementation of Alternative C would have the same effect as Alternative B.

Cerulean Warbler

The cerulean warbler relies on mature mesic hardwood forests with developed shrub layers. This species is not known to occur on the Uwharrie NF however suitable habitat is present. None of the alternatives focus activities in this habitat type so there would be no difference in impacts from alternatives. The existing habitat for the cerulean warbler on the Uwharrie NF would remain the same.

Kentucky Warbler

The Kentucky warbler is found on the Uwharrie NF where it relies on mid-successional forests with open canopy and developed ground cover. Alternative A includes activities that would create additional mid-successional forests as forests are regenerated and grow out of the early successional stage. Implementation of this alternative would lead to some increased habitat for the Kentucky warbler and would maintain or slightly increase the population of this species on the Uwharrie NF.

Alternative B focuses on ecosystem restoration which includes activities that would create additional mid-successional forests as forests are regenerated and grow out of the early successional stage. The amount would be less than Alternative A, however Alternative B proposes to create more open canopy conditions or woodlands, which Alternative A does not. Over time, implementation of Alternative B is likely to lead to increased habitat for the Kentucky warbler more than Alternative A, and would maintain or slightly increase the population of this species on the Uwharrie NF.

Alternatives B and C do not differ in terms of vegetation management activities, therefore implementation of Alternative C would also lead to increased habitat for the Kentucky warbler and would maintain or slightly increase the population of this species on the Uwharrie NF.

Rusty Blackbird

The rusty blackbird depends on moist pine forest and wooded edges of small permanent water bodies. Although this species is not found on the Uwharrie NF there is some limited potential habitat for this species. Alternative A does focus activities in pine forests and it is possible that through implementation of Alternative A some new potential habitat for the rusty blackbird could be created on the Uwharrie NF.

Alternative B focuses on ecosystem restoration and implementation of this alternative does include restoration of longleaf pine forests. However, the overall amount of pines such as loblolly and shortleaf would be reduced as these forests are converted to longleaf or oak/hickory forests. It is

possible that through implementation of Alternative B a portion of the limited potential habitat for the rusty blackbird on the Uwharrie NF would be lost.

Alternatives B and C do not differ in terms of ecosystem restoration and restoration of off-site pine forest, therefore implementation of Alternative C could also lead to a loss of a portion of the limited potential habitat for the rusty blackbird on the Uwharrie NF.

CUMULATIVE EFFECTS TO WILDLIFE SPECIES

Among the largest challenges facing the conservation of wildlife habitat in the Piedmont today are urbanization and fragmentation of the landscape. Direct habitat destruction is the most widely acknowledged threat to biodiversity at the species and ecosystem level (Noss and Peters 1995). Whereas forest land in the state had been increasing during the 1900's up until about the mid-1970's, since 1990 an estimated one million acres of forest land in North Carolina has been lost to development (Brown 2004). This trend of increased urbanization is expected to continue on private lands adjacent to the Uwharrie NF.

The North Carolina Wildlife Resources Commission has a State Wildlife Action Plan that was developed in cooperation with more than 50 partners to help conserve and enhance the state's full array of fish and wildlife species and their habitats. Among numerous objectives, the plan aims to restore longleaf pine to its historical range and restore off-site pine plantations to native species. All three alternatives analyzed for Uwharrie forest plan revision are consistent with the NC State Wildlife Action Plan, though Alternatives B and C promote longleaf pine restoration whereas Alternative A does not.

The effects from climate change on wildlife species will come most directly in the form of effects to wildlife habitat from increased disturbance events such as storms, wildfires, and outbreaks of insects and disease. While some species may benefit in the short-term from an increase in early successional habitat, other species may be less adaptable to changes in habitat conditions.

Less immediate impacts from climate change may include gradual shifts in species ranges northward (Parmesan and Yohe 2003) and impacts to dormancy, migratory, and reproductive patterns (Walther et al. 2002; Parmesan and Yohe 2003; Root et al. 2003; Parmesan and Galbraith 2004; Root et al. 2005).

AQUATIC WILDLIFE

AFFECTED ENVIRONMENT

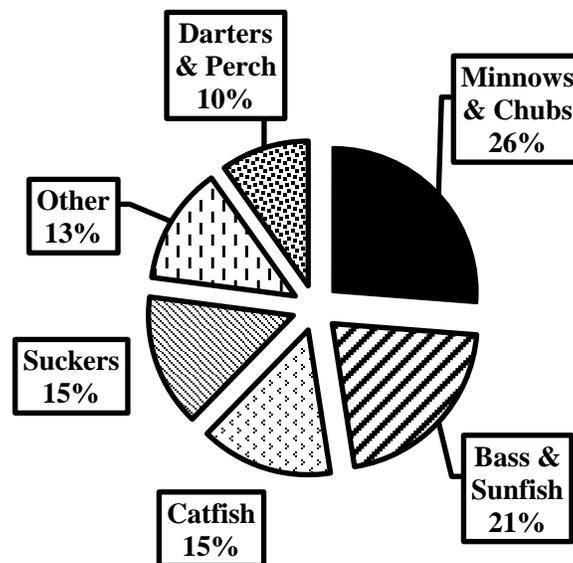
The discussion that follows draws from information in the Aquatic Viability Analysis available in the project files.

FISH COMMUNITY

Aquatic habitats within the Uwharrie NF are all classified as “warmwater.” Warmwater streams and rivers contain the largest number of native aquatic species, and support the highest overall diversity of all stream types. Warmwater streams flow through all forest types, and occur across all land types and geologies, representing all stream orders. It is not uncommon to witness a warmwater fish community with over 30 native species, or an aquatic insect community numbering in the hundreds of native species. Aquatic community complexity is a result of the diverse characteristics (land form, forest type, etc.) of warmwater streams.

Sixty-one freshwater fish species are known to occur on the Uwharrie NF. These species occupy most habitat types across the forest, with twenty-five (42%) being found only in the Uwharrie or Little Rivers and Badin Lake. The relatively high fish species diversity is typical of Piedmont ecosystems. Approximately 59% of the resident stream fish community is comprised of centrarchids (bass and sunfish), cyprinids (minnows and chubs), and percids (darters & perch) (Figure 3-6). This is not uncommon, since these taxonomic families are among the most diverse.

Figure 3-6. Fish diversity on the Uwharrie National Forest



It is also not uncommon to see these species occupying most streams across the Uwharrie NF since Piedmont streams typically pose few natural barriers to fish movement because of naturally lower gradients. Abrupt changes in gradient, such as those associated with chute (stream channel) habitats and waterfalls (natural occurrences), and the intersection of roads and streams, or dams have been shown to be the primary factor limiting fish distribution.

FRESHWATER MUSSELS

Fifteen species of native freshwater mussels are known to occur on the Uwharrie NF (Table 3-11). Of this community, 67% receive some level of management protection because of restricted ranges,

low densities and distribution, or limited habitat. This situation mirrors the trend in the global freshwater mussel community, where roughly half of the native species have become extinct, endangered, or been decimated to a point where federal, state, or local protection is necessary.

Table 3-11. Native freshwater mussels known to occur on the Uwharrie NF

Common Name	Scientific Name	Status
brook floater	<i>Alasmidonta varicosa</i>	S
triangle floater	<i>Alasmindonta</i>	LR
Carolina lance	<i>Elliptio angustata</i>	
Eastern Elliptio	<i>Elliptio complanata</i>	
variable spike	<i>Elliptio ictarina</i>	
Roanoke slabshell	<i>Elliptio roanokensis</i>	S
Atlantic pigtoe	<i>Fusconaia masoni</i>	S
Eastern lampmussel	<i>Lampsilis radiata</i>	LR
Eastern floater	<i>Pyganodon cataracta</i>	
Squawfoot	<i>Strophitus undulatus</i>	LR
Savannah lilliput	<i>Toxolasma pullus</i>	S
paper pondshell	<i>Utterbeckia imbecilis</i>	
notched rainbow	<i>Villosa constricta</i>	LR
Eastern creekshell	<i>Villosa delumbis</i>	LR
Carolina creekshell	<i>Villosa vaughaniana</i>	LR

S – sensitive, LR – locally rare

Despite the dismal outlook for native freshwater mussels, the Uwharrie NF continues to support one of the highest mussel diversities in North Carolina. This is thought to be largely due to pockets of high quality habitat within the Uwharrie NF ownership (when compared to surrounding privately owned habitats). Several sites on the Uwharrie NF are being considered by the North Carolina Wildlife Resources Commission (NCWRC), United States Fish and Wildlife Service (USFWS), and the USDA Forest Service for native species propagation nurseries to aid in species' recovery across the landscape.

RARE AQUATIC SPECIES

The lower Yadkin-Pee Dee River Basin, which includes most of the Uwharrie NF, contains suitable habitat for 69 rare aquatic species. Of these 69 species, six are federally-listed: two freshwater fish, the Cape Fear shiner (*Notropis mekistocholas*) and the shortnose sturgeon (*Acipenser brevirostrum*), and four freshwater mussels, the dwarf wedgemussel (*Alasmidonta heterodon*), Tar River spiny mussel (*Elliptio steinstansana*), Carolina heelsplitter (*Lasmigona decorata*), and the James spiny mussel (*Pleurobema collina*). None of the six are currently known to occur on the Uwharrie NF. The Cape Fear shiner is known to occur adjacent to the Uwharrie NF. The shortnose sturgeon requires large river habitats, which are not present on the Forest. There is suitable habitat for the dwarf wedgemussel, Tar River spiny mussel, and James spiny mussel on the Uwharrie NF; however, extensive surveys of freshwater mussel communities throughout the Yadkin river basin over the last 15-20 years have not documented the presence of these species on or adjacent to the forest. Both the James and Tar River spiny mussels are thought to be endemic to the areas they inhabit, and

are not likely to occupy Forest waters. The upstream-most documentation of the range of the Carolina heelsplitter is downstream of the Uwharrie NF; however, several sites on the Forest are being studied as suitable restoration areas for the species. It is possible that the Carolina heelsplitter could occupy Uwharrie NF waters as experimental populations during the life of this forest plan.

In the interest of maintaining aquatic species diversity, three federally-listed aquatic species, the Cape Fear shiner (*Notropis mekistocholas*), dwarf wedgemussel (*Alasmidonta heterodon*), and Carolina heelsplitter (*Lasmigona decorata*), will be considered in this analysis.

Of the remaining 63 rare aquatic species, 13 are listed as sensitive by the regional forester. These thirteen are known to occur on or adjacent to the Uwharrie NF and will be considered in this analysis (reference appropriate appendix). Fifty aquatic species are listed as locally rare by the National Forests in North Carolina (Global status of G1, G2, or G3). Of these species, 35 are known to occur on or adjacent to the forest, or have suitable habitat present on the Uwharrie NF, and will be considered in this analysis (reference appropriate appendix).

DEMAND SPECIES

Smallmouth bass (*Micropterus dolomieu*) and largemouth bass (*Micropterus salmoides*) are in high demand by the angling public. These species are identified as demand species for this analysis. There are no aquatic species identified as management indicator species.

Table 3-12 summarizes the aquatic species to be analyzed by species group. It is reasonable to assume that these groups of species would respond similarly to subtle changes in the environment, such as might occur as a result of national forest management. Site-specific and species-specific analysis may be necessary to evaluate potential effects on these species during forest plan implementation.

Table 3-12. Summary of aquatic species considered in the analysis

Species Group	Number of Species
Crayfish	2
Fish	14
Freshwater Mollusks	15
Aquatic Insects	22

SIGNIFICANT AQUATIC HABITATS

The North Carolina Natural Heritage Program identifies water bodies with important natural resources such as a large diversity of rare aquatic animal species as Significant Aquatic Habitats (SAHs). Six SAHs occur in the lower Yadkin River-Pee Dee River basin. Substantial portions of two of these flow through the Uwharrie NF: the Little River/Densons Creek SAH and Uwharrie River/Barnes Creek/Caraway Creek SAH. These SAHs are critical to maintaining aquatic species diversity across the Uwharrie NF, and within the lower Yadkin-Pee Dee River Basin. For example, of the 23 rare aquatic species occurring within lower basin's SAHs, 16 (70%) are known to occur

within one or both of the SAHs on the Uwharrie NF. The Carolina heelsplitter may be reintroduced into the Uwharrie River/Barnes Creek/Caraway Creek SAH in the future.

Table 3-13. Significant aquatic habitats within the lower Yadkin-Pee Dee River basin and rare species occurring in the area

Group	Status	Common Name	Goose/ Duck SAH	Lanes SAH	Little/ Densons SAH	Lower Pee Dee SAH	South Fk Crooked SAH	Uwh/Barnes /Caraway SAH
Fish	E	Shortnose				x		
Mollusk	E	Carolina	x					x
Fish	S	Carolina darter		x			x	x
Mussel	S	Roanoke				x		x
Mussel	S	Atlantic pigtoe	x	x				x
Mussel	S	Savannah	x		x			x
Crayfish	LR	Greensboro						x
Fish	LR	highfin				x		
Fish	LR	Carolina			x	x		
Mussel	LR	Carolina elktoe			x			x
Mussel	LR	triangle floater			x			
Mussel	LR	yellow			x	x		
Mussel	LR	Carolina			x	x		x
Mussel	LR	squawfoot	x	x	x	x		x
Mussel	LR	notched	x		x			x
Mussel	LR	Eastern	x		x			x
Mussel	LR	Carolina	x	x	x	x	x	x
Fish	other	<i>Cyprinella sp. 1</i>				x		
Fish	other	robust redhorse				x		
Mussel	other	<i>Alasmidonta sp.</i>			x			x
Mussel	other	alewife floater				x		
Mussel	other	Eastern				x		
Snail	other	a valvatid snail						x

E – Endangered, S- Regional Forester sensitive species, LR – locally rare

Streams and rivers of the Uwharrie NF and vicinity (Montgomery and southwestern Randolph Counties) host large numbers of rare mollusks, as well as the Carolina darter, Carolina redhorse, and Greensboro burrowing crayfish. Whether these streams were originally more diverse than other streams in the basin is open to speculation, but it is likely that species have survived in these waters due to the relatively undeveloped nature of national forest lands and resource protection offered by national forest management practices.

As human population growth increases and urban development expands, the significant aquatic habitats may become the last strongholds for some aquatic species. Therefore, it is vitally important that any population of these species on or adjacent to the Uwharrie NF be protected from loss.

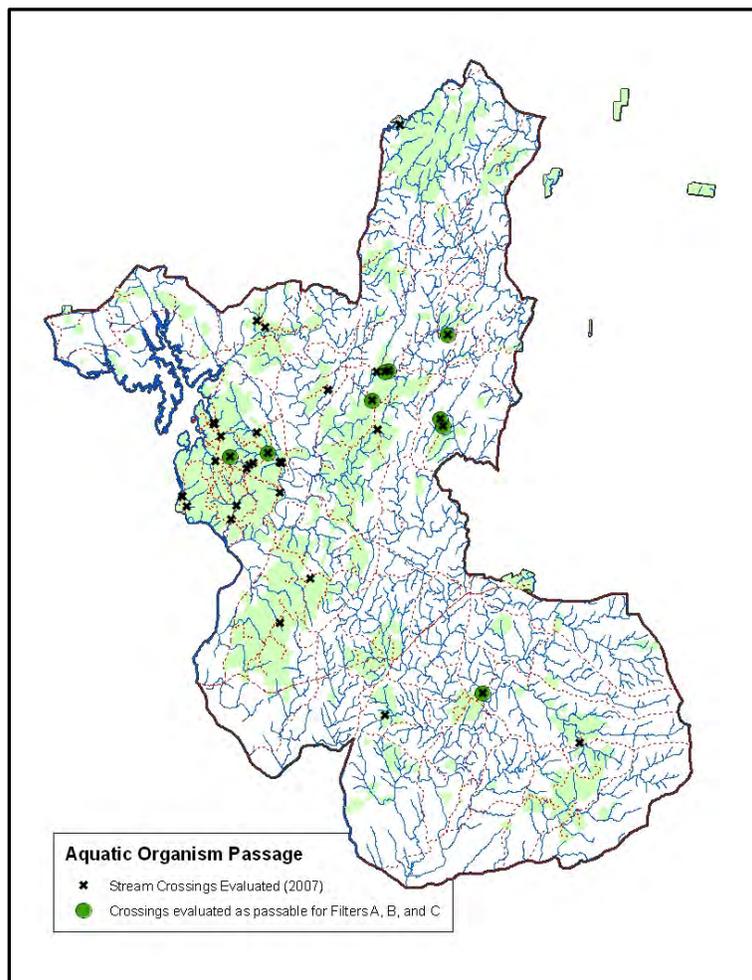
AQUATIC ORGANISM PASSAGE

The ability of stream fish and other organisms to move freely between habitats and stream reaches is critical to the health and stability of resident fish populations. This connectivity is also critical to the freshwater mussel community since this suite of species relies on native fish to reproduce.

In 2007, thirty-one road/stream intersections (hereafter, stream crossings) across the Uwharrie NF were evaluated for aquatic organism passage (CATT 2007). Three coarse screening filters were used to categorize stream crossings based on species' sustained swimming speed and leaping ability. Using Filter A (strong swimmers and leapers) 10 percent of stream crossings were classified as impassable, Filter B (moderate swimmers and leapers) classified 23% of stream crossings as impassable, and Filter C (weak swimmers and leapers) classified 32% as impassable. Figure 3-7 displays the results of the evaluation.

Of the 31 stream crossings evaluated, only nine (30%) were rated passable with all three filters; seven bridges and two culverts. This indicates that stream crossings are affecting the distribution of native aquatic species across the Uwharrie NF. For all three filters, most of the impassable and indeterminate stream crossings were located within the Badin Lake area. This indicates that stream habitats and associated aquatic populations are the most fragmented in this area.

Figure 3-7. Stream crossings on the Uwharrie National Forest evaluated as passable for all three filters



HYDROLOGIC CONNECTIVITY

Hydrologic connectivity occurs when storm water runoff from a road or trail enters a stream channel having perennial, intermittent, or ephemeral flow. Wherever a hydrologic connection exists, rapid runoff, sediments, and road or trail associated chemicals generated on the road/trail surface are provided a direct route into the streams (Forest Service, USDA 1999). The best situation is for roads and trails to NOT be hydrologically connected to streams. Human activities such as construction of roads and trails or degradation of stream banks and meadows can increase hydrologic connectivity. This can negatively affect nutrient availability to organisms, limit the availability of suitable habitat, and alter the pattern of stream flow resulting in different hydrologic processes and a decline of riparian or aquatic dependent species (Sierra Nevada Forest Plan Amendment 2004).

A 2010 survey of trails within the Badin Lake area identified 187 points of potential hydrologic connectivity, primarily trails crossing streams. Approximately 70 of these points, (37%), are associated with the designated trail system. Use of these trails includes foot, horse, bike, and/or off-

road vehicle use. Hydrologic connectivity at these crossings is generally “improved”, meaning that there is a design in place to minimize stream impacts when properly maintained.

The remaining approximately 117 points of hydrologic connectivity (63%), are located on nonsystem trails, and have no design or structure in place to minimize stream impacts. These areas are often point sources of chemical impact and stream sedimentation. Of these crossings, approximately 93 (79%) are associated with horse travel (Badin Lake Area Trails Assessment 2011).

ENVIRONMENTAL CONSEQUENCES

Parameters selected to measure aquatic ecosystem diversity and stability must be meaningful to describe and evaluate community composition, structure, and processes of the ecosystems. These parameters may include those required for rare species such as federally-listed (Proposed (P), Endangered (E) or Threatened (T)), regionally-sensitive (S), or locally rare (LR). Parameters should also reflect ecosystem processes that contribute to variation in ecosystem diversity. Most importantly, the scale of selected characteristics must match the scale of planning efforts.

Basinwide water quality planning is a nonregulatory watershed-based approach to restoring and protecting the quality of North Carolina’s surface waters. The North Carolina Division of Water Quality (NCDWQ) prepares basinwide water quality plans for each of the seventeen major river basins in the state, and revises them at five-year intervals. While these plans are prepared by the NCDWQ, their implementation and the protection of water quality involve the coordinated efforts of many agencies, local governments, and stakeholders.

The first basinwide plan for the Yadkin-Pee Dee River Basin was completed in 1998. The basin was reassessed in 2001 and 2006 (NCDENR 2007). The USDA Forest Service is an active partner in the collection, analysis, and use of the information contained in these (and other basin) assessments. The Yadkin-Pee Dee River Basin will be reassessed in 2011.

While these basinwide plans address many aspects of aquatic resource management, two are of specific relevance to maintaining aquatic ecosystem diversity: (1) fish community structure, and (2) benthic community structure. These two aspects will be used to evaluate aquatic ecosystem diversity and viability for the life of the Uwharrie NF LRMP.

Freshwater mussel species diversity and aquatic organism passage will be used to augment the discussion where appropriate. If a particular rare species would be affected differently than the rest of the community, then species-specific effects will be discussed.

EFFECTS TO FISH COMMUNITY STRUCTURE

The North Carolina Index of Biotic Integrity (NCIBI) is a modification of the Index of Biotic Integrity (IBI) initially proposed by Karr (1981) and Karr et al. (1986) and was developed to assess a stream’s biological integrity by examining the structure and health of its fish community. The NCIBI summarizes effects to aquatic faunal communities from water quality, energy source, habitat quality, flow regime, and biotic interactions. The scores derived from this index are a measure of the ecological health of the water body, but do not always directly correlate with water quality. For example, a stream with excellent water quality would not be rated excellent if it had poor or fair

fish habitat. However, in many instances, a stream which rated excellent on the NCIBI should be expected to have excellent water quality.

The IBI (and hence, the NCIBI) incorporates information about species richness and composition, trophic composition, fish abundance, and fish condition. While changes in a fish community can be caused by multiple factors, certain aspects of the community are more responsive to specific influences. For example, species composition measurements reflect habitat quality effects; information on trophic composition reflects effects of biotic interactions and energy supply; and fish abundance and condition information indicate additional water quality effects. It should be noted, however, that these responses may overlap—for example, a change in fish abundance may be due to decreased energy supply or a decline in habitat quality, and not necessarily a change in water quality. A complete description of the NCIBI method can be found at <http://portal.ncdenr.org/web/wq/ess/bau>.

Table 3-14. NCIBI scores and classification for fish communities within the Piedmont Physiographic Region (including the Yadkin-Pee Dee River basin)

NCIBI Score	NCIBI Classification
> 54	Excellent
48 – 52	Good
42 – 46	Good-Fair
36 – 40	Fair
<= 34	Poor

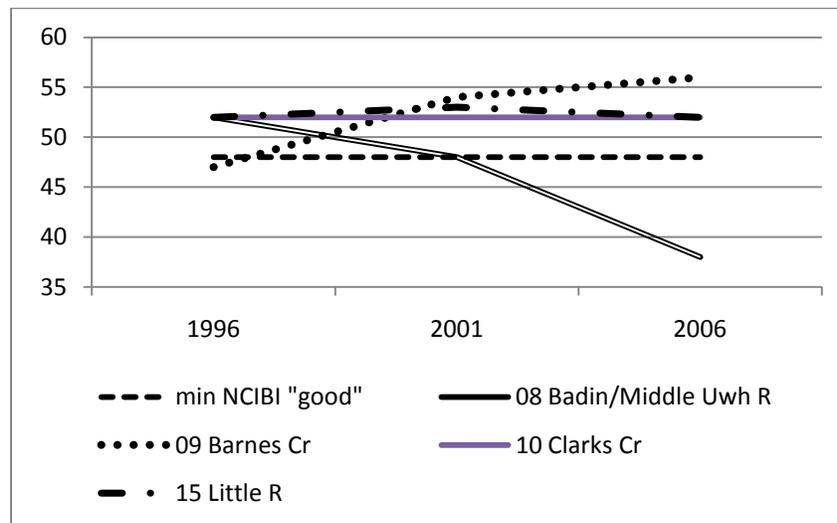
Because it is highly unlikely that any aquatic ecosystem has ever been completely undisturbed, an NCIBI value of 54 will be used as the baseline (or historical reference) for the analysis of trends in fish community structure within the Yadkin-Pee Dee River basin and across the Uwharrie NF.

A closer look at NCIBI values reveals that fish community health is stable or increasing in all subbasins containing parts of the Uwharrie NF, except in the Badin Lake area (Table 3-15 and Figure 3-8). Within the Badin Lake area, fewer fish species are present than the “typical” warmwater Piedmont fish community, and the aquatic community is dominated by more tolerant species such as bluehead chub and green sunfish, resulting in lower NCIBI ratings. It is important to note that no streams within the Uwharrie NF received an NCIBI rating lower than good, except within the Badin Lake area (subbasin 08). Maintaining an NCIBI rating of good or excellent for Uwharrie NF streams is the desired condition.

Table 3-15. Mean NCIBI values over time

	Mean NCIBI score		
	n=12	n=11	n=13
	1996	2001	2006
08 Badin/Middle Uwh R	52	48	38
09 Barnes Cr	47	54	56
10 Clarks Cr	52	52	52
15 Little R	52	53	52
min NCIBI "good"	48	48	48

Figure 3-8. Trend lines for mean NCIBI

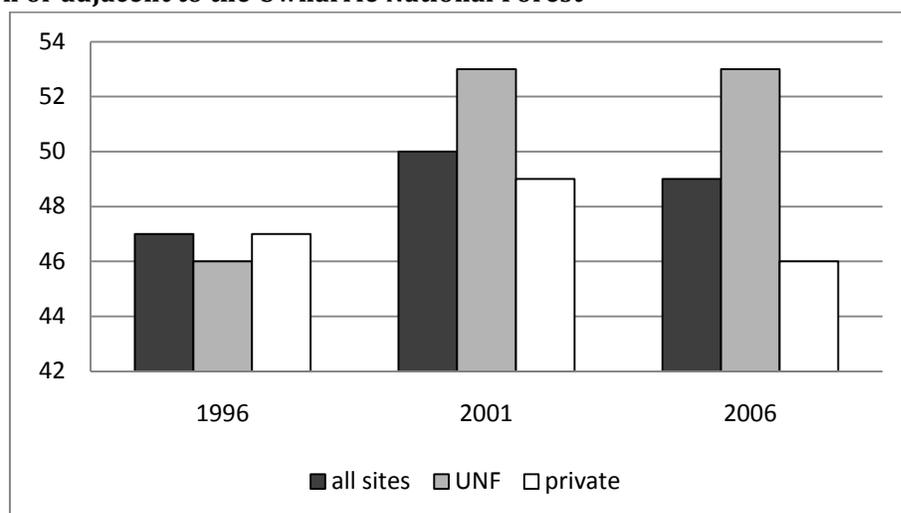


Lower NCIBI values in the Badin Lake area can be partly attributed to high levels of recreational use, particularly those uses associated with the dense trail network. Proximity of a trail to water is related to the potential for chemical impacts and stream sedimentation. However, because vegetated buffers are effective at mitigating stream impacts, proximity may not be a reliable indicator of potential impacts in the absence of hydrologic connectivity data. Points where there is no vegetated buffer and hydrologic connectivity is evident include trail/stream intersections (i.e. trail crossings) and locations where the trail and stream overlap.

Maintenance of high quality, high integrity fish communities across the Uwharrie NF will ensure the continued existence of stable warmwater fish communities within the Yadkin-Pee Dee Basin. However, due largely to the zoogeography of native fish, maintenance of healthy, stable fish communities across the Uwharrie NF would not ultimately guarantee the continued existence of all fish species within the Yadkin-Pee Dee Basin.

Over the last decade, mean NCIBI values are notably higher on sites within the Uwharrie NF than across the Yadkin-Pee Dee River basin, indicating better conditions on national forest than the basin as a whole (Figure 3-9). Fish community structure and health across the Uwharrie NF does not differ significantly from established historical reference conditions, while values across the basin are slightly lower, but not trending towards loss of structure or function.

Figure 3-9. Mean NCIBI values from streams within subbasins of the Yadkin-Pee Dee River basin on or adjacent to the Uwharrie National Forest



Under the 1986 Forest Plan, NCIBI measurements of fish community health and stability for sites on the Uwharrie NF all rate good or excellent (NCIBI value of 48 or greater) except Dutchmans Creek, which has consistently rated poor, and Densons Creek, which rates good-fair (Figure 3-10). All alternatives contain standards and guidelines to protect aquatic habitats, including a 33 foot protective buffer, with overstory, along all perennial and intermittent streams.

Dutchmans Creek flows through the Badin Lake area, and is highly impacted by recreational use in the area, including horse, mountain bike, and OHV trail use, particularly at stream crossings. The high number of instances of hydrologic connectivity including trail crossings from non-system trails exacerbates impacts to the stream because crossings are not managed or designed to properly minimize or mitigate impacts from repeated trail use.

Increased stream sedimentation is associated with the loss of fish species diversity and abundance within Dutchmans Creek, and is reflected in the lower NCIBI values. Because no changes to recreational use patterns are proposed under Alternative A, these impacts from sedimentation would be expected to continue.

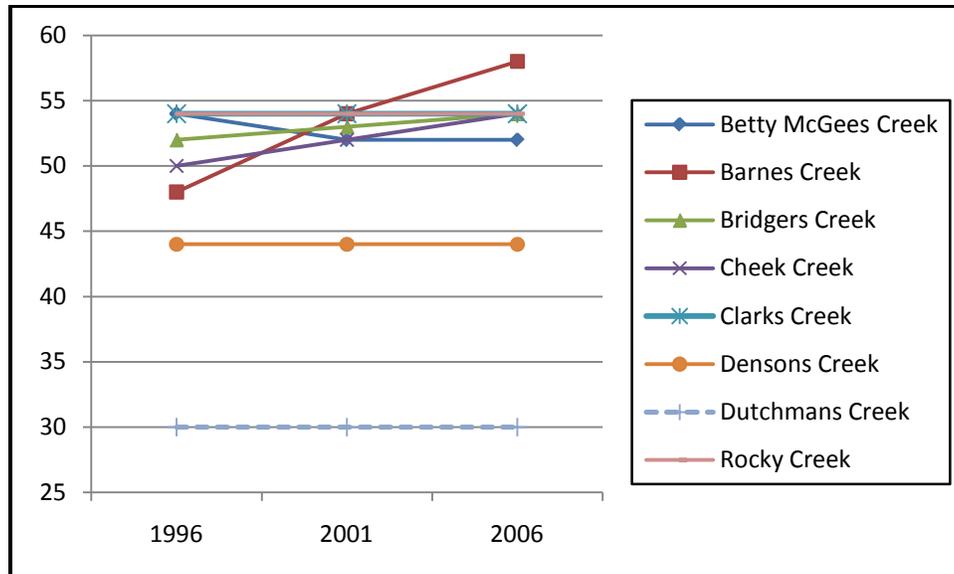
Alternative C proposes a goal to limit mountain bikes to a designated system which would effectively minimize impacts from sedimentation originating from mountain bike trails. However, horseback riding would still be permitted cross-country and there is a potential for user-created stream crossings to negatively affect stream habitat through sedimentation.

Alternative B, which contains a goal to limit horseback riding to a designated system of roads trails and areas, would lessen impacts from this use over time. Alternatives B and C also contain an objective to improve 1,500 linear feet of aquatic habitat where NCIBI ratings are below “good.” Dutchman’s Creek is a likely candidate for this improvement effort. With either Alternative B or C improvement to at least “good” would be expected over the fifteen year life of the plan.

Densons Creek flows mostly through private land north of Troy before flowing through the Uwharrie NF directly behind the ranger station. National forest ownership within the drainage areas for these streams is small in proportion to private ownership, so it is unlikely that the good-

fair rating reflects failure of protection by USDA Forest Service management, but rather is a result of land use and resource impacts on adjacent private land. Because no changes to land ownership and land use patterns are proposed in any of the alternatives, this trend is expected to continue.

Figure 3-10. NCIBI values for sites within the Uwharrie National Forest, 1996-2006



With the implementation of Alternative B or C, it is possible that proposed stream restoration and more focus on recreation management would result in improved NCIBI ratings on the Uwharrie NF; however, these changes would be difficult to detect because of fragmented ownership and private land uses.

Effects to the Benthic Community

Benthic macroinvertebrates (or benthos) are organisms that live in or on the bottom substrates of rivers and streams. These organisms are primarily insect larvae, but also include worms, crustaceans and mollusks. The use of benthos data has proven to be a reliable monitoring tool, as benthic macroinvertebrates are sensitive to subtle changes in habitat and water quality.

Sampling methods and criteria have been developed to assign bioclassifications to benthic samples taken from flowing fresh waters based on the number of taxa present within the generally intolerant species groups of ephemeroptera (mayflies), plecoptera (stoneflies), and trichoptera (caddisflies). This index is known as the EPT index. The North Carolina Biotic Index (NCBI, not to be confused with NCIBI) integrates EPT information with the remainder of the benthic community, and provides an overall assessment of the benthic community. Both the EPT index and NCBI are useful tools to describe benthic community structure and health. A complete description of the EPT and NCBI methods can be found at <http://portal.ncdenr.org/web/wq/ess/bau>.

Benthic community bioclassifications primarily reflect the influence of chemical pollutants. The major physical pollutant, sediment, is not assessed as well by this taxa richness analysis. The EPT and NCBI are extremely useful to assess species diversity and aquatic ecosystem viability. Therefore, it is important to use both fish community and benthic invertebrate community structure indices to assess overall aquatic ecosystem viability.

Benthic community parameters (or metrics) used in the EPT index focus primarily on taxa richness (particularly of intolerant species) and are based on the idea that unstressed streams and rivers have many invertebrate taxa and are dominated by intolerant species. Conversely, polluted streams have fewer numbers of invertebrate taxa and are dominated by more tolerant species. The diversity of the invertebrate fauna is evaluated using taxa richness counts (EPT index). Therefore, the higher the EPT value, the more diverse (or healthy) the stream (Table 3-16).

The NCBI integrates the relative abundance and tolerance of each species, and provides insight into the overall tolerance (or health) of the benthic community. Tolerance values for individual species, and the final NCBI, have a range of 0 to 10, with higher numbers indicating a greater influence of more tolerant species on overall benthic community structure (i.e. more polluted conditions) (Table 3-16).

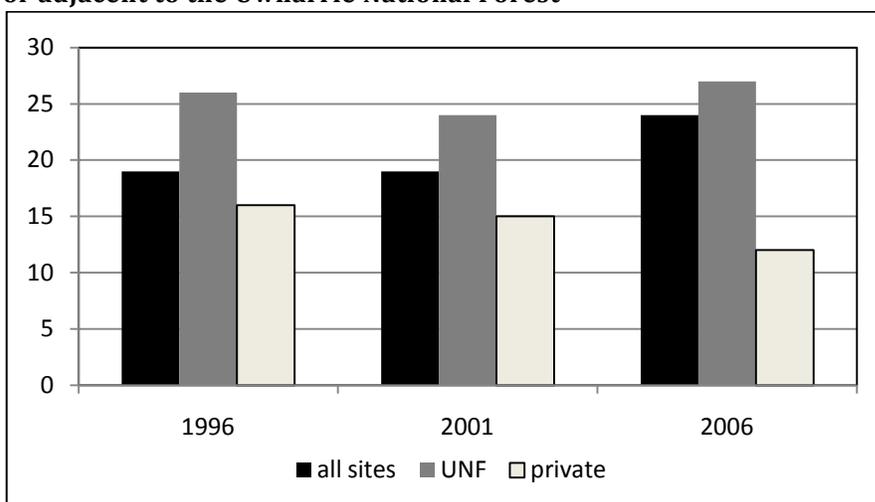
Because it is highly unlikely that any aquatic ecosystem has ever been completely undisturbed, reference values of 27 (EPT index) and 5.19 (NCBI) will be used as the baseline (or historical reference) for the analysis of trends in benthic community structure within the Yadkin-Pee Dee River basin and across the Uwharrie NF.

Table 3-16. Benthos classification criteria for flowing water systems in the Piedmont physiographic region (including the Yadkin-Pee Dee River basin)

Index	Sample Type*	Bioclass	Score
EPT	10-sample qual	Excellent	>31
		Good	24-31
		Good-Fair	16-23
		Fair	8-15
		Poor	0-7
EPT	4-sample EPT	Excellent	>27
		Good	21-27
		Good-Fair	14-20
		Fair	7-13
		Poor	0-6
NCBI (range 0-10)	10-sample qual	Excellent	<5.19
		Good	5.19-
		Good-Fair	5.49-
		Fair	6.49-
		Poor	>7.48

* Note there are two sets of scores for the EPT index, which refers to acceptable sampling protocols. The NCBI uses only one sampling protocol. Each protocol can be referenced at <http://portal.ncdenr.org/web/wq/ess/bau>.

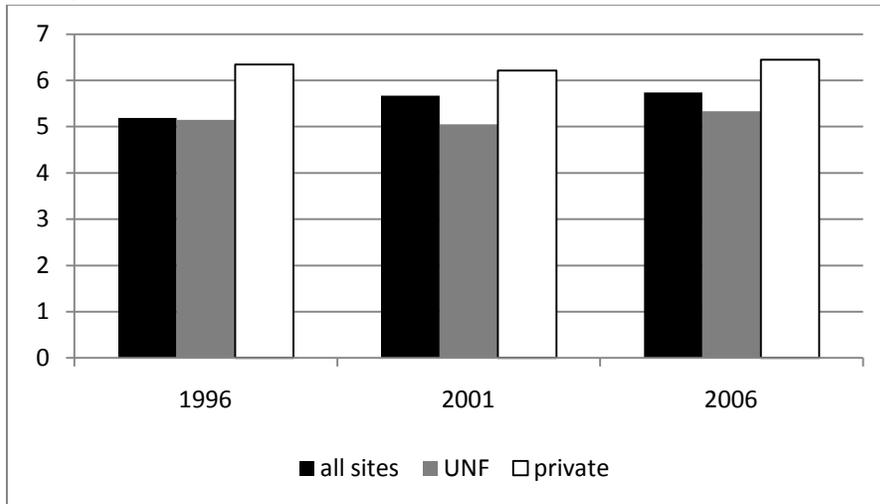
Mean EPT values are higher from sites on the Uwharrie NF (average rating of Good) than across the entire Yadkin-Pee Dee River basin (average rating of Good-Fair), and have remained relatively stable across the basin since 1996 (Figure 3-11). Maintaining an EPT rating of good or excellent for Uwharrie NF streams is the desired condition.

Figure 3-11. Mean EPT values from streams within subbasins of the Yadkin-Pee Dee River basin on or adjacent to the Uwharrie National Forest

Mean NCBI values are slightly lower on sites within the Uwharrie NF (average rating of good-excellent) than on sites across the entire Yadkin-Pee Dee River basin, and have remained relatively stable across the basin since 1996 (Figure 3-12). This is consistent with EPT analysis across the

Uwharrie NF and the Yadkin-Pee Dee River basin, since higher EPT values correspond with lower NCBI values. Maintaining an NCBI rating of good or excellent for Uwharrie NF streams is the desired condition.

Figure 3-12. Mean NCBI values from streams within subbasins of the Yadkin-Pee Dee River basin on or adjacent to the Uwharrie National Forest



Under current management, EPT and NCBI measurements of aquatic invertebrate community health and stability for sites on the Uwharrie NF all rate good or excellent (EPT value of 21 or greater, NCBI of 5.78 or lower), except Clarks Creek and Cheek Creek, both of which have consistently rated good-fair (Figures 3-12 and 3-13). Existing and proposed forest plan standards would continue to protect aquatic communities.

Clarks Creek and Cheek Creek flow through substantial portions of private land before flowing through the Uwharrie NF. EPT and NCBI values are improving; however, national forest ownership within the drainage areas for these streams is small in proportion to private ownership, so it is unlikely that this trend reflects national forest management, but rather is a result of improvements in land use and resource protection on private land. This trend is expected to continue with implementation of any of the alternatives.

Figure 3-13. EPT values for sites within the Uwharrie National Forest, 1996-2006

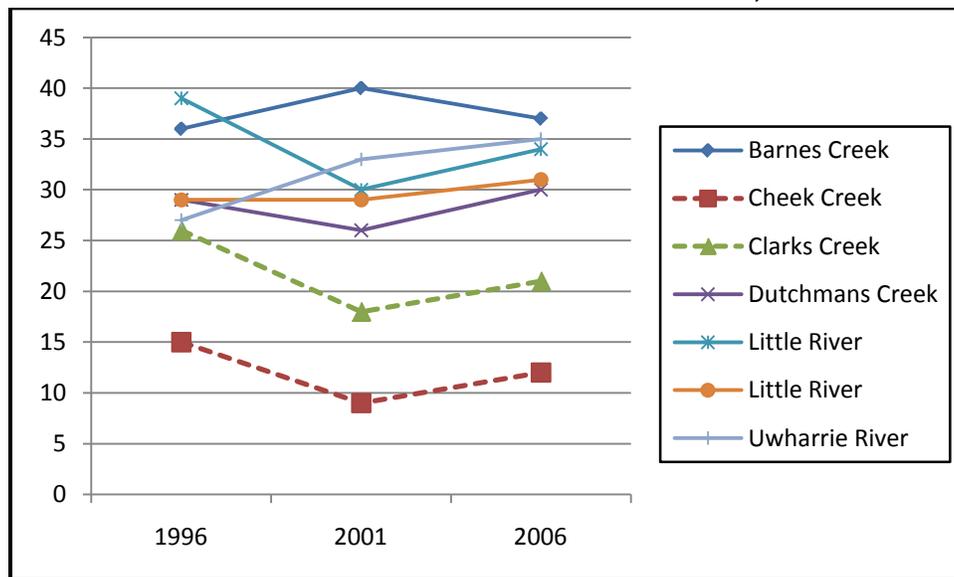
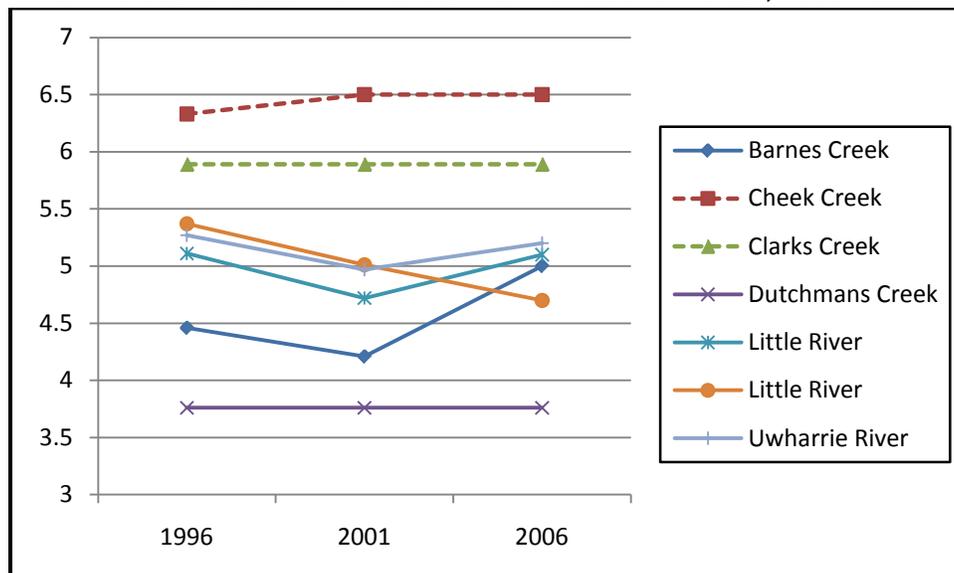


Figure 3-14. NCBI values for sites within the Uwharrie National Forest, 1996-2006



Current ratings of good or excellent for aquatic invertebrate community health and stability are expected to continue with the implementation of Alternatives B or C. Clarks Creek and Cheek Creek, both of which have consistently rated good-fair (Figures 3-12 and 3-13) may be improved with the proposed stream restoration and recreation management emphasis that would be implemented under either Alternative B or C. However, these changes would be difficult to attribute solely to Uwharrie NF management because of fragmented ownership and activities on private land.

Effects to Rare Aquatic Species

Because of fragmented ownership and activities on private land, it is unlikely that implementation of any of the alternatives would result in measurable changes in the distribution and abundance of rare aquatic species, including freshwater mussels. There is no evidence that populations of rare aquatic species are increasing or decreasing as a result of Uwharrie NF management.

Alternatives B and C propose the reintroduction of the Carolina heelsplitter (a freshwater mussel) into suitable habitats on the Uwharrie NF as part of the species' restoration and recovery. Sites on the Uwharrie NF are being studied, as well as sites on adjacent private lands. If the species is relocated to the Uwharrie NF, freshwater mussel diversity (and hence aquatic community diversity) would be enhanced.

Effects to Demand Species

Because of fragmented ownership and activities on private land, it is unlikely that implementation of any of the alternatives would result in measurable changes in the distribution and abundance of aquatic demand species, including small- and largemouth bass. There is no evidence that populations of these species are increasing or decreasing as a result of Uwharrie NF management.

Effects to Significant Aquatic Habitats

Because of fragmented ownership and activities on private land, it is unlikely that implementation of any of the alternatives would result in measurable changes in the condition of significant aquatic habitats (SAHs), including the Little River/Densons Creek and Uwharrie River/Barnes Creek/Caraway Creek SAHs. There is no evidence that these areas are being affected positively or negatively as a result of Uwharrie NF management.

Effects to Aquatic Organism Passage

It is unlikely that implementation of Alternative A would result in measurable reductions in fragmentation of aquatic populations by impassable stream crossings. While it is possible that crossings would be replaced with passable structures under Alternative A during project implementation (to maintain compliance with the Clean Water Act), there is no specific direction requiring crossing replacement solely to improve aquatic organism passage.

Fragmented aquatic habitats in the Badin Lake area can be partly attributed to high levels of recreational use, particularly those uses associated with the dense trail network. A closer look at the trail network within the Badin Lake area identified 187 trail crossings. Approximately 70 (37%) of these crossings are associated with the designated trail system. Use of these trails includes foot, horse, bike, and/or off-road vehicle use. These crossings are "improved" meaning that there is a design in place to minimize stream impacts when properly maintained.

The remaining approximately 117 crossings, (63%), are located on user-created trails, and have no design or structure in place to minimize stream impacts, including aquatic organism passage. Of these crossings, approximately 93 (79%) are associated with cross-country horse travel.

Without remediation, fragmentation of aquatic habitat would continue, jeopardizing the sustainability of healthy aquatic ecosystems. In several streams systems this could occur within the life of the revised forest plan.

Alternatives B and C identify the need to provide for aquatic organism passage to reconnect fragmented populations and expand species' range. As stream crossings are replaced, they would reconnect aquatic populations, especially of smaller, nongame species. Additionally, Alternative B, which contains a goal to limit horseback riding to a designated trails system, would reduce aquatic habitat fragmentation over time. This reduction in fragmentation would be measurable across the Uwharrie NF, but especially within the Badin Lake area, where most crossings are currently impassable to all or part of the aquatic community.

Summary of Effects

Alternative A, the 1986 Plan, incorporates measures to protect aquatic resources, including the recognition of riparian resources and the need to restore or enhance aquatic habitats (LRMP pages II-4 thru II-6, III-8 thru III-9). In addition to adhering to NC Forest Practice Guidelines related to water quality, Alternative A identifies a 33 foot protective buffer, with overstory, along all perennial and intermittent streams.

The Yadkin-Pee Dee Basinwide Assessment Report identifies the Badin Lake area as an area that has been compromised by sediment or chemical pollutants, and where biological indices reflect the loss of species or groups of species (NCDENR 2002, NCDENR 2006). The Forest Service is the primary landowner in this area, with a high amount of recreational use.

Lower biological index values in the Badin Lake area can be partly attributed to high levels of recreational use, particularly those uses associated with the dense trail network. Proximity of a trail to water is related to the potential for chemical impacts and stream sedimentation. However, because vegetated buffers are effective at mitigating stream impacts, proximity may not be a reliable indicator of potential impacts in the absence of hydrologic connectivity data. Points where there is no vegetated buffer and hydrologic connectivity is evident include trail/stream intersections (i.e. trail crossings) and locations where the trail and stream overlap.

Alternatives B and C propose several measures to protect and conserve aquatic resources, including the 33 foot buffer and recognition of a streamside forest management area consisting of approximately 100 feet on either side of all perennial streams, plus any alluvial forest. These alternatives have guidelines to limit road, trail, and fireline construction near streams, and to limit timber harvest to areas in need of restoration or forest health treatments. Other forest management activities may occur with consideration for the streamside forest desired condition, and potential site-specific effects on aquatic resources would be considered during project level analysis.

With Alternatives B and C maintenance of forested habitats and intact riparian areas would retain quality habitat for all aquatic species. Restoration of native forest communities, such as longleaf pine and oak woodlands would provide subtle habitat improvements for aquatic species, but the greatest effect would be from the maintenance of intact, functioning streams and riparian systems. Restoration activities proposed in areas where existing uses or historic mining have degraded

stream habitats (largely through sedimentation, but also loss of pool habitat and functioning riparian areas) would, over the life of the plan, improve habitat for aquatic species by returning stream conditions to a more stable, functioning condition.

Implementation of Alternatives B or C would result in stable to increasing populations of all aquatic species providing for sustainability at the local (i.e. forest) scale. Persistent and consistent implementation of North Carolina Best Management Practices and other buffer requirements (and enforcement of these requirements) across the basin would help ensure the sustainability of these species across the landscape.

Table 3-17. Summary of Effects to the Aquatic Environment.

	Alternative A	Alternative B	Alternative C
Fish community: NCIBI	NCIBI rating of Good or better across Forest, except Densons Creek (Good - FAIR) and Dutchmans Creek (Poor)	Good or better ratings continue across Forest; Densons Creek remain Good -FAIR unless pvt land uses change; Dutchmans Creek improve to Good within life of Plan	Good or better ratings continue across Forest; Densons Creek remain Good -FAIR unless pvt land uses change; Dutchmans Creek improve to Good within life of Plan
Aquatic Invertebrate Community: EPT	EPT rating of Good or better across Forest, except Clarks Creek (Good- Fair) and Cheek Creek (Good -Fair)	Good or better ratings continue across Forest; Clarks Creek and Cheek Creek remain Good - Fair unless private land uses change	Good or better ratings continue across Forest; Clarks Creek and Cheek Creek remain Good - Fair unless private land uses change
Aquatic Invertebrate Community: NCBI	NCBI rating of Good or better across Forest, except Clarks Creek (Good - Fair) and Cheek Creek (Good - Fair)	Good or better ratings continue across Forest; Clarks Creek and Cheek Creek remain Good - Fair unless private land uses change	Good or better ratings continue across Forest; Clarks Creek and Cheek Creek remain Good - Fair unless private land uses change
Aquatic Invertebrate Community: freshwater mussel species	Fifteen native species known to occur	Sixteen native species known to occur (1 species restored) within life of the Plan	Sixteen native species known to occur (1 species restored) within life of the Plan
Aquatic Organism Passage: passable crossings	Four crossings passable to Filters A, B, and C	At least six crossings passable to Filters A, B, and C (potentially more depending on funding) within life of the Plan	At least six crossings passable to Filters A, B, and C (potentially more depending on funding) within life of the Plan

CUMULATIVE EFFECTS

Changes (positive or negative) in aquatic community health or stability are difficult to attribute solely to Uwharrie NF management because of fragmented ownership and activities on private land, except at the most site-specific scale (e.g. point source). An exception to this is the Badin Lake area, where the Forest Service is the primary landowner and recreational use is high.

Predicted changes associated with climate change such as increased frequency of intense storms, increased wildfire risk, and increased outbreaks of insects, diseases, and nonnative pests may affect aquatic resources to varying degrees.

An increase in frequency of intense storms could result in increased flood risk and resultant channel instability which could in turn affect aquatic species distribution. While most populations

are resilient and recolonize quickly, local populations of less mobile species such as freshwater mussels, and species occurring at low frequencies or densities (such as rare species) could be negatively affected, or even lost.

Increased wildfire or outbreaks of insects, diseases, or nonnative pests would likely result in increased tree mortality, including trees within riparian areas. Tree mortality in riparian areas would lead to increased large woody debris (LWD) in stream channels. Increased LWD may accentuate detrimental effects of storm events by altering local hydrology in ways that intensify local streambank instability. More likely, increases in LWD in streams would improve aquatic habitat diversity, which will result in more diverse, stable aquatic populations.

While a loss of tree cover in riparian areas could potentially lead to increased stream temperatures, these increases in water temperature are not expected to have detrimental effects on the aquatic community. Warmwater streams of the Piedmont region are less susceptible to increases in water temperature than cool and coldwater streams of higher elevations.

FOREST HEALTH

AFFECTED ENVIRONMENT

A healthy forest is a forest that possesses the ability to sustain the unique species composition and processes that exist within it. A healthy forest must also be able to accommodate the present and future needs of people for a variety of values, products, and services. A healthy forest can have unhealthy trees, just as an unhealthy forest can have healthy trees. Forest health can be determined on a variety of scales ranging from an entire forest ecosystem to an individual tree. The determination of forest health must be made relative to the species, processes, or resources of interest.

Forest health can be impacted by biotic and/or abiotic stress agents. Stress agents cause a sustained disruption to the normal physiological or structural functioning of a tree. If a disruption is sustained over a long enough period of time, or if it is severe enough, a tree can be harmed or killed. It is important to distinguish between biotic and abiotic stress agents because it determines if the stress can spread and how it is managed. Biotic agents are living organisms including plants, animals, and microorganisms; whereas abiotic agents such as drought, air pollution, fire or herbicides are not living organisms. Biotic agents are infectious and transmissible while abiotic agents are not (NCDFR 2010).

Some of the most likely biotic threats to the Uwharrie NF are discussed below (USDAFS 2010).

Bark Beetles that threaten the Uwharrie NF include the black turpentine beetle, the ips engraver beetle, and the southern pine beetle. Populations of bark beetles rise and fall with little damage some years and greater damage periodically.

1. The southern pine beetle (SPB) is one of the most serious insect pests of pine in the southeast. Smaller than grains of uncooked rice, these hard bodied, dark brown insects

annually destroy millions of dollars worth of timber. Beetle infestations also have negative impacts on recreation areas, shade trees, and general aesthetics. Beetle infestation spots can vary in size from just a few trees to thousands of acres.

The number of generations of beetles per year depends on several factors, including location and weather conditions. Under favorable conditions in the southeast, the beetles can produce as many as seven generations per year, with the average life cycle being completed in as little as a month.

Typically, infestations begin in trees weakened by such stress factors such as disease, lightning strikes, old age, storm damage, or other bark beetles. Once SPBs become well established in stressed trees, they are capable of attacking otherwise vigorous, healthy hosts.

The Uwharrie NF has had several SPB infestations requiring cut and remove treatments of infested areas but not to the extent that the infestations would be considered an outbreak. While SPB infestations come and go across the southeast, the insect is almost always epidemic somewhere in its natural range. The last epidemic in North Carolina was in 2002. Due to the cyclical nature of SPB, the Uwharrie NF will likely continue to sustain periodic losses from the pest. Typically, outbreaks last two to three years, and repeat about every seven years. It is possible that a SPB outbreak could occur in the next few years. Long-term losses may decline with improved management methods that reduce stress on trees by increasing stand diversity through thinning, and restoration of more resistant longleaf pine communities. Better detection can also lead to quicker response time to remove infected trees.

2. Black turpentine beetles attack fresh stumps and the lower trunk of living pines. Initial attacks are generally within 2 feet (60 mm) of the ground. Their life cycle takes from 2 ½ to 4 months to complete, depending on the season and there are two to four generations a year. Natural enemies and good tree vigor generally keep black turpentine beetle populations at low levels. The prompt removal of infested trees also helps to control outbreaks. Forest management practices which promote tree vigor and minimize root and trunk damage help prevent infestations.
3. Ips engraver beetles kill more pine timber in the southeast than any other forest insect, with the exception of the southern pine beetle. Ips beetles usually attack injured, dying, or recently cut trees and fresh logging debris. Infestations are particularly common in trees weakened by drought or lightning strikes, and they may follow black turpentine beetle damage. Preventive control practices include minimizing logging damage to residual stands and quick removal of cut trees.

Gypsy moth, *Lymantria dispar* (L.), is a major defoliator of deciduous hardwood forests. This non-native pest was first introduced from Europe into Massachusetts in 1869 and continues to expand its range west and south each year. Gypsy moth larvae feed on more than 500 species of trees, shrubs, and vines. Favored hosts include oak, apple, birch, basswood, witch hazel, and willow. Hosts moderately favored by gypsy moth include maple, hickory, beech, black cherry, elm, and sassafras.

Defoliation by the gypsy moth may induce oak decline in healthy trees, resulting in reduced growth of shoots and stem, dieback of the crown, a failure in hard mast production, and a sufficiently weakened tree which is susceptible to other diseases.

Gypsy moth has not yet been documented on the Uwharrie NF but is expected to reach the Uwharrie NF by 2015. Pheromone traps are set out each year on the forest to monitor for their occurrence. Defoliation may be extensive and severe when gypsy moth outbreaks do occur.

Fusiform rust is the most important pine disease in the southeast. Approximately 13.8 million acres of slash and loblolly pine show at least 10 percent of the trees infected (4.0 million acres slash, 9.8 million acres loblolly). Fusiform rust infections that occur on the main stem within the first 5 years of a tree's life normally cause tree death. Infections that occur later in the life cycle of the tree weaken the stem, resulting in wind breakage at the canker or quality loss at rotation. Loblolly and slash pine are the most susceptible species. Longleaf pine is fairly resistant, while shortleaf pine is highly resistant. Oak is the alternate host.

USDA Forest Service – Forest Health Protection rates the Uwharrie NF as being “low hazard” for fusiform rust, indicating that while it occurs, it is less common than in the more southern parts of the Piedmont.

Littleleaf disease is the most serious disease of shortleaf pine in the Southern United States. Affected trees have reduced growth rates and usually die within 6 years. The disease is caused by a complex of factors including the fungus *Phytophthora cinnamomi* Rands, low soil nitrogen, and poor internal soil drainage. Often, microscopic roundworms called nematodes and species of the fungal genus *Pythium* are associated with the disease. Shortleaf pine is the most seriously damaged host, with loblolly pine damaged to a lesser extent. Littleleaf disease has also been reported on Virginia, pitch, slash, and longleaf pines.

Randolph County, where part of the Uwharrie NF is located, contains high and moderate risk soils for littleleaf disease (LLD). SPB risk (see above) is closely tied to LLD. LLD risk is a factor anywhere shortleaf pine restoration and management is considered.

Oak decline is a slow-acting disease complex characterized by a gradual, but progressive, dieback of the crown. Mortality typically results after several years, with mature overstory trees the most heavily afflicted. Oak decline has been reported in the United States for over 130 years. It is a syndrome that involves the interaction of predisposing factors such as climate, site quality, and tree age. Drought and insect defoliation escalate the condition. Armillaria root disease and the two-lined chestnut borer, which are ordinarily nonaggressive pests on vigorous trees, successfully attack trees stressed by oak decline. Species in the red oak group are more susceptible to oak decline than the white oaks.

Oak decline will likely increase on the Uwharrie NF, particularly as oak forests continue to age. This seems to be the destiny of oak forests throughout much of the southeast, where harvest and regeneration occur at a low rate. Losses are often heaviest on dry, south-facing slopes, and on shallow soils and rocky outcroppings.

Silvicultural treatments such as mid-story removal and light thinnings (from below) encourage the development of advanced oak regeneration. Subsequent removal of stems with 30% or more dieback can allow young oaks to grow and thus over time maintain the oak component of the forest stand (Clatterbuck and Kauffman 2010).

ENVIRONMENTAL CONSEQUENCES

Gypsy moth: Gypsy moth detection and control would occur under all alternatives. While there is no specific direction regarding gypsy moth in any alternative, all alternatives include direction to maintain healthy forests, and to control insects and diseases.

Bark beetles: Thinning dense stands can reduce the stress on pines that increases a stand's susceptibility to bark beetle infestation. Alternative A calls for 245 acres per year of thinning whereas Alternatives B and C call for 400 acres. Additionally, there is an emphasis in Alternatives B and C on removing loblolly and restoring longleaf pine – which is less susceptible to bark beetles than loblolly. These two actions would result in the Uwharrie NF being somewhat less susceptible to bark beetle infestation with the implementation of Alternative B and C compared to Alternative A.

Littleleaf disease: A small amount of shortleaf pine planting is likely to occur with every alternative, however existing shortleaf on inappropriate sites would begin to be removed with Alternatives B and C. Alternatives B and C also remove loblolly on inappropriate sites, replacing it with longleaf pine or oak-hickory forests. Alternatives B and C should lessen the risk across the national forest in the long term more than Alternative A.

Fusiform rust: The emphasis in Alternatives B and C in removing more susceptible loblolly and restoring longleaf pine would result in a somewhat lower risk hazard across the Uwharrie NF for fusiform rust compared to Alternative A.

Oak decline: Oak decline may continue across the Uwharrie NF under any alternative since regeneration of existing oak stands is not a priority action during this planning period. However Alternatives B and C do provide direction to restore oak-hickory forests in places that are currently occupied by off-site species. Likewise, Alternatives B and C direct that openings be created in oak-hickory stands that would provide for advanced oak regeneration. Alternative A directs that timber harvest may be used to diversify stand ages across the Uwharrie NF, however there is no specific mention of oak-hickory forests. Alternative A is more driven by stand age than forest community type.

CUMULATIVE EFFECTS

Climate change may impact forest health through increased frequency of outbreaks of insects and diseases. Indirectly, increased variation in temperature and moisture can cause stress and increase the susceptibility of forest ecosystems to invasions by insects, diseases, and non-native species. Changed environmental conditions can lead to a different mix of species of plants and animals that

can adapt their biological functions or are aggressive in colonizing new territories (Whitlock 2008). Non-native invasive pests are expected to continue to increase in numbers and extent.

The potential for a changing climate to increase the distribution of forest pests and diseases is a concern, particularly for pests that already cause widespread damage such as southern pine beetles. Higher winter temperatures are expected to increase over-wintering beetle survival rates, and higher annual temperatures will produce more generations each year leading to increased beetle infestations. Other factors, however, complicate projections of future infestation levels. Field research has demonstrated that moderate drought stress increases pine resin production thus reducing colonization success, while severe drought stress reduces resin production and increases pine susceptibility to beetle infestation. Insufficient evidence currently exists to predict which of these factors will control future beetle populations and impacts (McNulty et al., 1998).

PHYSICAL RESOURCES

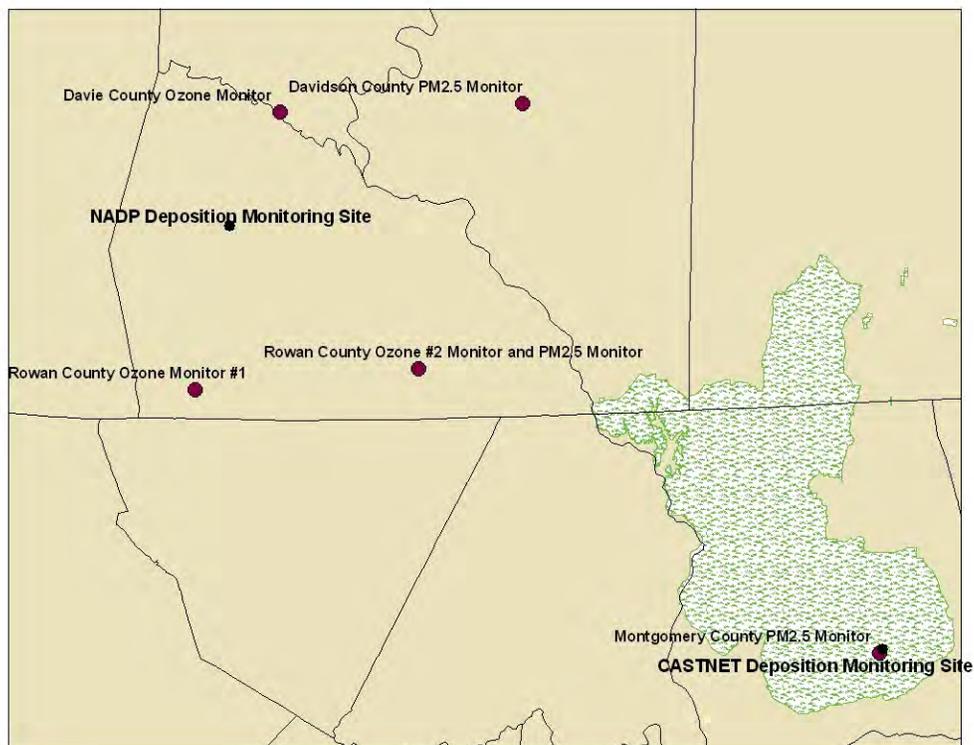
AIR QUALITY

AFFECTED ENVIRONMENT

Attainment status with the National Ambient Air Quality Standards (NAAQS)

There are five air quality monitoring locations near or within the Uwharrie NF. Four of the sites have ozone monitors and these are northwest of the national forest in Rowan and Davidson Counties, and within the national forest in Montgomery County at the CASTNET deposition monitoring site. Two monitors that measure fine particulate matter (PM_{2.5}) are also in Davidson and Rowan County. The map below shows the location of these monitors. The locations of acidic deposition monitoring sites (NAPD) are also shown.

Figure 3-15. Locations of air quality monitoring stations near the Uwharrie NF



Fine particulate matter is the leading cause of regional haze (also known as visibility impairment), while ozone can harm sensitive vegetation within the forest. Additionally, at elevated concentrations these two pollutants can impair the health of both employees and visitors to the national forests. At this time, the Uwharrie NF is attaining the air quality standards for ozone and fine particulate matter.

Figure 3-16 shows the measured ozone concentrations at the four nearby monitoring sites from 2004-2009. The red line is the current ozone standard, while the horizontal yellow bar is the range that has been proposed. Note that each of the ozone monitoring sites near the Uwharrie NF measured concentrations that were above the current and proposed ozone NAAQS. The data are from <http://www.epa.gov/airexplorer/> and <http://www.epa.gov/castnet/index.html>.

Figure 3-16. Ozone trends near the Uwharrie NF

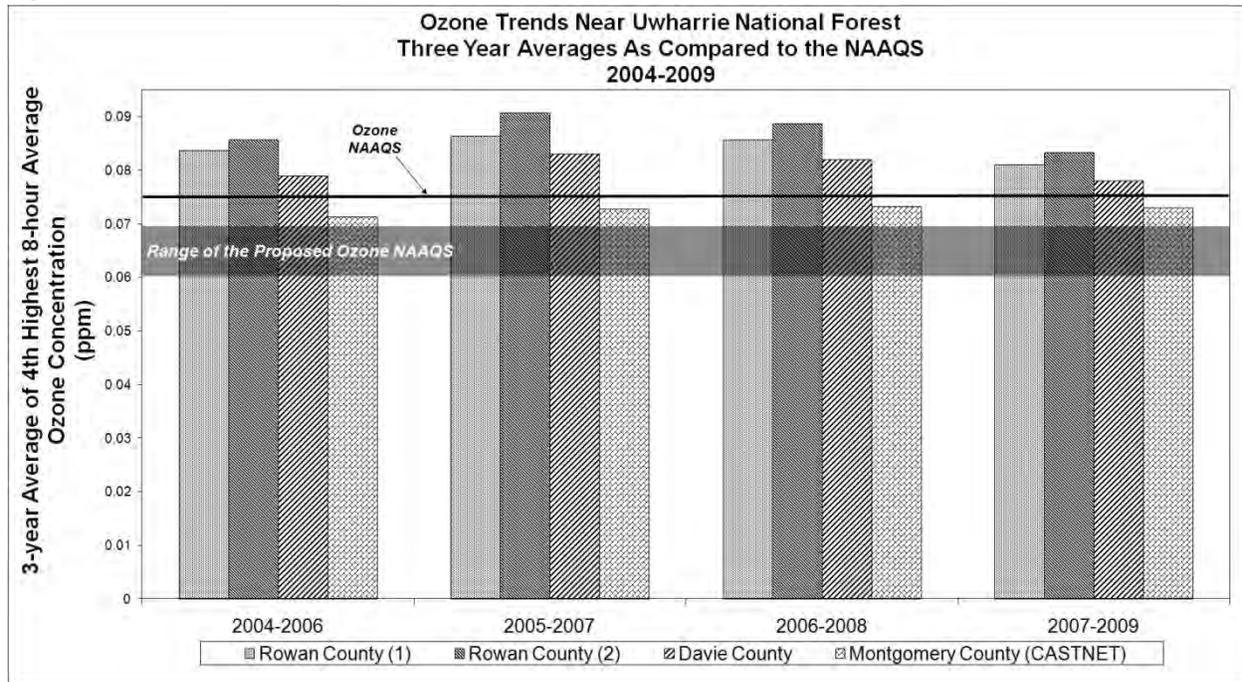
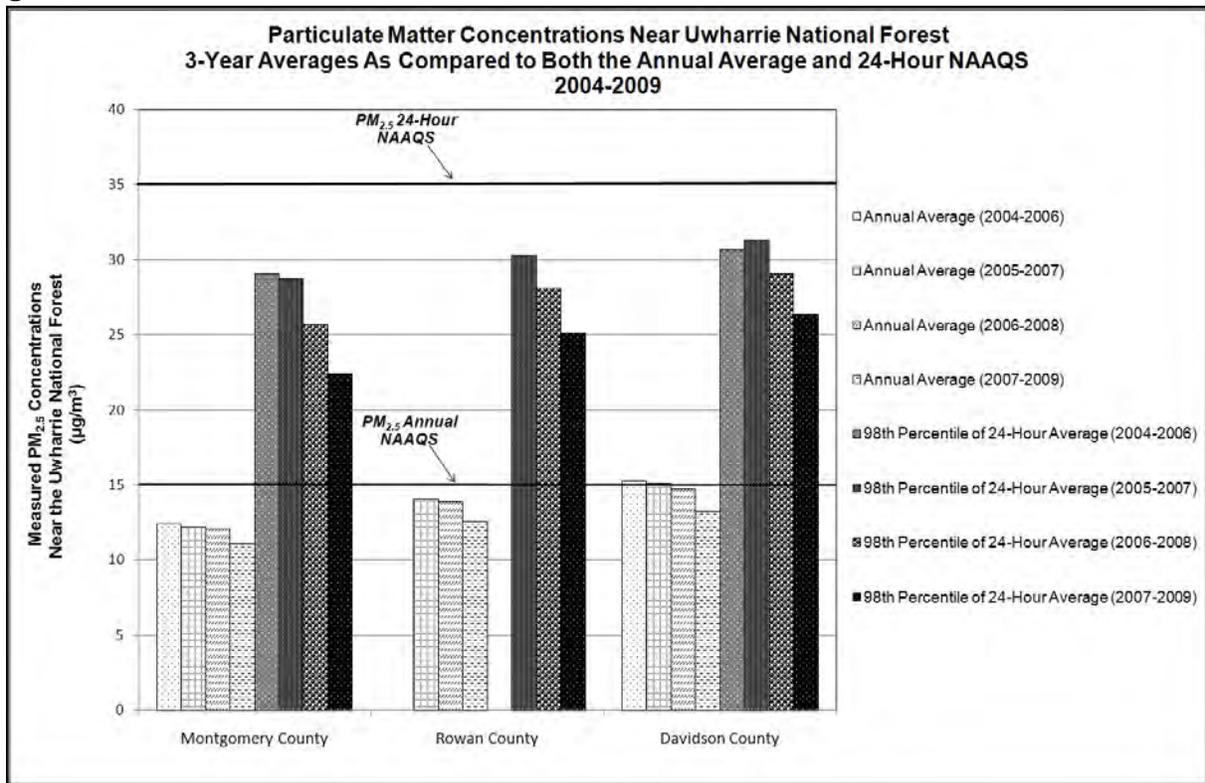


Figure 3-17 shows the measured fine particulate matter concentrations near or within the Uwharrie NF as compared to both the 24-hour and annual NAAQS. The most recent 3-year averages are shown in the columns to the far right; none of the monitors are currently exceeding either the daily or annual NAAQS. The data are from <http://www.epa.gov/airexplorer/>.

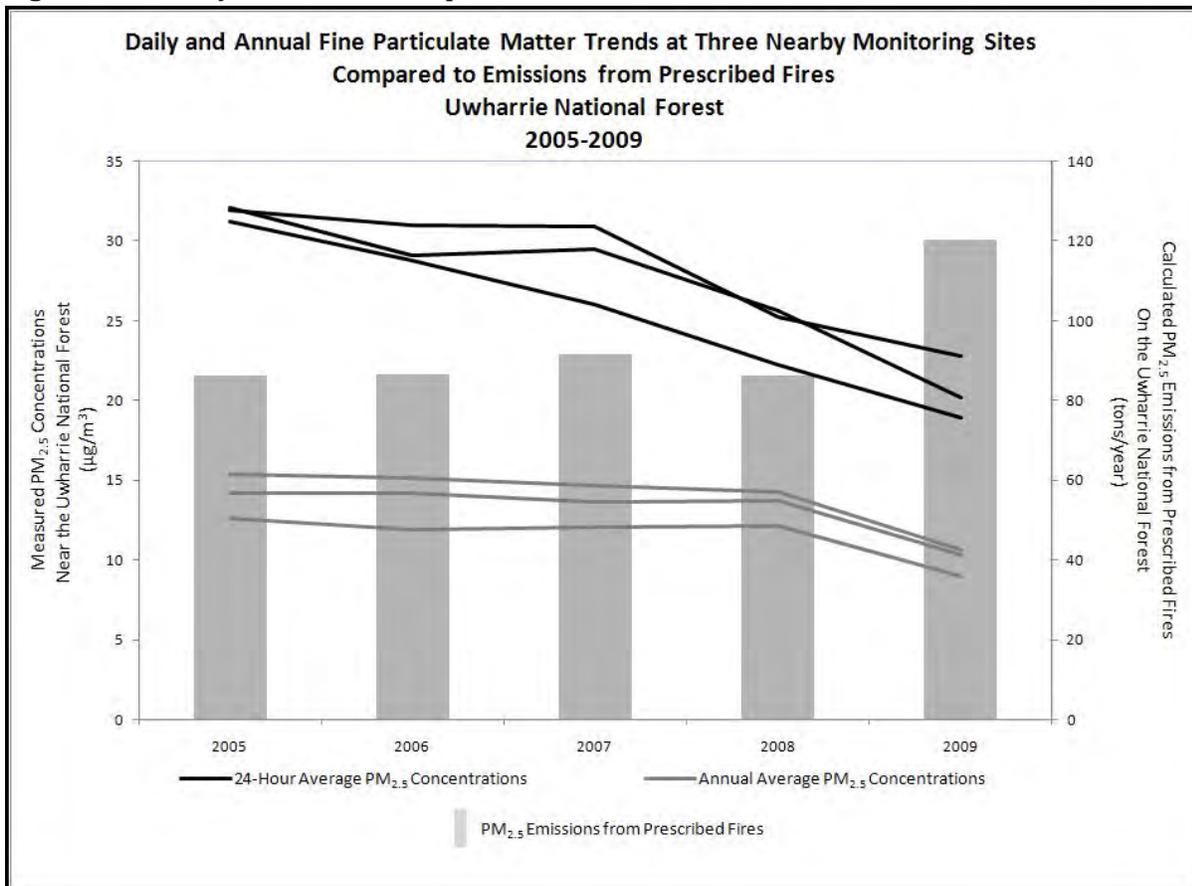
Figure 3-17. Particulate matter concentrations near the Uwharrie NF



Prescribed Fire Emissions

Figure 3-18 displays the daily and annual fine particulate matter concentrations near the Uwharrie NF from 2005 through 2009 as compared to emissions from prescribed fire conducted during that same time period. As shown, local and regional PM_{2.5} concentrations do not appear to be correlated with PM_{2.5} emissions from prescribed fires. Prescribed fire data were obtained from the National Forests in North Carolina Fire Management Officer, while monitoring data were taken from <http://www.epa.gov/airexplorer/>.

Figure 3-18. Daily and annual fine particulate matter trends



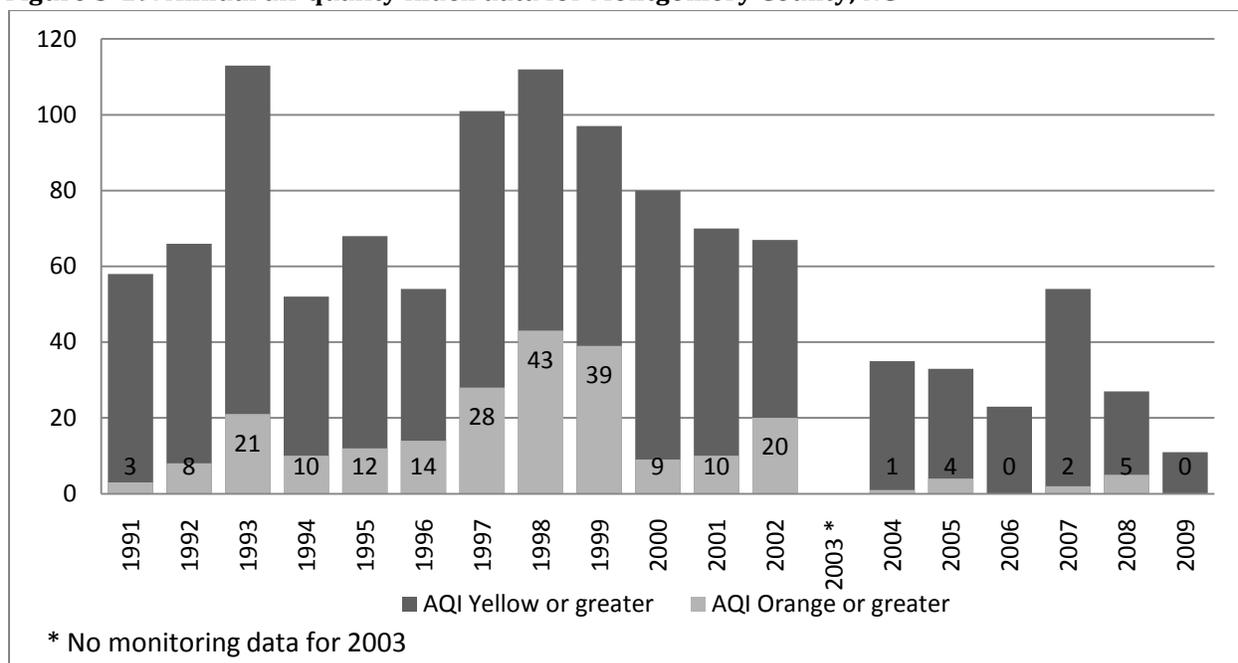
Air Quality Index

The open burning regulation in North Carolina says no prescribed fires can be ignited on a day predicted to have an Air Quality Index (AQI) of code orange or greater. On a day classified as code orange the air quality (based upon fine particulate matter or ozone) is considered unhealthy for sensitive people, while the adjacent and lower category of code yellow is classified as moderate air quality. People who are sensitive to air pollution include those with respiratory or cardiovascular diseases, children, and the elderly. Most of the prescribed fire activity on the national forest will occur in Montgomery County, but the North Carolina Division of Air Quality (NCDAQ) does not provide an AQI forecast for the County. Currently, the NCDAQ does forecast the AQI for both Davidson and Rowan County.

Figure 3-19 presents the number of days each year (starting in 1991, during the months of April through October) that were classified with an AQI of code yellow or orange based on ozone data collected in Montgomery County. Recently, there has been significant reduction in the air pollution emissions that contribute to ozone formation and further emission reductions are anticipated in the future. Since 2004, the number of code orange days has significantly reduced compared to the 1990's. In the future, there is a low likelihood that the national forest will conduct a prescribed fire in Montgomery County on a day that would be classified as code orange (if the ozone NAAQS remains the same) because: (1) ozone concentrations are expected to continue decreasing, and (2)

ozone forms on hot-sunny days with low wind speeds and these types of days are typically a high fire hazard day – a day when prescribed fires should not be ignited.

Figure 3-19. Annual air quality index data for Montgomery County, NC



ENVIRONMENTAL CONSEQUENCES

Alternatives B and C propose more annual acres of prescribed fire and more growing season burning than Alternative A. Therefore, Alternatives B and C would put more particulate matter into the air over time than Alternative A. However, air quality standards would likely be met for all alternatives since burning is not likely to occur when conditions are such that the air quality index is code orange, and since there is no evidence that local and regional fine particulate matter concentrations are correlated with fine particulate matter emissions from Uwharrie NF prescribed fires.

CUMULATIVE EFFECTS

The Clean Air Act requires periodic review of the science upon which the NAAQS are based, as well as the standards themselves. If the science indicates a more protective and stringent air quality standard is necessary in order to protect public health (regardless of the cost of meeting such a standard) or the environment, then EPA will propose and typically finalize the stricter standard. Thus, even if an area meets the current NAAQS, it may not meet future standards if they are strengthened. If a portion of a national forest does not meet the NAAQS and is designated nonattainment, then emissions from federal actions within the national forest (including prescribed burning activities) must be inventoried and assessed to ensure that those emissions do not cause or contribute to worsening of air quality in the region. As EPA is currently reviewing both the ozone and fine particulate matter NAAQS, this is an issue that could occur in the near future.

SOILS

AFFECTED ENVIRONMENT

Soil is a collection of natural bodies that consists of minerals, organic matter and living organisms, and is capable of supporting a wide variety of biological, chemical, and physical processes. Soil is a result of the weathering of parent rock material over extended periods of time. Physical components of soil include various sizes of mineral components, organic matter, water, and air. In order to be soil the natural body must contain living matter. Soil may encompass any given percentage of organic matter, sand, silt, and clay, as well as other particle sizes such as gravel, cobbles, and boulders that may occur in various combinations and depths. Soil horizon development is influenced by climate, living organisms, and relief. Also, soils of the southeastern Piedmont region have been influenced over time by natural events and cultural alterations.

The Uwharrie NF lies within the Piedmont Plateau and includes the Uwharrie Mountains. Soils of the national forest formed from metasedimentary rocks and metavolcanic rocks of the Carolina Slate Belt, triassic rocks, metamorphic rock, mafic rock, and intermediate igneous rock. The Piedmont landscapes are gently to steeply rolling hills. In general, the soils of the Piedmont region have been severely impacted by past cultivation which left soil moderately to severely eroded. However, in the Uwharrie NF the majority of the soils are non-eroded to slightly eroded, with a small percentage of soils considered as moderately eroded. Topsoils in the less eroded areas range in depths from 8 to 12 inches and areas that were once used for agricultural crops or pasture have 5 to 8 inches of topsoil. These topsoil depths are typically thicker than in most of the Piedmont region.

A second order soil survey has been used to delineate and identify specific soil series and their boundaries within the Uwharrie NF. At this level the minimum mapping unit typically ranges from two to eight acres, so local inclusions of other soil types within a mapping unit may be found. There are 42 soil mapping units on the Uwharrie NF. Mapping units have at least 50% of a primary soil series, with the remaining areas consisting of other similar or non-similar soils. Most soils on the Uwharrie NF are upland soils that have a silt texture with various rock fragments. These soils are sensitive to ground disturbing activities and can be highly erosive when exposed.

These soils vary in their physical and chemical properties. Differences in their erosion potential and stability vary with slope steepness, soil moisture, the amount and type of vegetative cover present, and the amount and timing of soil disturbance.

ENVIRONMENTAL CONSEQUENCES

The type of forest management actions that can have an effect on the soil resource are vegetation management, wildlife management, recreation, prescribed fire, and road management. Other activities proposed in the alternatives would affect the soil resources minimally. Ground disturbing activities from forest management practices have the greatest chance of affecting soil productivity

through, rutting, compaction, soil displacement, slope destabilization, and removal of the organic layer.

Rutting is the destruction of the soil structure caused by heavy equipment loading and indentation into the soil surface. During dry conditions, rutting is less frequent and occurs mostly in isolated moist areas, or on primary skid trails where repeated skidder traffic gradually compacts the soil into an indenture in the landscape. When soils are moist and/or wet, rutting can be a problem. Rutting is a highly visible impact of logging and can disrupt the normal hydrological flow of surface and subsurface water. Careful planning of activities will eliminate or minimize this effect.

Compaction is the reduction of soil volume due to an external force such as the use of heavy equipment on moist soils, which results in alteration of soil chemical and physical properties. Soil compaction alters soil structure by decreasing macro pore space and soil porosity. This reduces productivity by retarding root growth as well as air and water/nutrient transfer in the soil. Surface soil recovery from compaction is relatively rapid on sandy soils, but may take decades to recover on soils with clay near the surface unless some form of mitigation is used. Periodic freezing, thawing and fertilization can increase the rate of recovery. Any activity requiring the use of heavy equipment can cause some degree of compaction, but excessive compaction is often related to certain soil types and moisture levels.

Soil displacement is the movement of soil surface material from its original position on the landscape. The displacement typically is small, perhaps a few inches to a few yards and often has a vertical and horizontal component from the original location. It can alter the rich organic and mineral surface soil layer from one place to another through mechanical means (e.g., skidding of logs, blade construction of skid roads, landings, temporary and system roads, ATVs, etc.). It can also accelerate erosion and reduce nutrient supplies, which are all important to plant growth. On saturated soils, soils may reach their plastic limit and displace under the weight of heavy equipment. Excessive activity on saturated soils can also cause soil puddling, which is the breakdown of the soil structure bonds, resulting in soil particle displacement and mixture with water. Puddled soils make a poor growing medium because the pore structure is broken, air permeability is limited, and the soils retain water for extended periods. When dry, puddled soils have lost their soil structure and often develop deep cracks in the soil surface, making a very poor site for plant establishment and growth. Most plants have a difficult time rooting and growing under those conditions.

Slope stability is the capability of a soil to maintain its original position on the slope. Unstable soils in the mountains are typically colluvial soils. These soils are limited in extent, but may contain elevated groundwater or subsurface concentrated flow during wet periods that make them subject to slippage and slumpage when vegetation is removed or slope altering activities such as road construction and skidding are undertaken. This can potentially initiate or accelerate soil mass movement by undercutting, overloading a slope with subsurface water, or disrupting established subsurface drainage patterns. Areas with soil slope stability problems can affect roads, ability to harvest, and other activities.

Erosion is a natural process that dislodges soil particles and moves them. Soil exposure can be a result of natural and human-induced conditions. Exposed surface soil particles move during events with external forces such as rainfall, stormflow, and wind events. Forested soil is an excellent filtering mechanism that may absorb contaminants, preventing their entry into streams. However, when eroded, soil particles may include contaminants and may add to stream pollution upon delivery. Erosion that reaches the stream network is moved as a portion of the total dissolved solids or precipitates out temporarily-to-semi-permanently as sediment. Careful design of activities and use of BMPs can reduce both erosion and sedimentation.

Removal of the organic surface from ground disturbance can temporarily increase erosion and sedimentation. Loss of organic matter can result in disruption to nutrient recycling in the soil and reduced nutrient availability for trees and other plants. Nutrient removal varies with the intensity of the activities and degree of those organic materials that are removed. Removal of the surface materials can be caused by mechanical operations or fire.

These alterations affect the physical, chemical, and biological processes within the soil. Most of these effects go unnoticed, unless a threshold is reached. The application of forest standards and guidelines and the use of Best Management Practices (BMPs) will minimize the impacts on soil productivity and reduce soil erosion when implemented properly and in a timely manner. Productivity loss can typically be reclaimed with treatment, but at a cost and with sometimes years or decades of recovery.

Vegetation Management

Timber Harvesting and Associated Actions

Vegetation management involves various types and intensities of ground disturbing activities that can potentially affect the soil resource. Methods needed to maintain, manage, or manipulate vegetation densities and types include timber harvesting, silviculture treatments, and prescribed fire.

Soil concerns associated with timber harvesting activities and other connected actions center around rutting, compaction, displacement/erosion, soil exposure, organic surface removal, and an overall loss in productivity. Areas subject to compaction include skid trails, temporary roads, and log landings. While subject to many variables, it is estimated that about 10% of a given area harvested by conventional logging equipment (rubber tired skidders/forwarder) is impacted. The potential effects of soil erosion, sediment yield, and compaction have a spatial and temporal context. The amount of effects depends upon the topographic, soil, and climatic characteristics of the affected area along with the intensity of management practices being implemented. Erosion that results from timber harvest would be greatly modified through time in that disturbance would be temporary and generally a single pulse over a long period of time. Research has repeatedly shown that sediment production during timber harvest may accelerate temporarily to about 0.05 to 0.50 tons per acre per year (Patric 1994). Soil disturbance and compaction during timber harvest vary depending upon both the type of soil and harvest method (Swank et al. 1988).

Studies indicate that nutrient loss from timber harvest can be comparable to nutrient inputs, resulting in no long-term reduction of the ecosystem's productive potential (Kimmins 1977, Wells and Jorgensen 1979, Patric 1980). Nutrient losses from timber harvest were found to be small to negligible, with losses such a small fraction of total nutrient capital that site productivity would not be reduced (Sopper 1975). Timber harvest practices occur at infrequent intervals and will generally maintain soil productivity with close attention to and proper implementation of BMPs. Timber harvesting can increase organic material in localized areas by leaving cut tree limbs and tops, and increasing sunlight and soil temperatures on the forest floor, which would in turn as decomposition rates.

Areas that are maintained as or converted into savannas or woodlands would lead to some short-term increase in erosion and sediment. These areas would be burned on fairly frequent cycles. Burning coupled with harvesting would increase sunlight to the forest floor therefore increasing the densities of native plants and grasses in the understory. Once developed, native grasses have dense root networks that help to increase soil development, organic content, and productivity. Native grasses would help provide erosion control.

Fire

Fire effects on soil properties and processes is quite varied, depending largely on fire intensity, fire severity, temperature, fuel type and amount, soil moisture, and other factors. Fire generally affects soil erodibility if mineral soil is exposed. Reports show little to no erosion after light to moderate intensity fires in the southeastern United States (Swift et al. 1993). However, burns with previous soil disturbance, activities such as skidding of logs would increase the probability of soil erosion after burning (Swift et al. 1993). Effects to the organic layers and soil organisms depend greatly on heat penetration into the soil. Heat penetration depends upon the duration of the fire and soil moisture (Swift et al. 1993). Prescribed fire activities have the potential to increase the solubility of some cations in the forest floor, but would not diminish water quality (Knoepp et al. 2004).

Prescribe fires are in general designed to burn with less intensity and with minimal effects to soil by removing vegetative cover and litter, while protecting the duff and humus layers of the soil. In some cases prescribed fire may result in a severe burn where all or nearly all of the litter, duff, and humus layers would be consumed and mineral soil exposed. Severe burning can affect the soil biota, structure, organic matter, and fertility. Removal of the duff and humus layers can potentially lead to accelerated erosion and a disruption in the nutrient cycling. Overall, published scientific studies have concluded that prescribed fire, implemented under managed or controlled conditions, have negligible effects on the physical, chemical, and biological properties of soils and soil productivity (Ralston and Hatchell 1971, Johnson and Cole 1977, Kodama and Van Lear 1980, Richter, Ralston, and Harms 1982, Douglas and Van Lear, 1982, Van Lear and Johnson 1983, Van Lear 1985, Van Lear and Danielovich 1988, Sanders and Van Lear 1988, Van Lear, Thomas, and Waldrop 1989, Van Lear and Kapeluch 1989).

Connected actions with prescribed fire include the potential construction of bladed or plowed firelines. Fireline blading or plowing exposes the mineral soil by removing vegetation, leaf litter and duff. Blading or plowing would increase the exposed area's susceptibility to soil erosion and displacement of nutrients and organic matter offsite. Firelines can recover quickly when they

accumulate litter from a forest canopy and are treated with erosion control measures to control concentrated flow and reduce soil exposure through revegetation efforts. Firelines that are needed for frequent or regular burning cycles are designed and maintained to provide for both long term use and ability to control concentrated flow and erosion by employing relatively permanent drainage dips, reverse grades, out-sloping and lead-off ditches along with reinstalling and maintaining of other erosion control measures when not used.

Wildlife Management

A variety of treatments are used to manipulate vegetation to meet specific wildlife viability, habitat, public hunting, or observation activities. Areas where timber harvesting/silviculture treatments and prescribed fire are used for wildlife management are covered in the above sections. Effects covered under this section include the creation and maintenance of wildlife fields, openings, and ephemeral pools.

For wildlife openings and linear wildlife strips, annual to periodic disking is common on some areas. Disking at regular intervals can cause excessive erosion and productivity losses. These adverse effects are at acceptable levels normally by limiting these activities to slopes less than 10%. The use of fertilization would be used to help maintain productivity. Additional measures such as no till, contour farming, or leave strips can be used to further reduce soil exposure or concentrated flow that contributes to erosion. Fewer disturbances such as disking would be needed in areas converted to native grasses therefore the potential to impact the soil resources in those areas would be less.

Some of the soils on the forest are not suited for creating ephemeral pools. Effects from the creation of ephemeral pools on flat ground would be minimal. Great care would be taken to avoid unstable soils on slopes, fill slopes and other areas that could be hydraulically overloaded, resulting in failure. Direct effects will be the removal of the surface soil horizons, and an increase in water retention within the localized area. There would be some soil displacement from the removed soil. Indirect effects may be an eventual change from aerobic to anaerobic conditions of the soil within the wetland. This would depend on how well the depression holds water. Soil types that lack enough clay to support surface water would only hold water for a short duration of time.

Vegetation Management by Alternative

The potential for the soil resource to be effected from timber harvesting/silviculture treatments and their associated actions would be less in Alternatives B and C than in Alternative A. An increase in the use of fire in Alternatives B and C would indicate a higher probability that soils would be affected from fire than in Alternative A.

There is a greater potential for affecting the soil resources through wildlife opening creation in Alternative A. Alternatives B and C do not include any additional wildlife openings and some of the current openings would be converted into areas of native grasses which would also lead to an overall decrease in soil impacts.

Recreation Management

Trails

Recreational trails impact the soil resources to various degrees depending on trail location, type of users, maintenance methods, maintenance rotation, and amount of use. Impacts include rutting, soil compaction, erosion, sedimentation, and loss of vegetation. With the creation of new trails, surface soil layers and vegetation would be removed from the tread path increasing the potential for erosion to occur within the trail tread. Erosion potential would be greater on sections located on steeper slopes, trail sections located in areas with coarse or silty soil material, and areas void of overstory vegetation. Trails would be designed so that the trail contours with the terrain which would decrease erosion potential. The trail tread degrades more rapidly if travelled when soil moisture levels are high. Silty and sandy soils are more erodible and rutting can become a problem if traveled while wet. Rutting over time can accelerate erosion by entrenching the trail and concentrating water which would increase maintenance needs. The trail tread would also become compacted as use increased. Proper maintenance is essential to decrease the effects to the soil resource. Horses and OHVs would cause more soil compaction, rutting, and displacement than hikers and bikers. Horse and OHV trails usually degrade more rapidly than hiking and biking trails.

Designated trails are planned and designed to minimize the impacts to the soil resource by locating them on adequate grades with water diversion structures, proper slopes and stable soils. They are maintained to minimize erosion and off-site soil movement. Soil compaction, displacement, failure, rutting and erosion are some of the impacts that are minimized by properly designing designated trails.

User-created trails have more potential for erosion and sediment entering the stream because of their location and lack of design and maintenance. As a result, they are periodically eroded during storm and flood events and become more entrenched over time, as well as more efficient at eroding and delivering sediment.

Recreation Areas

Developed recreation areas would have minimal effects to the soil resource. Most impacts would come from the construction period. Developed areas are designed to limit effects to resources within a certain level of use.

Dispersed recreation areas would have more impact on the soil resources. Concerns with dispersed campsites are associated with the number of sites, their lack of design and maintenance, and their frequently close proximity to surface water. Dispersed areas that are within riparian areas are more likely to erode during storm events or periods of flooding.

Soil disturbance and compaction combined with erosion, exposes roots of vegetation leaving them susceptible to damage. This leads to vegetation die-back or decline and the expansion of the site over-time. Campers often try to get off the eroded portion of the site back onto areas with some ground cover and vegetation. As sites deteriorate, they become less attractive for use and there is the potential for new sites to be created or for existing areas to be expanded if mitigation measures

are not utilized. With extended periods of non-use, there is potential that some sites might be rehabilitated or restored to levels that they could again be re-used for a period of time.

Recreation Management by Alternative

Recreation management direction in Alternative A is limited while Alternatives B and C make recreation management a major emphasis area. In Alternative A there are no goals to restrict horseback riding or mountain biking to designated trails. Alternative B includes a goal to eventually limit horse use and mountain bike use to a designated trail system. Alternative C retains the goal to limit mountain bikes to a designated system but not horseback riding. Therefore Alternative B would have the least impact to soil from recreation. Alternative A and C would have similar impacts, with Alternative C having slightly less due to a goal to limit mountain bikes to designated trails.

Roads

Roads expose and compact soils, concentrate runoff, and alter surface and subsurface water flow patterns. Open roads contribute higher erosion and sedimentation rates due to ongoing maintenance activities.

Road maintenance operations such as blading the road surface and pulling the ditches can lead to increases in soil erosion and increases in sedimentation. During road maintenance activities, soil may be displaced and exposed. Soil movement would occur, however, mitigation measures designed to stabilize the road surface, such as adding aggregate surfacing by armoring the soil or limiting distance and amount of concentrated flow by installing water diversion devices (dips, reverse grades, outlopes, leadoff ditches, culverts) would reduce adverse effects. The detachment and distance soil particles move would be reduced by limiting water concentration and movement on disturbed surfaces and/or fill materials.

Some soil types are better suited for road building. Proper location of roads would reduce the risk of road failure. Adherence to forest plan standards and guidelines would reduce the effects to the soil resource.

Decommissioning roads allows the soil building process to begin on the road surface. As soils develop vegetative growth enhances. This process allows decommissioned roads to recover to a more natural state over time.

Roads by Alternative

In Alternative A there would be a potential for up to 2 miles of system roads developed each year. In Alternative B and C little of no new system road construction is anticipated which would reduce the soil resource impact potential. Temporary roads for timber harvesting could be developed under each alternative though there would be fewer with Alternatives B and C than Alternative A since the amount of harvest is higher in Alternative A. A description of those effects is covered in the vegetation management section.

CUMULATIVE EFFECTS

Effects to soils generally occur because of ground disturbing activities. Cumulative effects from past and present activities generally result in a localized loss in soil productivity due to compaction, rutting, soil displacement, erosion, unstable slopes, or the soils nutrient status. The forest management activities with the greatest long-term potential impact to soils are associated with construction of roads, log landings, primary skid roads, timber harvest on steep slopes using conventional equipment, and actively cultivated wildlife openings. Most soil effects occur on-site or on areas nearby. Therefore, these effects will concentrate on what is happening to the soils on the national forest and immediately adjacent areas, and not be discussed at landscape or watershed scales.

Impacts on soils resulting from timber harvests normally recover before a new cycle of harvesting begins, and as a result, cumulative impacts relative to compaction and displacement from successive harvesting operations would be expected to be minimal. Areas that are repeatedly used for logging decks and skid trails have the potential to suffer more continuous periods of decreased soil productivity and decreased water infiltration. Although rehabilitation of these sites decreases the duration of the recovery period for soils and lessens the potential for cumulative degradation of soil conditions, the re-opening and use of these areas during successive harvest operations generally results in some decreased soil quality on these sites. Areas having temporary productivity losses would be dispersed across timber harvests and would be a small fraction of the overall area.

Rocky or coarse sandy soils show limited effects from compaction. Clay soils tend to hold water and displace rather than compact. However, the silt dominated soils tend to provide the most problem.

Where affected areas are not adequately restored following compaction, soil density will slowly revert to normal levels based on the frequency of freeze-thaw cycles, plant root penetration, soil microorganisms, earthworms, moles, etc. It would not be unusual to expect some effects of the soil compaction to linger for decades if treatments are not employed to break up the compaction.

Cumulative impacts on soil productivity relative to organic surface removal, compaction, displacement and subsequent erosion from past prescribed burning and connected actions are considered minimal for the majority of areas. Soil would recover over time depending on burn severity. Severely burned areas lose productivity and are subject to erosion.

For roads and rights-of-way, activities are performed to ensure the safety of the public and to prevent degradation of infrastructure and the environment. Road maintenance operations such as blading the road surface and pulling the ditches can lead to increases in soil erosion and increases in sediment production. However, these operations may be combined with structural improvements and improvements to drainage structures which reduce soil erosion and sediment production from the road surfaces over the long term.

Disking wildlife openings at regular intervals can cause excessive erosion and productivity loss. Limiting these activities to lesser slopes, vegetating, and fertilizing would keep these adverse effects

at acceptable levels. These activities are dispersed throughout the forest and effects would be localized.

Overall, Alternative A proposes more activities that have the potential to decrease soil productivity compared to Alternatives B and C. Activities proposed in Alternative B would impact soil productivity the least of all alternatives. However, fire would be used on a much larger scale; this increase in prescribed fire would increase the potential to impact soil productivity from severe burns, however the potential remains small. As long as fire is used within the USDA Forest Service parameters this would not change the cumulative effects. Alternative C is similar to Alternative B with the exception of allowing horseback riding throughout the forest. Unplanned horse trails would increase the potential for soil disturbance to occur.

Cumulatively, environmental consequences to soils from past, present, and foreseeable actions are minimized through careful planning, design, implementation, and monitoring. Most adverse impacts will be low-to-moderate.

WATER RESOURCES

AFFECTED ENVIRONMENT

The Uwharrie NF is located within seven 5th level watersheds within the Yadkin-Pee Dee and Cape Fear Basins of the Piedmont physiographic province. Public land management by the USDA Forest Service is approximately 51,000 acres with almost all within the Yadkin-Pee Dee Basin.

Approximately 160 miles of streams flow through the national forest. The landscape of the Uwharrie NF drains into two major river systems of the Yadkin-Pee Dee Basin, including the Uwharrie River and the Little River, and several smaller drainages like Clarks Creek and the drainages that flow directly into the Yadkin-Pee Dee River, Badin Lake, and Lake Tillery. Within the Cape Fear Basin, federal land drains into several headwater streams for Richland and Fork Creeks, both tributaries to Deep River. Table 3-18 shows the hydrologic unit codes, watershed names, proportion that is national forest, and stream miles.

Table 3-18. Sixth Level Hydrologic Unit Code (HUC) Watersheds within the Uwharrie NF Proclamation Boundary and/amount of available aquatic habitat based on surface ownership.

6th level HUC	Watershed Name	HUC area (acres)	Uwharrie NF area (acres)	% Uwharrie NF land	HUC streams (miles)	Uwharrie NF Streams (miles)	% Uwharrie NF Streams
03030003020040	Richland Creek	18,031.12	187.67	1.04	65.45	1.87	2.85
03030003020060	Fork Creek	30,747.78	249.46	0.81	131.92	2.72	2.06
03040103050070	Upper Uwharrie	41,170.56	5,548.61	13.48	155.08	2.56	1.65

6th level HUC	Watershed Name	HUC area (acres)	Uwharrie NF area (acres)	% Uwharrie NF land	HUC streams (miles)	Uwharrie NF Streams (miles)	% Uwharrie NF Streams
03040103050080	Middle Uwharrie	44,712.44	8,341.35	18.66	183.67	27.32	14.87
03040103050090	Lower Uwharrie	19,936.76	11,353.97	56.95	77.63	10.41	13.41
03040103050110	Badin Lake	23,682.35	3,606.23	15.23	752.34	12.44	1.65
03040103050130	Dutch John Creek	6,196.53	3,520.75	56.82	39.89	3.08	7.73
03040104020010	Pee Dee River	18,234.76	4,340.60	23.80	54.50	4.86	8.91
03040104020020	Clark's Creek	21,326.80	1,124.78	5.27	54.42	14.68	26.98
03040104030010	Upper Little River	44,092.89	1,412.63	3.20	205.18	0.56	0.28
03040104030020	Barnes Creek	23,724.24	432.07	1.83	108.51	39.59	36.49
03040104030030	Denson's Creek	22,051.48	1,281.76	5.81	97.76	0.00	0.00
03040104040010	Middle Little River	31,360.43	2,831.68	9.03	138.38	20.18	14.58
03040104040020	Rocky Creek	19,313.57	3,689.77	19.1	95.55	5.11	5.35
03040104040030	Lower Little River	27,573.20	428.33	1.55	92.83	8.95	9.64
03040104040040	Dick's Creek	5,498.46	0	0	6.50	0.00	0.00
03040104050010	Cheek Creek	20,861.78	2,328.38	11.16	61.09	6.00	9.82

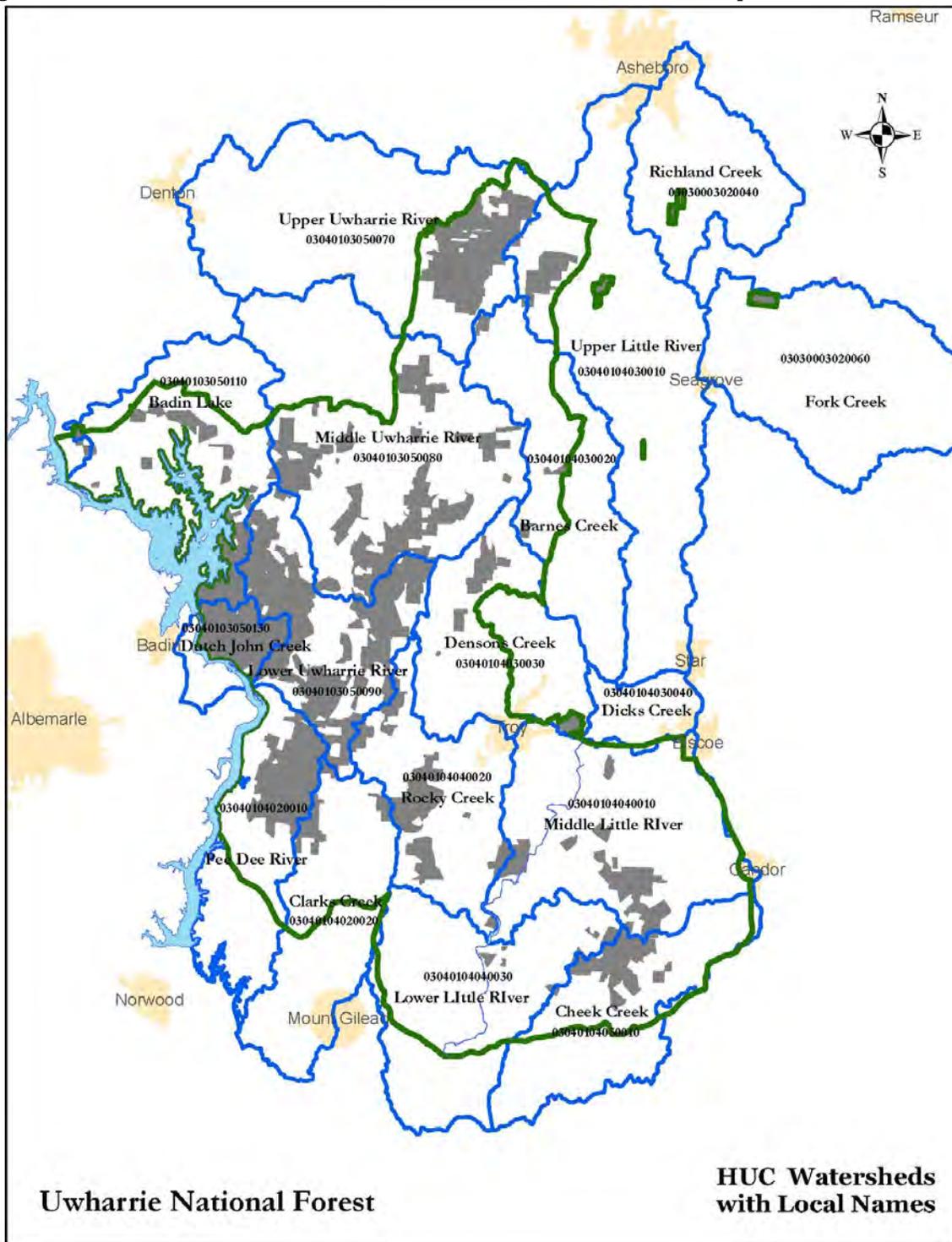
Note: **Bold type** indicates those watersheds where more than 50 percent of the land is national forest. These two watersheds are in the Badin area.

The intermingled public and private land ownership pattern means that stream condition is often an outcome of land use on adjacent private lands. The condition of stream channels across the national forest varies. There are many unstable stream channels that exhibit a lack of in-stream large wood, loss of floodplain area, stream bank erosion, downcutting, or visible channel scour. These conditions are largely the legacy of mining, agricultural, and timber practices along with railroad and road development that took place prior to federal acquisition. Channel stability can often be improved with various stream restoration techniques.

Streamflow within the Piedmont region depends largely on rainfall since winter precipitation is dominated by rain rather than snowfall. Snowfall does occur in small amounts between November and March. About 46 inches of precipitation falls in the region each year, with 68% returning to the atmosphere through evapotranspiration and 32% ending up as stream runoff. There is little local demand for water supply from the Uwharrie NF, presumably due to low populations in the three-county area.

Water quality is classified based on a system of designated “best uses” of water. The best uses of water are designated by the State of North Carolina, Division of Water Quality (DWQ), for all state waters, including those on the Uwharrie NF. All surface waters in North Carolina are assigned a primary classification to protect those best uses, and all waters in North Carolina must at least meet the standards for Class C (fishable/swimmable) waters. Class C waters are protected for the following uses: secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, agriculture and other suitable uses, however there are no restrictions on watershed development or types of discharges into these waters. The other primary classifications provide additional levels of protection: (1) water contact recreation (Class B) and (2) drinking water (Water Supply Classes I through V).

Figure 3-20. Uwharrie NF HUC Watersheds. Green line is the Uwharrie proclamation boundary



Within the Uwharrie River drainage many streams are classified as sources of water supply, defined by Water Supply (WS) – IV. WS-IV waters are typically located within developed drainages and are to be protected for drinking, culinary, or food-processing purposes in addition to uses provided by Class C. Barnes Creek and several of its tributaries are classified as Outstanding Resource Waters (ORW). Outstanding Resource Waters are considered unique and special surface waters of the state that are in exceptional condition or are of national recreational or ecological significance. Within the Little River drainage no streams are classified as water supply, but many are classified as High Quality Waters (HQW), particularly in the Denson’s Creek drainage. These waters are rated as having excellent biological and physical/chemical characteristics. Within the area draining directly into the Yadkin-Pee Dee River, Badin Lake, and Lake Tillery, many streams are classified as sources of water supply, defined as WS-IV. In addition to WS-IV, Dutch John Creek is given an elevated primary classification of Class B to protect waters for primary recreation, which includes swimming on a frequent or organized basis.

The North Carolina Department of Environment and Natural Resources (NCDENR) – Division of Water Quality has responsibility for listing the state’s impaired waters on the annual 303d list. On the NCDENR website (<http://portal.ncdenr.org/web/wq/ps/mtu/assessment>) there is a statement that “all waters in North Carolina are in Category 5-303(d) List for mercury due to statewide fish consumption advice for several fish species.” The majority of the mercury within the streams and water bodies of North Carolina come from emissions from coal fired power plants (http://daq.state.nc.us/planning/AQMP_Presentation_06082009.pdf). The mercury issues are not a result of land management on the Uwharrie NF and past or future management of the national forest would not affect the mercury levels. All streams within the Uwharrie NF boundary are currently identified by the state as meeting state water quality criteria except for the mercury standard. There are some sections of the Pee Dee River that are downstream from the national forest that are listed for low dissolved oxygen and low pH. These sections of the Pee Dee River are outside of the proclamation boundary of the Uwharrie NF and are from the Norwood Dam to the Rocky River. The management of the dam can affect the levels of dissolved oxygen and pH in the river by minimizing flows downstream which affects the aeration and the pH of the water.

Valley types of the Uwharrie NF are of very low to moderate relief, with valley gradients typically less than 5 percent. Valley stream bottoms are typically wide relative to channel width and allow for channel meandering and floodplain access under natural conditions. Stream types, characterized by the Rosgen Stream Classification System (1996), are typically “B” types in the headwaters that transition into “C” or “E” types lower in the drainage. B type channels are generally step-pool systems with slight to moderate meanders and small to moderately wide floodplains. B channel types are sediment transporting streams. C and E type channels are low gradient, meandering, depositional channels that have very wide floodplains (100 feet or greater). These channels are what is generally visualized when someone pictures a wide valley with a meandering stream. The main difference between a C and an E type stream is that C channels develop point bars as sediment deposits on the inside curves of the meanders and E channels are deep and narrow and do not create point bars. Stream substrates can range in size from sand to bedrock, and banks are typically a mix of sizes from silt/clay to boulder. Streambank vegetation

and in-stream large woody debris are important in many of these stream channels to promote stability and habitat diversity for aquatic species.

Hill slopes are typically low to moderate (< 50 percent) and are mostly stable without mass movement. Thus, natural sediment regime would have few inputs from the terrestrial environment, but be driven by fluvial (river and stream) activity. Flooding and in-stream erosion would be the main contributor to sediment in the stream network. It is only when slopes are disturbed by such things as roads, trails, tree blowdown, or streams undercutting the toe of slopes that movement of soil is accelerated beyond the slow process of soil creep.

The Uwharrie NF is also an access point for Badin Lake, a 5,350 acre utility-owned reservoir. Streams feeding Badin Lake originate on both public and private land. While the hydropower generated is used by Alcoa or sold on the open market, the lake provides multiple recreation opportunities on the national forest including boating, fishing, swimming, skiing and hunting. The Badin Lake area has the highest concentration of recreation use on the national forest and the most recreation trails.

How Roads and Trails Affect Water Resources

Road and Trail Density

Roads and trails have three main effects on water: (1) they intercept rainfall directly on the road or trail surface and cut banks and subsurface water moving down the hill slope or springs; (2) they concentrate flow, either on the surface or in an adjacent ditch or channel; and (3) they divert or reroute water from normal flow paths. Increasing road and trail density increases the impacts to a watershed and its waterways. For example, by intercepting surface and subsurface flow, and concentrating it into culverts, ditches, gullies, and channels, road and trails effectively increase the density of streams on the landscape; thereby changing the amount of time it takes for water to enter a stream channel, and altering the timing of peak flows. Usually this change leads to a quicker runoff response time (i.e. “flashier” flow response). As road and trail density increases within a watershed the flashier the stream flow becomes because there is less infiltration and percolation into the soil and more runoff reaching stream channels. Table 3-19 shows the range of road and trail density for the watersheds within the Uwharrie NF. Generally, road and trail density of 2 to 3 km/km², which is equivalent to a road and trail density of 3.22 to 4.83 mi/ mi², appears to be the maximum for a naturally functioning landscape (Foreman and Alexander 1998; Malecki 2005).

Table 3-19. Authorized Road and Trail Miles by Watershed Area in Miles² and Road and Trail Density by Watershed in mi/mi²

Hydrologic Unit Code	Watershed Name	Watershed Area (mi ²)	Road & Trails*/Watershed (mi)	Road & Trail Density (mi/mi ²)
03030003020040	Richland Creek	28.17	10.49	0.37
03030003020060	Fork Creek	48.04	8.7	0.18
03040103050070	Upper Uwharrie River	64.33	36.55	0.57
03040103050080	Middle Uwharrie River	69.86	86.49	1.24
03040103050090	Lower Uwharrie River	31.15	91.14	2.93
03040103050110	Badin Lake	37.0	55.76	1.51
03040103050130	Dutch John Creek	9.68	37.79	3.90
03040104020010	Pee Dee River	28.49	51.19	1.80
03040104020020	Clarks Creek	33.32	28.90	0.87
03040104030010	Upper Little River	68.89	48.72	0.71
03040104030020	Barnes Creek	37.07	32.53	0.88
03040104030030	Denson's Creek	34.46	36.62	1.06
03040104040010	Middle Little River	49.0	49.47	1.01
03040104040020	Rocky Creek	30.18	54.54	1.81
03040104040030	Lower Little River	43.08	30.64	0.71
03040104030040	Dick's Creek	8.59	2.39	0.28
03040104050010	Cheek Creek	32.60	25.41	0.78

*The trail mileage used here only includes the system trails included in the Uwharrie National Forest's GIS Database. The road mileage includes Forest Service and Non-Forest Service Roads included in the Uwharrie National Forest's, State of North Carolina Roads Database.

A trail survey in the Badin Lake area in late 2010 and early 2011 located and recorded the condition of both system and non-system trails in the Badin Lake, Lower Uwharrie River, and Dutch John watersheds that include the intensely used Badin Lake Recreation Area. System trails are defined as those authorized, tracked, and managed by the agency. Non-system trails are typically unplanned, unauthorized, unmanaged and not tracked. Sometimes they are known as "user-created" trails, although in reality most trails in the Badin area, both system and non-system, were originally created by recreation users. Table 3-20 shows the road and trail density in the three Badin Lake area watersheds once non-system trails are added. These densities indicate Lower Uwharrie River watershed is approaching the maximum for a naturally functioning landscape, and Dutch John Creek watershed is exceeding the maximum.

Table 3-20. Trails mileage and density in the Badin Lake area.

Watershed Name	Miles of System Trails	Miles of Non-System Trails	Total Miles of Trails	Watershed Area (mi ²)	Road and Trail Miles With non-system trails added	Total Road and Trail Density (mi/mi ²)
Badin Lake	16.2	6.4	22.6	37.0	62.16	1.68
Lower Uwharrie River	22.3	31.5	53.8	31.15	122.9	3.90
Dutch John Creek	24	16.6	40.6	9.68	54.39	5.52
Total	62.5	54.5	117			

Hydrologic Connectivity and Proximity to Streams

Hydrologic connectivity occurs when storm water runoff from a road or trail enters a stream channel having perennial, intermittent, or ephemeral flow. Wherever a hydrologic connection exists, rapid runoff, sediments, and road-associated chemicals (for example, spills, oil) generated on the road surface and cut-slopes are provided a direct route into the streams (Forest Service, USDA 1999). The best situation is for roads and trails to NOT be hydrologically connected to streams. The number of times a road or trail crosses or comes very close to a stream is an indicator of potential hydrologic connectivity. Poorly designed or undesigned stream crossings negatively affect streams when they constrict the channel, are misaligned relative to the natural stream channel, or when they are improperly sized. Crossings also serve to connect disturbed areas (i.e. road surface, landings, trailheads, etc.) to the stream, allowing water and sediment to be delivered directly to the stream channel. Disturbance of streambanks can cause over-widening of the stream channel and cause the stream to become shallower, especially at user-created fords, as they are generally put in poor locations and are not maintained or repaired.

Roads and trails in wetlands, riparian areas, and floodplains can also become entrenched and intercept subsurface flow, potentially lowering the water table.

The trail locations recorded in 2010/ 2011 in the Badin Lake area, when plotted in a Geographic Information System and overlaid with the locations of streams, allowed for the identification of points where trails either cross streams or are very close and are potential points of hydrologic connectivity. The following table displays the number of points of potential hydrologic connectivity

Table 3-21. Badin Lake Recreation Area Trail Miles and Points of Potential Hydrologic Connectivity (PHC) (including stream crossings)

Watershed Name	#PHC Points on System Trails	#PHC Points on Non-System Trails	Total #PHC Points on Trails	Miles of System Trails	Miles of Non-System Trails	Total Miles of Trails
Badin Lake	3	5	8	16.2	6.4	22.6
Lower Uwharrie River	46	74	120	22.3	31.5	53.8
Dutch John Creek	21	38	59	24	16.6	40.6
Total	70	117	187	62.5	54.5	117

The above table indicates 47% of the Badin Lake area trail miles are non-system, while 63% of the points of potential hydrologic connectivity (including stream crossing) are on the non-system trails. The trail surveyor made note of 50 instances where stream crossings were sources of visible sediment into streams, and 36 instances where there were multiple crossing points in the same general location. Problems were noted to exist on both system and non-system trails.

Assuming 100 feet either side of a stream could be riparian, flood plain, and/or wetland, trails within this 100 foot zone could indicate the amount of riparian area and floodplain on the NFS lands in the Badin area that are impacted by trails that could become entrenched. The following table displays the miles of stream within 100 feet of a trail or trails.

Table 3-22. Badin Lake Recreation Area Stream Miles with Trails within 100 Feet

Watershed	Miles of Stream	Miles of Stream with System Trails within 100 ft	Miles of Stream with Non-System Trails within 100 ft
Badin Lake	12.44	0.12	0.24
Lower Uwharrie River	10.41	1.88	2.75
Dutch John Creek	3.08	1.18	1.8
TOTALS	25.93	3.18	4.79

Entrenchment of trails and roads interrupts the natural flow of water through the area by causing more puddling to occur on the roads and trails and by stopping the surface flow from moving into the surrounding watershed. Entrenchment can also lead to the widening of the travel way by users that are trying to avoid getting wet leading to further disturbance to the watersheds. The 2010/2011 Badin area trails survey noted 25 locations of entrenched segments ranging from 2 to 4 feet deep and from 15 to 250 feet in length. Entrenchments were noted on both system and non-system trails.

Other Potential Impacts Affecting Water Resources

With respect to water resources, impacts are related to location of management, type of management, and extent of management that occurs in relation to water bodies and wetlands. Generally speaking, the greater the number of acres of timber or prescribed fire treatment, and recreation development, the greater the risk that best management practices or mitigation

measures may not be effective. Additionally, some different treatment methods involve greater ground disturbance with heavy machinery and therefore greater impacts to the watershed.

Activities that disturb the land surface, decrease forest canopy, or otherwise alter land surface cover would potentially affect water yield (quantity and timing of streamflow) and water quality. Soil particles detached and transported (erosion) from disturbed sites would potentially reach streams as sediment affecting aquatic systems and water quality. The risk of adverse water quality impacts increases as the distance between a ground disturbing activity and a stream or other water body decreases.

ENVIRONMENTAL CONSEQUENCES

All alternatives contain mitigation measures and best management practices stated in the form of standards and guidelines. Riparian buffers specified for perennial and intermittent streams would mitigate or minimize potential impacts to streams; however, there would still be some impacts to water resources from activities on the national forest. The following activities and uses have the highest potential to affect watershed condition, and water quality and quantity on the Uwharrie NF, and are used as indicators of effects to the water resource:

- The management of roads and trails.
- The management of dispersed and developed recreation
- The amount of timber harvest and related activities
- The amount of prescribed fire and wildland fire and suppression activities,

The kinds of impacts are discussed below and comparisons of the relative impacts of the alternatives are described for each indicator.

Effects of Transportation System Management (Roads and Trails)

Trails

The alternatives address trail density, hydrologic connectivity of trails and proximity of trails to streams in the watersheds in different ways. In Alternative A there is a maximum amount of mileage set for the OHV trail system, which is 25 miles, however, equestrian and mountain bikers are not restricted to a trail system and there is not a minimum or maximum number of trail miles. Also, Alternative A has no restrictions on how close to streams trails can be constructed. As shown in Table 3-21 the total miles of trails (system and non-system) just in the Badin Lake area watersheds is 117, and of those miles 54.5 are non-system. Existing impacts from unimproved stream crossings and other points of hydrologic connectivity streams, especially those on non-system trails, would likely continue, and more could develop over time. With this existing mileage of non-system trails in these watersheds, no control over new non-system trails being created by hikers, mountain bikers and equestrians, and no restrictions on proximity of trails to streams, Alternative A would result in the greatest impact on watershed resources from trails.

In Alternatives B and C there is no minimum or maximum OHV trail mileage stated, however, the goal is to have a well designed, well located and sustainable OHV trail system. These alternatives

would also prevent new motorized trails within 100 feet of perennial streams and 50 feet of intermittent streams, except for at crossings. New non-motorized trails would not be constructed within 33 feet of streams, except for at crossings. A minimum of one mile of unauthorized trails per year would be closed and rehabilitated. Additionally, Alternative B proposes to move toward a designated system of trails and areas for mountain bikers and equestrians. In order to designate the systems, a thorough design process and site specific analysis would be conducted after the Forest Plan Revision is completed if Alternative B is chosen. This process would ensure that the trail systems would minimize impacts to watershed and soil resources.

In Alternative C, equestrian use would be as it is in Alternative A, with no goal to have this use restricted to a designated system. In this alternative OHV and mountain bike use would be restricted to designated trail systems. The continuation of equestrians being allowed to ride cross country would mean new user-created trails would likely develop as well as additional unimproved stream crossings. While Alternative C would be an improvement over Alternative A in terms of managing impacts to water resources from the transportation system, it would be less of an improvement compared to Alternative B. Alternative B would result in the most improvement in impacts to water from trails.

Roads

The majority of roads in the watersheds are non Forest Service roads. For the 6th level watersheds that are in the Uwharrie NF there are approximately 433 miles of non Forest Service roads and 133 miles of Forest Service roads. Alternative A calls for approximately two miles of new road construction each year, whereas Alternatives B and C do not call for road construction and state as a goal, “there is little evidence of new road construction”; which indicates that the current system road mileage is thought to be adequate for land management. Alternatives B and C also call for eliminating all unauthorized roads on the Uwharrie NF over the course of the planning period. Alternative A has no such stipulation. Therefore, with Alternatives B and C the impacts to water resources from roads, in particular unauthorized roads, should be reduced over time.

In summary, Alternative B would result long term in the least adverse impacts and most potential for improving water quality, followed by Alternative C, with Alternative A being the least favorable to water resources based on the direction for trails management and roads management.

Effects of Timber Harvest and Related Activities

Timber harvest activity has the potential to adversely affect water resources and aquatic habitats. Typically, it is not tree cutting that directly effects soil erosion or sediment production but rather the haul routes, skid trails, log landings, and stream crossings that are used to remove the timber (Ursic and Douglas 1978). In addition to erosion and sedimentation, impacts may include soil compaction, potential vegetation loss in riparian areas, effective extension of the channel network through roads and skid trails connecting upstream disturbances to streams, and impacts to water quality.

Following timber harvest, there is a potential short term increase in water yield or quantity in the harvest units. However, changes to annual water yield for a watershed is only measurable when 25% or more of the timber volume in a watershed is removed (Troendle and Olsen 1994; Troendle and King 1987; Hornbeck et al. 1987; and Hornbeck et al. 1993), extremely unlikely for typical Forest Service operations. Sediment yields into forest streams can indirectly be affected as forest soils remain wetter after tree harvest, and more soil moisture is available to stream channels. As more soil moisture is available to create overland flow or runoff, intermittent streams would potentially be wetter during the growing season and perennial streams would potentially expand upslope into hollows and swales that are normally dry before timber harvesting takes place. This effect would be temporary and localized to the cutting area depending on how much volume of timber is removed and would usually last no more than 3-5 years (Swank et al. 2001) before returning to pre-harvest condition. Generally, as the treatment areas revegetate and begin absorbing soil moisture, water runoff returns to pre-harvest levels.

Additional impacts could include the contamination of water or wetlands from chemical substances such as gasoline, oil, or hydraulic fluid that is leaked from forestry equipment. There are also potential effects from chemicals used for site preparation and timber stand improvement and treatment of non-native invasive plants as follow up after timber harvest activities. Adherence to forest plan standards and guidelines and the North Carolina Division of Forest Resources Best Management Practices would mitigate impacts from chemicals and fuel.

The amount of national forest ownership across the 6th level watersheds is quite variable so the amount of national forest timber management will be quite variable within the watersheds. There is little that the management of the Uwharrie NF can contribute to improving the quality of the water flowing in from private land; however, land management on national forest service lands can contribute to the degradation of water quality and watershed resources if done improperly. For the watersheds with minimal national forest lands there would be relatively little impact from timber management on the Uwharrie NF regardless of which alternative is selected. In watersheds where there is relatively high national forest ownership timber management on the Uwharrie NF could potentially have greater effects. Dutch John Creek and Pee Dee River are the only two watersheds with over 50 percent of national forest land. The effects of Uwharrie NF management on individual streams and watersheds would be best determined at a project level (smaller watershed scale) where the specific management practices are evaluated and the specific locations are known.

Erosion that results from timber harvest activity would be temporary and generally result in a single pulse of erosion (and sedimentation if the particles reach a stream or water body). Cut areas generally receive site preparation within two years following harvest, including revegetation of the disturbed areas (roads, skid trails, and landings). With the proper mitigation measures applied as directed in all alternatives, impacts to the water resources from erosion and sedimentation would be short term and minimized and they would be immeasurable within two to five years of treatment.

For all alternatives, forest-wide mitigation measures and riparian buffers along intermittent and perennial streams have been designed to mitigate or minimize potential impacts from timber harvest, other silvicultural treatments, and other management activities. Effectiveness monitoring

and research have shown that proper implementation of Best Management Practices (BMPs) greatly reduces erosion, compaction, sedimentation and other water quality impacts (Patric 1994; and US EPA 1996).

Table 3-23. Planned Annual Acres of Timber Harvest By Alternative

ACTIVITY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Harvest and Regeneration or	543	266	266
Thinning	245	400	400
Other Silvicultural Activity	57	34	34
TOTAL	845	700	700

As Table 3-23 indicates, Alternative A calls for more timber harvest and related activities than Alternatives B or C, and would therefore have more potential for impacting water resources.

Effects of Prescribed Fire and Wildland Fire Management

Each alternative proposes the use of prescribed fire for fuel reduction, ecosystem restoration, and timber stand site preparation. The effects of prescribed fire on water quality vary, depending on fire severity, type and amount of vegetation burned, soil moisture, location within the watershed and its proximity to the stream network (Van Lear and Waldrop 1989). Research has shown that prescribed burning implemented under managed or controlled conditions has negligible effects on the physical, chemical, and biological properties of soil and soil productivity within a watershed (Patric 1994; Richter et al. 1982; Van Lear and Waldrop 1989). In addition, there is little evidence that sedimentation or water yield increases significantly in streams from forested lands burned according to a prescribed burning plan that is designed to meet wildlife, recreation, watershed, vegetation management, or ecological objectives. Understory burning would consume only a small portion of the duff layer and would expose very little mineral soil. Most of the organic layer and fine root layer would be left in place.

Ground disturbance from fireline construction, particularly those constructed with bulldozer, could result in erosion and sedimentation to streams. Forestwide management standards and guidelines reduce these effects by minimizing connectivity of fire lines to streams. Additionally, the fire lines would receive erosion control measures after the prescribed burning is completed, as necessary, as outlined in the alternatives, where bare soil would be revegetated. Alternatives B and C also contain a standard to minimize soil disturbance from fire lines near streams.

As fire severity increases, either through prescribed fire or wildfire, a greater percentage of leaf litter, duff, and large fuels on the forest floor are consumed, which would potentially trigger accelerated erosion and loss of soil nutrients into streams. Very hot, stand replacing burns (wild or prescribed) would result in these effects. It is estimated that less than one percent of the acres subject to prescribed fire would be severely burned (Kelly Cagle, personal conversation, August 26, 2010).

Table 3-24. Amount of Prescribed Fire by Alternative

ACTIVITY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Prescribed Fire (avg. annual acres burned)	Up to 3,000	3,000 to 6,000	3,000 to 6,000

Alternatives B and C would have a greater potential to adversely impact water resources in the watersheds than Alternative A; however, the amount of impact is expected to be very minor. Severely burned areas would generally be small patches distributed throughout the burn area where the fuels were most concentrated, basically mimicking natural fire effects.

Effects of Dispersed and Developed Recreation Management

Water plays an important role in many aspects of recreation on the Uwharrie NF. Badin Lake Recreation Area and the Uwharrie and Little Rivers receive a lot of recreation pressure from the public. People are especially drawn to water during the hot summer months. The desire for recreation near water creates varying degrees of impact to the resource.

Primitive camping is popular on the national forest, and some areas are heavily impacted by this use. Heavily impacted areas include the Birkhead Mountains Wilderness Area, along roads and trails, along the Uwharrie River, along the shoreline of Badin Lake and Falls Reservoir, and hunt camps that are established on game lands during the hunting season. As recreation use on the Uwharrie NF has increased over the years since the original forest plan was signed in 1986, there have been increasing impacts to water quality and streambank stability from primitive camping which contributes trash and human waste along Badin Lake's shoreline and rivers and streams. This type of concentrated use also causes damage to vegetation and soil (compaction and erosion) within the riparian area and along stream banks. Water pollution from human waste, dishwashing, trash accumulation, and horse use all have potentially negative effects where people congregate. Generally, these effects would be localized and reduced through conservation education strategies which emphasize the importance of avoiding riparian areas when possible and the use of appropriate directions, standards and guidelines in the forest plan.

Several developed recreation sites have been constructed near water since 1986. Managed campgrounds and picnic areas provide a more efficient setting for managing access to water as well as human and animal waste compared to uses that occur outside the developed setting.

There is very little direction in the alternatives aimed specifically at reducing the impacts from primitive camping. A standard for primitive camping in Alternative A states "allow primitive camping anywhere except in wildlife openings or specific areas posted closed to camping." Alternatives B and C are silent in regard to primitive camping. Alternative B, however, does contain a desire to move to designated road and trail systems for equestrians and mountain bikers that would provide some management over where these users camped. Alternative C keeps mountain bikers on a designated system but not equestrians, resulting in less control over where equestrians camp. Overall, Alternative B would likely lessen impacts from primitive camping more than Alternatives A or C.

CUMULATIVE EFFECTS

Cumulative effects from the implementation of the LRMP include effects of the management on national forest plus potential effects from land management on adjacent lands of other ownership (i.e. private, state, other federal agencies, county, etc.). In general, cumulative effects include impacts from past activities, current and potential future activities, such as agricultural use, forestry, suburbanization and urbanization, travel way use and development, and recreation.

Table 3-18 shows the percent of National Forest System lands within the watersheds that make up the Uwharrie NF. Table 3-19 shows the level of road and trail development within these watersheds. Additional road construction is more likely to occur over the planning period in those watersheds with less national forest land compared to those watersheds that are predominantly national forest. The widening of NC 24/27 is currently in the planning stages and likely to be implemented during the planning period. Additional road construction by non-Forest Service entities within the proclamation boundary would add to water resource impacts from roads and trails on the national forest.

Cumulative effects from land management (timber, fire, recreation, trails, roads, etc.) would be combinations of all of the direct and indirect impacts discussed above, in addition to land management and land development activities within the watersheds on private lands. Private land managers must also adhere to the North Carolina Best Practices Manual to minimize impacts to water resources. On the Uwharrie NF, the potential cumulative effects from timber management, road and trail management, fire and fuels management, and recreation management plus the activities on the private lands would be minimized through the utilization of BMPs and through the management of stream buffers and protection of wetlands on the national forest.

For the different alternatives the ranking of least impact to most impact to watershed resources and water quality would be Alternative B, Alternative C and Alternative A. This takes into account all of the anticipated levels of management for timber, fire, road and trail management and recreation management. Alternative B would have the least impact overall because trails would be better located, designed, constructed, and maintained for all trail recreation user groups. Alternative C would have the next lowest impact to watershed resources and water quality because OHV and mountain bike trails would be better located, designed, constructed, and maintained, however, equestrian use would not be restricted to a designated trail system, therefore, the current watershed impacts from this use would continue. Both Alternatives B and C are the same in regard to impacts from other activities. While B & C have more potential impacts from prescribed burning than Alternative A, these are still expected to be minimal. Alternatives B and C would have less potential for impacts to water quality from timber management activities than Alternative A, although impacts are mitigated by standards and guidelines in all alternatives.

Cumulative effects from climate change include the anticipation that the frequency of intense storms will increase and there would be an increase in the risk of wildfire in many areas. These two anticipated effects would impact watershed resources by increasing the potential for erosion, sedimentation and decreased water quality. To manage for these potential impacts, road and trail management and management of stream buffers and protection of wetlands would help to mitigate

these cumulative effects. The alternatives do this to varying degrees as discussed above. Additionally, by increasing management with prescribed fire over the current amount, as in Alternatives B and C, the potential for large landscape scale wildfires occurring on the Uwharrie NF would be greatly reduced, thereby minimizing the potential effects of increased wildfire.

CLIMATE CHANGE

AFFECTED ENVIRONMENT

The discussion below is derived from the document *Climate Change Trends and Strategies – Uwharrie National Forest* (available in the project record).

For the Uwharrie National Forest in central North Carolina and for much of the southeastern United States, climate variability and weather events such as floods, heat waves, droughts, tornadoes, hurricanes, and lightning storms have long been part of the natural environment. From a climate perspective, the Southeast has some of the warmest temperatures in the United States, generally receives more rainfall than any other region in the United States, and experiences many extreme climate events (US Global Change Research Program 2001). Hurricanes are a threat from both the Gulf and Atlantic coasts, tornadoes and other intense storms can occur throughout the Southeast, and weather disasters from floods to freezes can cause extreme damage.

Scientists have indicated that a changing climate can affect the future biodiversity and alter the function of the forest ecosystems that support these services and products (U.S. Climate Change Science Program SAP 4., May 2008). Species distributions may shift, some species are likely to decline while others expand, and whole new communities may form. Forest productivity may be reduced in some instances due to a decline in photosynthesis caused by increased ozone, and productivity may be enhanced in other settings where elevated levels of carbon dioxide (CO₂) have a fertilizing effect on overall tree growth. Anticipated increases in extreme weather events (such as with droughts and hurricanes) outside the historic range of natural variability may alter the frequency, intensity, duration, and timing of disturbances such as fire, non-native invasive species, and insect and pathogen outbreaks. Changes in forest composition and growth may also have associated impacts on wildlife habitats, the supply of wood products, specialty markets, and recreational opportunities (U.S. Climate Change Science Program SAP 4.4 June 2008; Marques 2008).

The climate change factors that appear most likely to affect the Forest and impact desired conditions in the revised Forest Plan are ecological and weather-related disturbances as described below:

- Projected increase in frequency of intense storms
- Projected increase in wildfire risks, and
- Projected increase in outbreaks of insects, diseases, and non-native invasive species.

Indicators affecting the Forest's vulnerability to climate change

Maintaining and restoring native ecosystems. Longleaf pine is better adapted to fire and may be less damaged by storms than loblolly pine. Longleaf also appears to have less insect and pathogen problems and can grow as fast as or faster than loblolly after the grass stage thereby sequestering more carbon (Johnsen and Nelson 2008).

Managing the potential for soil erosion. Increased frequency of intense storms could increase the potential for soil erosion. Road and trail management and management of streamside zones would impact the potential for soil erosion and stream sedimentation.

Reducing vulnerability to drought and windthrow. Removal of trees susceptible to wind or ice storms and altered spacing or thinning of dense forest stands would reduce vulnerability to more frequent disturbance events. Maintaining wind buffers around high value resources would also be appropriate.

Reducing vulnerability to insects and diseases. Thinning and managing for a multi-age forest can help ensure vegetation has adequate nutrients and promote resiliency. Prescribed fire also plays a role in maintaining habitats, reducing fuel loads, and maintaining the desired conditions of fire-dependent ecosystems that would otherwise be susceptible to insects and diseases.

ENVIRONMENTAL CONSEQUENCES

Maintaining and restoring native ecosystems

Alternatives B and C both name restoration of natural vegetation as a major theme for management over the next planning period, including restoration of 1,500 acres of longleaf pine communities and maintaining the existing longleaf pine. Alternative A calls for maintaining the existing longleaf pine but makes no mention of longleaf restoration. Therefore, in regard to this indicator Alternative A would result in a forest more vulnerable to the effects of climate change than Alternatives B and C, since more restoration is likely to occur during implementation of Alternatives B or C.

Managing the potential for soil erosion

Road and trail management and streamside zone management are the indicators. Alternative A calls for more road construction than Alternatives B and C. However neither horse trails nor mountain bike trails are mentioned. While there is a general direction to maintain trails to standard there is no real emphasis on the importance of these recreation opportunities and their potential to increase erosion. There is no requirement in Alternatives A or C that horses remain on a designated trail system, and there is no mention of mountain bikes at all in Alternative A. More erosion potential exists when horses and bikes are allowed to travel cross-country. Due to the increased potential for erosion, in regard to this indicator Alternative A would result in a forest more vulnerable to the effects of climate change than Alternative B or C. Alternative C, which allows cross-county horseback riding, would result in more vulnerability than Alternative B. Implementation of Alternative B would be most likely to reduce the potential for increased erosion from climate change.

Reducing vulnerability to drought and windthrow

Thinning and wind buffers are the indicators. Alternative A calls for 245 acres to be thinned annually whereas Alternatives B and C call for an average of 400 acres of thinning. No alternative specifically calls for wind buffers for high value resources nor are they discouraged. Therefore, in regard to these indicators Alternative A would result in a forest more vulnerable to the effects of climate change than Alternatives B and C, since more thinning is likely to occur during implementation of Alternatives B or C.

Reducing vulnerability to insects and diseases

Tree thinning, managing for a multi-age forest and prescribed fire are the indicators. Alternative A calls for thinning 245 acres per year, clearcutting 543 acres per year (creating stands of different ages across time), and burning 2,450 per year, for a total of 3,238 acres treated. Alternatives B and C call for thinning 400 acres per year, restoring 300 acres per year (creating stands of different ages across time), and burning 3,000 to 6,000 acres per year for a range of 3,700 acres to 6,700 acres treated. Therefore, in regard to these indicators Alternative A would result in a forest more vulnerable to the effects of climate change than Alternative B or C, since more acres are likely to be treated with implementation of Alternatives B or C.

CUMULATIVE EFFECTS

Almost all of the Uwharrie NF is within Montgomery and Randolph Counties. Land use plans (or drafts) for these counties reflect a desire to maintain green space. In Montgomery County forestry and agriculture are among the most desired land uses in the rural areas and sensitive natural environments are recognized as important. In Randolph County most of the land adjacent to the Uwharrie NF is in a Rural Growth Management Area where significant high intensity residential growth is discouraged or not anticipated for ten to fifteen years. These are areas where maintaining the rural character and the natural heritage asset resources are important. At the same time, these two counties recognize that residential development near the national forest is likely to increase. So while the intent of the counties is to conserve natural environments, some development may increase the potential for soil erosion and loss of native forestland, making the larger landscape more susceptible to extreme weather events that may accompany climate change. Invasive species and insect pests often have high reproductive rates, good dispersal abilities, and rapid growth rates enabling them to thrive in the disturbed environments associated with residential development. Increased development could add to the potential for insect and disease outbreaks that may increase with climate change.

The North Carolina State Wildlife Action Plan (2007) seeks to encourage retention of large private forest tracts, use of prescribed burning for maintaining habitat, and creation of multi-aged forests. These actions, to the extent they occur in the broader landscape of the Uwharrie NF, should lessen the Uwharrie NF's vulnerability to climate change. Large expanses of multi-aged forest would provide more resiliency than single-age plantations, and prescribed burning would help reduce the fuel loads that could occur with increased extreme weather events, making the area safer from catastrophic wildfire.

SOCIAL, ECONOMIC, AND CULTURAL RESOURCES

ROADS

AFFECTED ENVIRONMENT

The Uwharrie NF road system is comprised of 98 classified roads totaling approximately 107 miles. Three of the 107 miles are paved. Approximately 23.6 miles are open for public use, and another five miles are seasonally open. The remainder are closed to motor vehicles or in some way restricted. Some roads that are not open to public motor vehicles are used to access administrative sites, communication sites, or private in-holdings. The chief reasons roads are kept closed are to reduce maintenance costs and to provide secure areas for wildlife.

Additional travel ways (approximately 33 miles) exist that are not part of the Forest Service road system and are considered “unauthorized.” Many are more like trails and include unplanned, abandoned travel ways, old off-road vehicle tracks, and roads that were once under permit or other authorization and were never decommissioned upon termination of the authorization. Travel ways in this category are awaiting management evaluation as to whether or not to include them as part of the transportation system, decommission or restrict them from further use, or leave them as is.

Very little new system road construction has occurred over the past 20 years, and none over the last five years. There is a maintenance backlog and some existing roads need heavy maintenance. There are existing concerns regarding public safety and erosion that can lead to sediment reaching streams.

ENVIRONMENTAL CONSEQUENCES

Alternative A has general direction to maintain open or closed roads to a particular “maintenance level.” There is also a stated expectation that approximately two miles of system road would be built each year and that about 56 miles of Forest Service road would be open.

Alternatives B and C contain direction for roads that include more specific maintenance objectives, an objective to resolve the status and potentially obliterate the unauthorized roads, and a goal that there be little or no evidence of new road construction. There is no stated expectation for new road construction or the amount of road that would be open.

Assuming full implementation of the alternatives, Alternative A would result in a national forest with much greater road access than currently exists. Given the current maintenance backlog, it would be likely that the maintenance backlog would grow as the transportation system increases. Alternatives B and C would provide much less road access than Alternative A, and the maintenance backlog would not likely increase as it would in Alternative A.

CUMULATIVE EFFECTS

State road widening and some paving is planned for a few of the state roads and highways that traverse the national forest or are nearby. No new road construction is planned as of 2010, however a minor reroute of NC 24/27 by the Uwharrie Ranger District office is planned. None of these projects are expected to increase or decrease the amount of access onto the national forest. These road improvements could facilitate the increases in visitors expected over time, which would put added strains on road maintenance.

One expectation for the changing climate is that there would be more frequent intense storms. Storm damage is a major contributor to the need for road maintenance and more storms could result in a larger road maintenance backlog.

RECREATION

AFFECTED ENVIRONMENT

National forests provide over 191 million acres of public land within the United States and Puerto Rico. National forests in the Southern Region contribute approximately 13.3 million acres of the national total and provide unique settings for a variety of outdoor recreation activities. The Uwharrie NF is popular for many recreation activities including hunting, fishing, shooting, off-highway vehicle (OHV) riding, horseback riding, mountain biking, boating, developed and primitive camping, canoeing/kayaking, hiking, and picnicking. In 2010 visitors from 30 states and Canada camped at the four developed campgrounds on the Uwharrie NF that take reservations. The majority of users reside in North Carolina, followed by South Carolina, Florida and Virginia.

The USDA Forest Service's National Visitor Use Monitoring program estimated that in 2008 there were close to half a million visits to the Uwharrie National Forest. The percentage of visitors that came to the Uwharrie NF for varying recreational activities was estimated from the 2010 Montgomery County Tourism Development Authority Survey of Visitors to the Uwharrie National Forest. This survey consisted of volunteers from the county visiting recreation sites on the Uwharrie NF and asking recreationists if they would participate in a survey. This survey was conducted in the late summer through early fall of 2010. From that data we developed a summary of people do when they visit the forest. The percentages indicate that the majority of visitors to the Uwharrie NF camp and use the trail systems. The trail use from highest to lowest order is hiking, horseback riding, OHV or 4-wheel driving, and mountain biking. With the majority of the campgrounds, OHV trails, and equestrian trails being concentrated in the Badin Lake Recreation Area, these figures indicate that there is a lot of recreation use in a relatively small area on the Uwharrie National Forest.

Table 3-25. Visitor Use Percentages on the Uwharrie National Forest, Survey Conducted by the Montgomery County Tourism Development Authority in 2010.

Recreation Activity	Percentage of visitors participating in the activity
Hunting	3.4
Fishing	11.9
Camping	26.0
Hiking	17.1
4-Wheel Driving	11.2
Mountain Biking	1.8
Horseback Riding	13.5
Boating	3.7
Wilderness	0.9
Gold Panning/Rock Collecting	1.4
Swimming	5.7
Picnicking	2.3
Other	1.1
Total	100

Hunting and Fishing

The Uwharrie NF has historically provided excellent hunting opportunities in the Piedmont region of North Carolina. The national forest provides approximately 51,000 acres of forest open to the public for hunting six days per week following the hunting seasons set by the North Carolina Wildlife Resources Commission. As part of the hunting experience on the national forest there are five hunt camps. At East Morris Mountain, Yates Place, and Wood Run Hunt Camps, hunters can primitive camp for free, and at West Morris Mountain Campground and Uwharrie Hunt Camp, facilities are provided for a nominal fee. These camping areas are not exclusively used by hunters, but they are very popular with hunters. Hunters may also choose to disperse or primitive camp throughout the forest or camp in the more developed campgrounds during the hunting seasons.

The greater Uwharrie area has diverse wildlife habitats ranging from oak-hickory forests to longleaf pine woodlands with open fields mixed on both national forest lands and private lands. This mixture of habitat types provides opportunities for hunters to take white-tailed deer, wild turkey, raccoon, eastern gray squirrel, rabbit, northern bobwhite quail, fox, dove, wood ducks, geese, and more. Due to the Uwharrie NF's proximity to large urban areas within an hour's drive, it has been and continues to be one of the most heavily hunted public lands in North Carolina. Hunting opportunities are further enhanced by the national forest being part of the North Carolina Wildlife Resources Commission (NCWRC) Game lands. This means that the NCWRC works with the Uwharrie NF to implement early successional habitat management to promote game and other wildlife species.

Fishing is another popular recreational activity on the Uwharrie NF. At King's Mountain Point there are four universally accessible fishing piers. A floating pier is provided in cooperation with the NCWRC Fisheries program. Additionally, there are many locations around Badin Lake that people access through national forest lands. The Uwharrie and Little Rivers and several creeks in the area are very popular for anglers as well. River access for anglers is a need that was identified through the collaborative planning process.

Trails

Under the 1986 Plan off-highway vehicle (OHV) use was confined to a designated trail system while hikers and horseback riders were not restricted. Mountain biking was not a recognized use at the time the 1986 Plan was written so there were no restrictions of this use either. There are currently 121 miles of designated system trails on the Uwharrie NF. Of this total, approximately 17 miles are designated as motorized OHV routes for the full range of OHVs, 40 miles are designated as equestrian/mountain bike and hiking trails combined, 16 miles are designated as hiking/ mountain biking trails, and 48 miles are designated as hiker-only trails. The majority of equestrian use occurs in the Badin Lake Recreation Area on the 40 miles of designated trails, as well as, cross-country throughout the national forest. The majority of the mountain bike use occurs on the trails in the Wood Run area. All these uses have become increasingly popular on the Uwharrie NF, especially equestrian and OHV use because of limited opportunities elsewhere in the Piedmont region of North Carolina. Based on the Montgomery County Tourism and Development Authority User Survey displayed in the table above, the total percentage of visitors that utilize trails or cross-country riding during their visit to the Uwharrie NF is 43.6 percent.

The Uwharrie National Recreation Trail (Uwharrie Trail) is a hiking trail that follows a north-south route through the national forest. Several conservancy organizations and the Forest Service are working toward protecting the entire length of the trail with the goal of eventually putting as much of the route as possible on public land. This need was identified in the public collaborative planning process. At present, only about 50% of the desired route is on public land.

Increasingly, adjacent private landowners are creating their own trails from their private property onto the national forest. These trails may be for all-terrain vehicles (ATVs), dirt bikes, mountain bikes, horses, or hikers, depending on the individual landowners and their preferred type of recreation (note that OHV use – which includes ATVs – is only authorized on the designated system so adjacent landowners accessing the national forest from their property by ATV or dirt bike is in violation of law). These adjacent private landowners are currently enjoying a freedom to access the national forest directly from their homes, which they highly value.

There are approximately 54.5 miles of non-system trails in the Badin Lake area alone that are causing issues for trail users and impacting natural resources. Table 3-26 shows the amount of system and non-system trails in the Badin Lake Recreation Area. There are approximately 117 miles of system and non-system trails in the three watersheds that make up the Badin Lake Recreation Area. While system trails are managed and maintained by the USDA Forest Service, non-system trails do not receive maintenance funding and often have issues related to poor construction and upkeep.

Resource damage and user conflicts are occurring in some places as a result of the abundance of non-system trails, and can impact the recreation experience by causing unsafe trail conditions. Additionally, safety concerns during the hunting seasons are increasing as the level of use on the trails increases. The myriad of non-system trails through the Uwharrie NF makes it difficult for hunters to know what areas to avoid.

With increasing trail use, many trails of all types are in need of heavy maintenance, reconstruction, or relocation. Trails that might have sustained the lower levels of use that existed when they were established are unable to sustain today's higher levels of use. Some trails are so entrenched, rocky, or steep, that use of the trail is unpleasant and unsafe for some users while other users actually value these conditions as providing a challenge. Limited trail maintenance and management funding is available for maintenance of system trails; however, dedicated trail volunteers have donated hundreds of hours of time to trail maintenance and have improved conditions in many locations.

Table 3-26. Badin Lake Recreation Area Trail Data*

Total NFS Acreage	# System Trails w/ Points of Hydrologic Connectivity	# Non-System Trails w/ Points of Hydrologic Connectivity	Total of Points of Hydrologic Connectivity	Miles of System Trails	Miles of Non-System Trails	Total Miles of System and Non-System Trails
34,910	70	117	187	61.5	54.5	116

*This table includes all non-system and system trails found in the Badin Lake Recreation Area through contractor trail condition survey by D. Mattocks, 2011. This data is summarized for the National Forest System lands included in the 3 watersheds that make up the Badin Lake Recreation Area.

Developed Recreation Sites

Several major recreation facilities were constructed in the Badin Lake Recreation Area since the 1986 Plan went into effect. These facilities improved the opportunities for camping, horseback riding, fishing, and swimming. Recent projects include Kings Mountain Point Day Use Area, parking facilities for the OHV trails, electrification of Canebrake Horse Camp, and upgrading of the electrical sites at the Arrowhead Campground. The Uwharrie NF offers a range of camping experiences, from primitive camping with no facilities to highly developed campgrounds that include flush toilets, showers and dump stations. The Uwharrie NF maintains five campgrounds with a total of 141 camp sites. The majority of campgrounds are in the Badin Lake Recreation Area. Two camping areas cater specifically to horseback riders, one being the developed Canebrake Horse Campground and the other being the primitive Badin Horse Camp. The developed campgrounds where fees are charged are: Arrowhead Campground, Badin Lake Campground, Badin Lake Group Camp, Canebrake Horse Camp, Uwharrie Hunt Camp, and West Morris Mountain Campground. The only developed campground not in the Badin Lake Recreation Area is West Morris Mountain.

Other facilities include two picnic areas, three primitive hunt camps, and a shooting range. Additionally, there are three trailheads for the Birkhead Mountains Wilderness and four trailheads for the Uwharrie Trail. Even with a number of newer facilities, there remains public interest in additional facilities tailored for specific users, such as OHV users, mountain bikers, and horseback riders. There is still a need to improve some existing facilities and to devise ways to meet ongoing maintenance challenges.

Water-based Recreation

Badin Lake: Approximately eight miles of the Uwharrie NF borders the eastern shore of Badin Lake. Activities range from motor boating, water skiing, fishing, and paddling on the lake, to

camping and picnicking at developed facilities near the lake, and dispersed camping on the lakeshore. The Falls Lake area provides a relatively remote setting for fishing and dispersed camping. Cove Boat Ramp provides motorized boating access to Badin Lake above Badin Dam.

Uwharrie River: There is limited access to the Uwharrie River from national forest lands. Paddling and fishing are emerging recreation activities on this river. The Uwharrie River is listed as eligible for consideration as a National Wild and Scenic River, and has been determined to have outstanding remarkable scenic, historic, and cultural values. Of three possible categories (wild, scenic, recreational), the river meets the criteria for a “recreational” classification. However, limited public ownership of the stream bank makes long-term protection of special characteristics of the entire river corridor difficult. See the Wild and Scenic Rivers section of this document for more information.

Barnes Creek: National forest trails provide access to this stream. It is listed as eligible for consideration as a National Wild and Scenic River, and has been determined to have outstandingly remarkable fish and wildlife values. Of three possible categories (wild, scenic, recreational), the river meets the criteria for a “recreational” classification. See the Wild and Scenic Rivers section of this document for more information.

Recreation Visitor Information

Participants in the collaborative planning process placed great emphasis on the need for better visitor information and interpretation, both to improve visitor experience and to reduce impacts to natural resources. Being well-informed could help forest visitors know how to use the national forest in more environmentally friendly ways.

Improvements and additions to information kiosks and appropriate signing of the forest have occurred over the past several years and are on-going needs. The National Forests in NC maintains a website with recreation information and brochures describing the most popular trail systems and facilities are available. Information gaps remain in areas such as rules and regulations; natural resource information; cultural resource information; leave no trace ethics; and environmental education. Keeping information current is a challenge. Visitor information and conservation education are often dependent on external partnerships.

ENVIRONMENTAL CONSEQUENCES

Recreation use is expected to increase over the next fifty year as displayed in the table that follows.

Table 3-27. How Recreation Use is expected to Change over Time by Alternative (1000 visits per year)

	All Alts 2010	Alternative A		Alternative B		Alternative C	
		2035	2060	2035	2060	2035	2060
Camping	127.81	164.68	198.93	164.68	198.93	164.68	198.93
Fishing	58.45	71.37	82.80	71.37	82.80	71.37	82.80
General	33.52	43.91	54.44	43.91	54.44	43.91	54.44
Hiking	84.22	111.41	139.09	111.41	139.09	111.41	139.09

	All Alts 2010	Alternative A		Alternative B		Alternative C	
		2035	2060	2035	2060	2035	2060
Hunting	16.55	18.15	19.02	18.15	19.02	18.15	19.02
Nature	6.90	9.07	11.21	9.07	11.21	9.07	11.21
Off-highway Vehicles	54.85	64.86	76.64	64.86	76.64	64.86	76.64
Picnicking	11.31	14.57	17.6	14.57	17.6	14.57	17.6
Trails (non- hiking)	93.63	118.79	150.53	114.01	140.31	118.18	149.26
Wilderness	14.45	17.94	21.39	17.94	21.39	17.94	21.39
TOTAL	501.68	634.75	771.66	629.97	761.44	634.14	770.39

Recreation use is calculated to increase with Alternative A slightly more than in Alternative C, with Alternative B trailing. The assumption is that less use would occur if equestrians and/or mountain bikers are restricted to designated systems. Since equestrian use is much greater than mountain bike use as previously shown, Alternative B which has a goal to restrict equestrian use would result in lower total recreation use.

Alternative A emphasizes forest management throughout the national forest using management areas that emphasize different levels of recreation, timber harvest, wildlife and fish habitat, and motorized access. The general focus of Alternative A is timber production, game species management, and providing multiple recreation opportunities.

Alternatives B and C emphasize different management themes for ecosystem or biological habitat restoration, recreation management, management of cultural resources and management of special places. For Alternatives B and C, the timber, prescribed fire, botanical, soil and water, and wildlife and fish programs would focus on restoring the oak-hickory and longleaf pine forests and the terrestrial and aquatic plant and animal species that thrive in these habitats. For recreation there would be a focus on providing outstanding outdoor recreation opportunities and improving the quality of trails and facilities while minimizing impacts to other resources, and improving the availability of visitor information.

Indicators of effects to recreation opportunities and the recreation experience are:

- Changes to the recreation settings
- Altering the land or its management to make it more or less attractive for recreation
- Improving or limiting access
- Constructing, improving, or removing recreation facilities
- Impacts to hunting and fishing

Changes to the recreation settings

The Recreation Opportunity Spectrum (ROS) provides planners a way to divide outdoor recreation settings, activities, and experience opportunities into several categories: Primitive, Semi-primitive

Non-motorized, Semi-primitive Motorized, Rooded Natural, Rural and Urban. Rooded Natural has two sub-divisions based of proximity to roads and road density. The Uwharrie NF contains lands that may appropriately be assigned to the following categories:

- Semi-primitive Non-motorized (SPNM) – An area characterized by a predominantly natural-appearing environment of moderate to large size. Interaction among users is low. For the Uwharrie NF, the Birkhead Mountains Wilderness is the only area that meets this definition.
- Rooded Natural 2 (RN2) – A sub-classification of Rooded Natural that, while still near open roads, has a generally lower road density than RN1. Interaction among users is lower than in RN1.
- Rooded Natural 1 (RN1) – A sub-classification of Rooded Natural setting generally located within a half mile of an open road. Interaction among users is moderate and evidence of other users is prevalent.

Table 3-28. Comparison of ROS acreage by alternative

ROS Category	Alternative A	Alternative B	Alternative C
Semi-Primitive Non-Motorized	5,160	5,160	5,160
Rooded Natural 2	+/- 32,000	31,804	31,804
Rooded Natural 1	+/- 13,000	13,850	13,850

While it appears that there is little difference in total acres assigned to each category between Alternative A and Alternatives B and C, there have been substantial changes in which parcels are assigned to which classification. Alternative A assigns categories to whole management areas. Management Area (MA) 1 is assigned to RN1, MAs 3 and 4 are assigned to RN2 and MA 8 (Wilderness) is assigned to SPNM (Figure 3-21).

Figure 3-21. Management Areas and ROS Categories for Alternative A

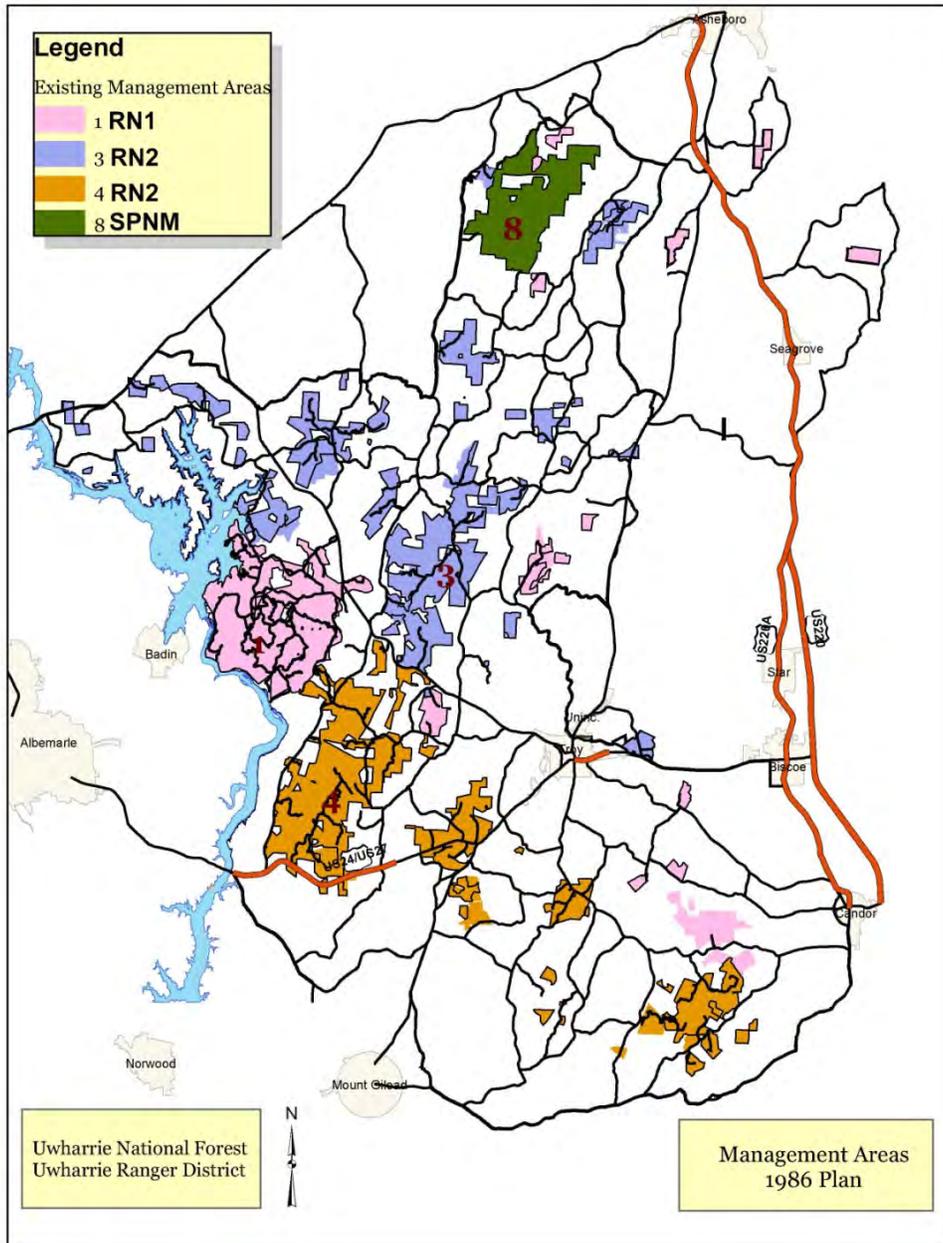
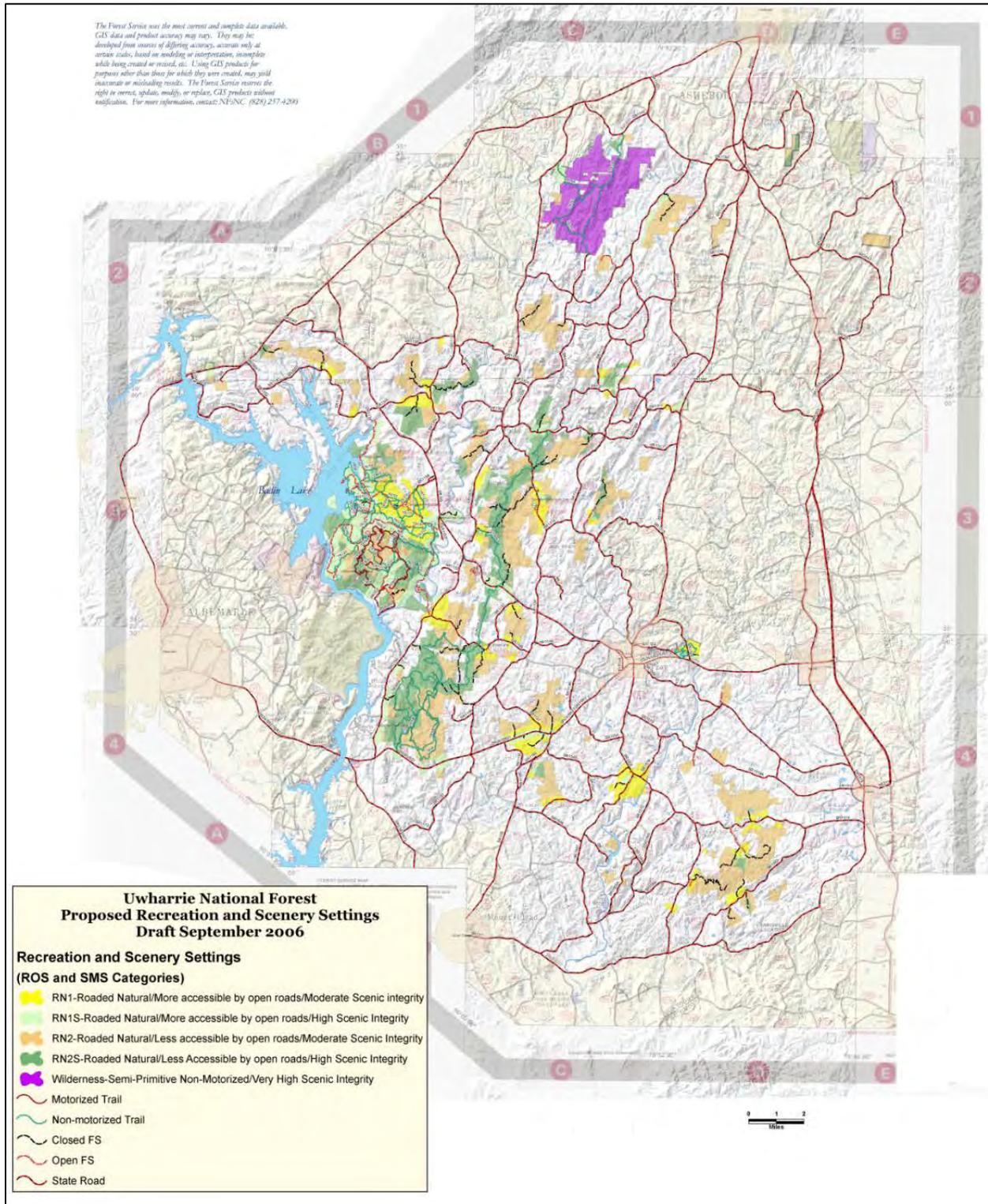


Figure 3-22. Recreation Settings Map for Alternatives B and C



Note: A larger version of this map is available on the NFsNC website, Uwharrie Plan Revision Page

Alternative B and C assign ROS categories with consideration for scenery, trails, and Special Interest Areas, and the results often cut across management area boundaries (Figure 3-22). As such, the assigned settings for Alternatives B and C are more site-specific and more responsive to recreation desired conditions compared to Alternative A. Only the semi-primitive non-motorized acres (Birkhead Mountains Wilderness) remain the same in all alternatives.

Altering the land or its management to make it more or less attractive for recreation

Timber management impacts recreation when travel routes are used to access timber sale units or to haul out timber from log landings. In many parts of the Uwharrie NF, recreationists have made use of old timber sale haul roads, skid trails or non-system roads as trails, yet only some of these are part of the designated trail system. Generally, these access routes would be used as part of the timber sale access system every 15 to 20 years as the management rotates around the Uwharrie NF. Timber management impacts the character of the area, which affects the recreating public in different ways. There are impacts to the scenery from the trails, as well as, how the corridor itself looks: much wider than a typical designated non-motorized trail, gravel surfacing, less tree canopy, more sunlight, and often less challenging or interesting. Similarly, utilizing designated recreational trails as fire breaks or fire lines for the prescribed burning program can cause changes to the trail's character. Site specific mitigations would be developed within the project analyses whenever these changes in use are planned.

When trails traverse timber sale and prescribed burn units, impacts to scenery can be evident for up to several years after the management activity is completed. Smoke from prescribed fires could last from a few days up to a week after the burn is completed as fuels continue to smolder. Affected trails would be closed during the management activity for safety reasons. Vegetation green up after fire occurs rapidly in the Piedmont, but the visual effects of fire (darkened bark, burned leaves, etc.) can be evident for up to a year. Timber harvest activities typically take a few years to implement, with subsequent regeneration apparent for several years. Scenery treatment guides and other mitigations would help to reduce impacts to recreationists. See the Scenery section of this document for more information.

Noise from timber and prescribed fire management can also impact recreation. Heavy equipment and occasionally helicopters would increase noise impacts for recreationists. These impacts occur only during the active management in the timber sale and burn units, so they are short term. Management activities are rotated around the national forest so areas would be impacted for a couple of years and then the management would move to another area of the forest for the next few years.

Alternative A would have more timber harvest and less prescribed fire activity than Alternatives B and C. Based on the assumption that impacts from timber harvest would likely last longer and be observable for longer than impacts from prescribed fire, Alternative A would have somewhat more impacts to recreation than Alternatives B and C. Over time, Alternatives B and C, which restore native hardwood and longleaf pine ecosystems, would result in an improved recreation experience since these more natural appearing landscapes are preferred over unnatural appearing loblolly pine plantations.

Improving or Limiting Access

In Alternative A, OHV use would continue to be restricted to a designated trail system, with an increase in miles of trails (less than 10) for a total of 25 miles. Mountain bikes, horses and hikers would not be restricted to designated trails and would be allowed to ride or walk cross-country.

One of the themes of Alternatives B and C is to provide outstanding and environmentally friendly outdoor recreation opportunities with excellent trails and facilities. In Alternative B, the goal is for all trail uses except hiking (motorized OHV, mountain bikes, horseback riding) to be eventually restricted to designated trails, roads, and areas (unless a road is posted as closed to that use). Hikers would still have open access to the national forest, unless the area is signed as closed to that use. Alternative C differs in that only OHVs and mountain bikes would be restricted to designated systems. Horseback riders and hikers would be allowed to travel cross-country and would not be restricted to a designated system. For both Alternatives B and C, there are no stated maximum or minimum miles of trails for any type of use. The focus would be on creating trail systems that meet the needs of the user groups; offering opportunities for differing skill levels of users; increasing vista opportunities along the trail systems; reducing user conflicts; creating well located, designed, and constructed trails that would be easier to manage and maintain; and to meet these recreation demands with minimal impact to other resources.

The experience for OHV users does not differ among alternatives. This use is already restricted to a designated system and all alternatives allow for maintaining an OHV trail system that provides for all types of OHVs.

With implementation of Alternative A, there would be no change to the recreation experience for mountain bikers. Since mountain bikes would not be limited to a designated system, cross-country and non-system trail users have the potential to get lost where trails are not blazed, mapped, or signed. Under Alternative B or C there is a goal to eventually limit mountain bikes to designated trails or areas. The expectation is that designated system trails would be better marked, mapped, and maintained in Alternatives B and C compared to Alternative A. With implementation of Alternative B or C, a separate analysis would be conducted, with public participation, to develop a designated trail system for mountain bike use.

Alternatives A and C allow for continued cross-country equestrian riding. Since non-system trails would not be maintained by the USDA Forest Service, the trails would continue to degrade, negatively impacting the recreation experience. Visitors that encounter unmapped and/or unsigned trail junctions could potentially exacerbate the problem by continuing to use undesignated trails that are in poor condition. The potential for riders to get lost would continue since non-system trails throughout the forest are not blazed, marked or mapped by the forest service. However, the sense of freedom to roam on horseback, a desire for many horseback riders, would be retained in Alternatives A and C.

In Alternative B, horseback riding would eventually be limited to a designated system. If Alternative B is chosen, a separate analysis would be conducted with public participation to identify and develop designated trails and cross-country areas for equestrian and mountain bike use.

The experience for hikers is unlikely to differ among alternatives except there may be fewer user conflicts with bikes and horses if Alternative B is selected, and fewer conflicts with bikes if Alternative C is selected.

Table 3- 29. Comparison of trail uses by alternative.

	Alternative A	Alternative B	Alternative C
Hiking: cross-country travel	YES	YES	YES
Goal: OHV's only on designated system	YES	YES	YES
Goal: Horses only on designated system	NO	YES	NO
Goal: Mountain bikes only on designated system	NO	YES	YES

Constructing, improving, or removing recreation facilities

Since the 1986 Plan, many new recreation facilities have been constructed, including a shooting range and several developed campgrounds. Many of these new facilities have become very popular with recreationists. All of the alternatives call for a focus on maintaining or improving existing facilities before considering new construction.

With the Uwharrie NF's emphasis on hunting and the increased popularity of recreational shooting, the shooting range is heavily used by visitors who travel from throughout the mid-state area. Facilities at the existing range include a 50 yard pistol range and 100 yard rifle range with covered shooting allies and a vault toilet. However, safety issues surfacing in 2009 and 2010 led to the range being closed in 2010. The intent is to resolve the safety issues, either through modifying the existing range or possibly moving it to another location, an intent that does not differ among alternatives. One impact from target shooting recreation on other recreation experiences is noise heard at other recreation facilities (campgrounds, day use areas, and trails). The existing range is located in the Badin Lake Recreation Area where many developed facilities are concentrated. The general impact of noise would be the same for all alternatives.

Impacts to Hunting and Fishing

Impacts to hunting and fishing would occur if access for hunters or anglers changes or if habitats for game species improve or degrade. In all three alternatives, the Uwharrie NF would remain part of the North Carolina Gamelands and the USDA Forest Service would continue to cooperate with the NCWRC to improve and manage wildlife and fish habitat for the benefits of species sought by hunters and anglers.

Alternative A is the continuation of the 1986 LRMP that focuses on healthy forests for timber production and management of game species. Hunter success varies with species but continues to be stable to increasing for white-tailed deer, eastern gray squirrel and wild turkey, three of the most popular game species on the Uwharrie NF. If Alternative A is chosen, these hunting and fishing opportunities and experiences would remain the same.

Alternatives B and C focus on ecological restoration that would result in areas of loblolly, shortleaf pine or mixed pine-oak stands being replaced by site-appropriate longleaf pine, pine-oak, oak or oak-hickory forests. If Alternative B or C is selected, restoration of deciduous woodlands would

increase most producing trees that many game species rely on, leading to an increase in the quality of habitat and an increase in the opportunities for hunter success with these species. Additionally, the restoration of longleaf pine and open pine woodlands would contribute to increased habitat for some game species such as the northern bobwhite quail that are currently not as common, thereby increasing opportunities for hunter success.

Alternatives B and C include an objective to construct one new streambank and lakeshore angler access area during the planning period. This would improve fishing opportunities for Alternatives B and C compared to Alternative A which does not propose any changes.

In Alternative A, the management and location of wildlife openings would continue in their current locations, which have led to user conflicts between hunters and other recreationists and private landowners. In their current locations there are safety concerns because many of the wildlife openings are adjacent to roads, trails and private property. If this alternative is implemented, these issues would continue to increase as the level of use increases and the potential for an accident increases.

With implementation of Alternatives B or C, location and management of wildlife openings could change based on evaluation of location and condition. Wildlife fields and openings would be predominantly planted with native plants and desired non-invasive non-native vegetation. The openings would also be dispersed across the forest and would not be located within 150 yards of developed recreation areas. This would minimize impacts to both hunters and other recreationists on the forest because it would separate these groups from one another, decreasing user conflicts and improving safety. Some of the existing wildlife fields and openings that are in close proximity to developed recreation areas might be discontinued or some trails might be rerouted away from wildlife openings in order to meet this goal. The Uwharrie NF would work and coordinate the location and management of the wildlife openings with the NCWRC.

CUMULATIVE EFFECTS

Projections of future trends in national forest activities indicate that visitor use on the Uwharrie NF would increase by 60 percent over the next 50 years. National estimates of future trends in types of use indicate that demand for some activities would increase more than others. Categories of activities available on the Uwharrie NF that are likely to increase somewhat more than 60 percent are: (1) winter visits; (2) “challenge activities” such as biking and climbing; and (3) hiking. Additionally, other recreational activities that are expected to increase at a rate slightly less than 60 percent include hunting, fishing, and motorized off-road use (Cordell forthcoming).

Cumulative effects to recreation resources are complex to measure and pinpoint. Generally, the greater the number of people recreating in an area, the greater the impacts to the natural resources and facilities. It is anticipated that there would be more people recreating on the Uwharrie NF as the population of the USA and North Carolina increases. This increase in use would undoubtedly lead to increased user conflicts on trails and/or at developed recreation sites. Alternative B addresses these cumulative impacts more than Alternatives C and A by having a goal to restrict equestrians and mountain bikers to a designated system. Alternative C addresses user conflicts

slightly more than Alternative A because it has a goal of limiting mountain bikers to a designated system. Alternative A does not address this issue well because hikers, equestrians, and mountain bikers would all be able to utilize the same trails.

Climate change is expected to result in increasing temperatures, more intense storms, more wildfire risk, and more insect and disease outbreaks. Increasing temperatures could lead to more recreationists visiting the national forest during fall, winter, and spring rather than summer. More recreationists may also seek water-based recreation. Storm damage and wildfire damage could create safety hazards on trails and in developed areas, resulting in temporary closures. The effect could be to make the national forest less attractive for use at certain times of year and in certain locations, while it could be more attractive during cooler seasons and in areas near water.

SCENERY

AFFECTED ENVIRONMENT

All national forests including the Uwharrie NF are managed within a basic framework of sustaining high-quality scenery. Research has demonstrated that high-quality scenery is one of the primary reasons people visit national forests and is a primary component of recreation experiences. The Uwharrie NF has a generally natural-appearing character but is bounded by or contains many areas that have a rural, agricultural, or pastoral character - including industrial forest plantations, farm lands, and cultural/historic sites.

Land use themes within Uwharrie NF landscapes can be grouped predominantly into four categories: Natural Evolving, Natural Appearing, Rural-Forested, and Rural-Pastoral/Agricultural.

The vast majority of the national forest is characterized as Natural Appearing.

Designated Wilderness, lands where ecological processes predominate, are characteristically Natural Evolving landscapes.

Rural-Forested is a category that includes the national forest's developed recreation areas and managed pine plantations.

Rural-Pastoral/Agricultural is a category composed mainly of managed open areas associated with historic/cultural sites, wildlife openings, and dispersed recreation areas.

The physiographic and ecological setting of an area combined with the area's existing and historic human land uses and human perception determine the existing scenic character of the landscape. The Uwharrie NF is in the Central Piedmont and has a long history of human use dating back thousands of years. Scenic changes in the landscape over time are normal - some changes occur over thousands of years and completely reshape the character of the landscape. In many parts of central North Carolina, more recent human uses have altered the landscape to move it away from a natural-appearing condition. In some cases these alterations are a positive or acceptable change,

such as historic, cultural or pastoral landscapes. In other cases these alterations have negatively affected scenery and need human intervention to restore a landscape back to a desired condition - such as restoration of oak-hickory or longleaf pine plant communities.

Scenery Management vs. Visual Management

The scenic resources of the Uwharrie NF are currently managed in accordance with the 1986 Plan. The scenery management direction is identified through Visual Quality Objectives (VQO) for each of the management areas - which were determined using the Visual Management System (VMS). Visual Quality Objectives in the 1986 Plan range from Preservation to Maximum Modification. This direction applies to Alternative A

For the Proposed Plan, scenic resources have been re-inventoried to comply with the Scenery Management System (SMS), which replaced the VMS in 1995 (See Landscape Aesthetics, A Handbook for Scenery Management, Agricultural Handbook Number 701). Through the planning process Scenic Integrity Objectives (SIOs) were identified across the national forest - they include Very High (unaltered), High (appears unaltered), and Moderate (slightly altered). The SIOs define acceptable levels of alteration affecting the scenic resource and apply to Alternatives B and C.

The crosswalk between Visual Quality Objectives (Visual Management System) and Scenic Integrity Objectives (the updated Scenery Management System) is shown in Table 3-30.

Table 3-30. Crosswalk between VQOs and SIOs

Visual Quality Objective (VQO)	Scenic Integrity Objective (SIO)
Preservation (P)	Very High (VH)
Retention (R)	High (H)
Partial Retention (PR)	Moderate (M)
Modification (M)*	Low (L)*
Maximum Modification (MM)*	Very Low (VL)*

*Although used in the 1986 Plan, these are not objectives identified in the Proposed Plan.

ENVIRONMENTAL CONSEQUENCES

The scenic resource is affected by management activities which alter the appearance of the landscape. Short-term scenic effects are usually considered in terms of the degree of visual contrast a management activity has within the surrounding natural-appearing landscape. The scenic landscape can be changed over the long-term or cumulatively by the alteration of the visual character. Management activities that have the greatest potential of affecting scenery are road construction, vegetation management, insect and disease control, utility rights-of-ways, and mineral extraction. Other management activities that affect scenery resources to a lesser degree are habitat improvement projects, prescribed fire, fire suppression, land adjustment, developed recreation facilities, and elements of dispersed recreation.

Some activities affecting scenery would vary by alternative and some are unlikely to change. Those activities that are not likely to vary by alternative are: insect and disease control, fire suppression,

land adjustment, and management of developed recreation facilities. Special use utility rights-of-way and mineral extraction are unlikely to vary by alternative but if such an activity should occur it could impact management's ability to meet the assigned scenery objectives in an area. Vegetation management, habitat improvements, prescribed fire, road construction, and elements of dispersed recreation would vary by alternative and those variations would serve as indicators of the effects of the alternatives.

Indicator measures of effects to scenery are:

- Scenic objectives identified for each alternative
- Acres and character of vegetation management and habitat improvement
- Acres of prescribed fire
- Road construction and management
- Disperse recreation management
- Special uses and minerals management

Scenic Objectives Identified for Each Alternative

Table 3-31. Scenery Objectives Vary by Alternative

Objective	Alternative A	Alternative B	Alternative C
Preservation / Very High	MA8-Wilderness	Wilderness	Wilderness
Retention / High	Sensitive landscapes in MA 4	Sensitive landscapes across the national forest	Sensitive landscapes across the national forest
Partial Retention / Moderate	Sensitive landscapes in MAs 1 & 3, less sensitive landscapes in MA4	Less sensitive landscapes across the national forest	Less sensitive landscapes across the national forest
Modification / Low	Less sensitive landscapes in MAs 1 & 3	None	None
Maximum Modification / Very Low	Least sensitive landscapes in MAs 1 & 3	None	None

As shown in Table 3-31, Alternative A allows management activities that are only required to meet Modification or Maximum Modification Visual Quality Objectives on some portion of the national forest. These are not typically used in visually sensitive areas, but treatments that only meet "modification" or "maximum modification" create the greatest impacts to scenery.

Alternatives B and C incorporate the updated Scenery Management System which is consistent with ecosystem management goals, desired conditions, and management of scenic cultural/historic landscapes. Additionally, these alternatives only use SIOs aimed at preserving, maintaining, or improving scenic quality, with no portion of the national forest managed only to meet "modification" or "maximum modification." Therefore, based on scenery objectives, Alternative B and C would result in more positive outcomes for scenery than Alternative A.

Acres and Character of Vegetation Management and Habitat Improvement

Vegetation management has the potential to alter the landscape and impact scenic resources. Timber harvest practices can cause long-term effects on scenery by altering landscape character through species conversion, changes in species diversity, manipulation of the prominent age class,

and introduction of openings in the landscape. However, most impacts as a result of timber harvest are short-term because of rapid vegetation growth. The end result may have a positive or negative effect on scenery, depending on consistency with the desired future condition of the landscape.

Of the various harvest methods, even-aged management creates the greatest short term impacts to scenery. Among the even-aged regeneration methods clear-cutting harvest produces the highest visual contrasts, because it removes the forest canopy and creates openings. These openings would vary in their effects on scenery depending on size, shape, location, and proximity to other openings. Two-aged regeneration or shelterwood methods can also affect scenery by creating openings, and causing contrasts in form, line, color, and texture. Impacts from this harvest method are highly variable depending on leave-tree density, rotation of over-story removal, and other factors mentioned above. Thinning harvest is normally less evident because it does not cause noticeable openings in the canopy.

Many loblolly pine plantations exist across the Uwharrie NF in land use themes categorized as rural-forested. They typically occupy areas where the desired condition may be a natural-appearing forest. These plantations resemble industrial forestry, with single age loblolly pine trees arranged in parallel rows. To restore these areas to native communities, active management, including clear-cutting, would be necessary to change the composition of these stands. Activities such as tree cutting and understory burning would be visible while the national forest transitions from the existing condition to a desired condition of more longleaf pine and oak-hickory communities. Scenery mitigation and enhancement techniques could be used so that scenic integrity or visual quality objectives are maintained. If native communities are reestablished over time through ecosystem restoration activities, the less natural appearing pine plantations will be replaced with more natural appearing mixed-age and often mixed-species forests. This would create a positive change in landscape character. The more open, park-like stands of longleaf pine would offer views further into the forest and combined with a native grass understory create a more scenic natural-appearing landscape. The table below displays the acres and purpose of vegetation management by alternative.

Table 3-32. Annual projection of vegetation management by alternative and purpose.

ACTIVITY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Regeneration Harvest (even-or two-aged)	PURPOSE		
	Timber Production and Forest Health (acres)	Ecosystem Restoration and Forest health (acres)	
	543	266	266
Thinning	245	400	400
Other Silvicultural Activity	57	34	34
TOTAL	845	700	700

Alternative A results in more overall timber harvest than Alternatives B and C and that activity is not for the purpose of restoring native vegetation. There would be more short term scenery impacts and no long term benefit from restoring the natural-appearing landscape. Alternatives B

and C would have less short term impacts to scenery and the long term objectives of restoring native vegetation would be beneficial.

All alternatives propose prescribed fire on various cycles. Drifting smoke, blackened vegetation, and charred tree trunks would be the main visual impact. Visual contrast from fire-line construction would also be evident. The contrast levels and duration vary with fire intensity. Blackened vegetation usually last a short time but charring of trees may be evident for many years. Repetitive burning may result in the loss of some mid- and understory species such as dogwood or redbud, but tends to promote flowering herbaceous and native grass species. However, fire is a natural component of this ecosystem and is required to maintain or restore desired conditions. The amount of prescribed burning proposed varies by alternative and is displayed in the table below.

Table 3-33. Estimate Annual Acres Treated with Prescribed Fire by Alternative

Alternative A	Alternative B	Alternative C
For improving wildlife habitat = 1,540 acres For reducing wildfire potential/site prep = 1,460 acres	For ecological restoration and maintenance – 3,000 to 6,000 acres	For ecological restoration and maintenance – 3,000 to 6,000 acres

Under Alternative A the existing vegetation management, habitat improvement, and fire regimes would continue. Regeneration harvest acres are more than twice that of Alternatives B and C, which combined with less restrictive VQOs could result in fewer acres of natural-appearing landscapes. Alternative A proposes less prescribed fire, which could be interpreted to have reduced scenery impacts. However, it lacks the emphasis on fire-dependant ecosystem restoration that ultimately improves scenery.

Alternatives B and C emphasize ecosystem restoration, and propose fewer acres of regeneration harvest while utilizing more thinning and prescribed fire than Alternative A. The overall effect to scenery from vegetation management, habitat improvement, and prescribed fire proposed in this alternative would result in more acres of natural-appearing landscapes and a continual improvement of scenic quality as desired conditions are achieved.

Road Construction and Management

Road maintenance (including rights-of-way), affects scenery. Mowing frequency and timing alters the appearance of the landscape. Road construction introduces unnatural visual elements into the landscape and causes contrasts in form, line, color, and texture. However, poorly maintained roads can cause further degradation to scenery through erosion. Road management also controls how much of the landscape is seen by having roads open or closed. Well maintained roads at appropriate density levels provide the optimum combination of minimizing impacts while providing access to scenic landscapes for all forest users.

Alternative A anticipates that about two miles of new road construction would occur each year. Alternatives B and C do not anticipate any particular amount and have a desired condition that, “There is little evidence of new road construction.” The assumption is that Alternatives B and C would ultimately result in fewer miles of road construction and fewer scenery impacts associated

with road construction. On the other hand, Alternative A anticipates approximately 56 miles of open road through the national forest while the assumption for Alternatives B and C is that the existing approximately 30 miles of open road would remain over time. In this regard Alternative A would result in greater motorized access to the national forest than Alternatives B and C. For road maintenance, while the desire for all alternatives would be to maintain the roads in good condition, Alternatives B and C, with fewer overall miles and fewer open road miles would be more likely result in adequate road maintenance for all roads than Alternative A.

Dispersed Recreation Management

Improperly located and poorly maintained trails often become entrenched, which captures and concentrates the erosive forces of storm water. The resulting bare soils and silt laden streams are visible scars across the scenic landscape. This condition occurs more commonly on trails with high-impact uses such as mountain bikes, equestrians, or OHVs. A properly constructed and maintained trail on a side-hill location will shed water with minimal erosive effects, thus reducing potential impacts to the scenic resource. Typically, user-created trails are not designed, constructed, or maintained to minimize erosion. Bare ground and erosion scars from these trails can be seen throughout the Uwharrie NF, particularly in the Badin Lake area where there is an abundance of user-created trails.

The current situation would continue under Alternative A. Trails would be maintained in their current condition, and uncontrolled expansion of user-created equestrian and mountain bike trails would continue unrestricted. This has a negative effect on scenic quality by allowing user-created trails to persist on the landscape in an otherwise unmanaged system.

Alternatives B and C state goals of well designed, constructed, and maintained trails where damage to soil and water are minimal. Both alternatives restrict mountain bike use to designated routes; additionally, Alternative B proposes a goal to restrict equestrian use to designated routes. Alternative C allows cross-country travel on horseback - which would continue the current uncontrolled expansion of user-created equestrian trails. Trail management under Alternative B would ultimately result in the least impact to scenic resources.

Special Uses and Minerals Management

Utility rights-of-way, communication sites, and mineral extraction have a high potential of affecting the scenic resource for a long duration. Cleared ROWs, utility structures, and mining activities contrast and may be incongruent with surrounding natural-appearing landscapes.

As previously stated, Alternative A incorporates a broader range of VQOs allowing activities that are only required meet Modification or Maximum Modification in some areas. Alternatives B and C identify most of the Uwharrie NF as Moderate SIO, which is equivalent to Partial Retention VQO. The remaining land base is inventoried as the even more restrictive High and Very High SIOs. Therefore, the scenery resource with regard to special uses and minerals management would be protected to a greater extent under Alternatives B or C compared to Alternative A.

CUMULATIVE EFFECTS

Climate change is likely to result in increased frequency, duration, and severity of drought and intense storm events. These conditions may increase the frequency of severe wildfires, insect infestations, and disease outbreaks. Any one of these events could result in mortality of canopy trees over large areas of the Uwharrie NF, which could be visible from numerous locations. Increased occurrence of these events would result in an ever-broadening loss of natural-appearing landscapes - regardless of assigned VQO, SIO, or viewshed sensitivity. Managing scenery under these conditions would be difficult. Vegetation mortality and salvage operations may create unacceptable scenic conditions in the short-term, but subsequent restoration efforts may allow transition toward desired conditions and identified scenery objectives over the long-term. These impacts could occur under any of the three alternatives; but with clear objectives for restoration as a desired condition, Alternatives B and C would be more effective in maintaining or restoring natural-appearing landscapes and reducing potential cumulative impacts to scenery compared to Alternative A.

WILDERNESS

AFFECTED ENVIRONMENT

Wilderness

Congressionally designated Wilderness areas are protected by law and valued for their ecological, historical, scientific and experiential resources.

The demand for wilderness is largely attributable to people's desire to recreate in remote and primitive areas. Other values of wilderness include long-term environmental monitoring, scenic backdrops for tourism, watershed protection, and maintenance of biological diversity. Many people who do not regularly visit primitive areas or designated wilderness areas still value protection of such areas to maintain the opportunity for visits in the future (option value). People also gain benefits simply from knowing that natural areas exist (existence values) and that their protection today sustains them for future generations (bequest value). The option, existence, and bequest values, when combined are known as passive use values (Loomis 2000). Several studies have shown the importance and value people place on these passive use benefits of wilderness (Cordell et al. 1999).

Currently on the Uwharrie NF, there is one Congressionally designated Wilderness containing approximately 5,160 acres. This amounts to approximately 10 percent of the total Uwharrie NF. This Wilderness area was designated by Public Law 98-324, the North Carolina Wilderness Act of 1984. The Uwharrie NF does not contain any wilderness study areas or recommended wilderness study areas that have not been acted upon by Congress. Birkhead Mountains Wilderness will be managed to maintain the area's natural characteristics. Natural occurrences such as outbreaks of insects and disease are allowed. Human caused intrusions are only allowed in limited

circumstances and with special authority. Under emergency conditions, mechanical equipment and motorized transport may be approved for use to control fire that threatens life, property, or the wilderness resource; search and rescue; or pest outbreaks threatening private property.

There are currently five private inholdings within the Birkhead Mountains Wilderness, with three different landowners. Two of the inholdings have structures on them. Access to these inholdings is by motor vehicle, utilizing permanent rights-of-way through national forest ownership. There have not been any special use permits issued to these landowners for public utility service.

Outdoor recreationists are one of the drivers of demand for wilderness and wilderness management. The current uses of the Birkhead Wilderness are hiking the developed trail systems, dispersed camping, hunting, and fishing.

Potential Additions

Forest Service directives (FSH 1909.12, chapter 70) provided the detailed criteria for the identification of potential wilderness areas. Using these criteria, four potential additions to the Birkhead Mountains Wilderness were identified through a GIS analysis. Through this analysis, no stand-alone areas were found to meet these criteria, including the special criteria for potential wilderness east of the 100th Meridian.

Currently on the Uwharrie NF, four areas adjacent to the Birkhead Mountains Wilderness that exhibit some wilderness characteristics. These tracts comprise the potential wilderness additions. Typically, each individual potential wilderness addition would have a separate report prepared that evaluates its wilderness potential. Due to the small size of these tracts (approximately 388 acres cumulatively) and the similarities between the vegetation, geology, and past management, one report has been prepared for all tracts. This report is found in Appendix C. The evaluation report considers wilderness potential in three main categories:

- Capability (the qualities that make an area suitable or not suitable for wilderness);
- Availability (an assessment of the non-wilderness resources and demand of the area); and
- Need (a consideration of the amount of wilderness already in the region).

The four potential additions to Birkhead Mountains Wilderness, totaling approximately 388 acres (cumulatively known as Birkhead Additions) could be recommended for wilderness study. Figure 3-23 shows the location of the Birkhead Additions adjacent to the Birkhead Mountain Wilderness, and acres by tract in Table 3-34.

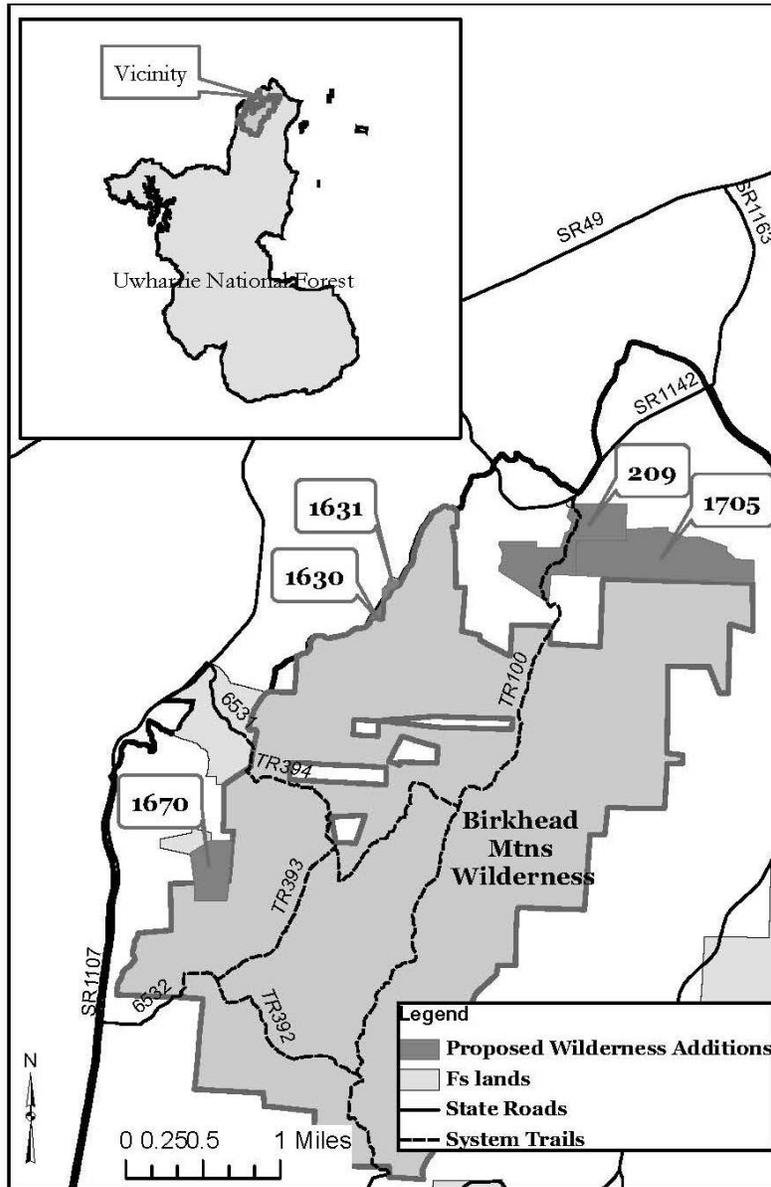
Table 3-34. Acreage of Potential Wilderness Additions

Tract Number	Total Acres (approximate) that qualify for Potential Wilderness
Tract U-1670	51
Tract U-1630	2.6
Tract U-1631	4.5
Tract U-209*	140

Tract Number	Total Acres (approximate) that qualify for Potential Wilderness
Tract U-1705*	190

*Tracts U-209 and U-1705 are addressed as one contiguous potential addition.

Figure 3-23. Vicinity Map of Potential Wilderness Additions on the Uwharrie National Forest



ENVIRONMENTAL CONSEQUENCES

Wilderness

There would be no difference in the acres of designated wilderness among the alternatives.

Effects to the wilderness resource come from many sources. Recreational use can have negative impacts to the quality, character, and integrity of the wilderness resource due to overuse. Some of these negative impacts include soil compaction; vegetation loss; disturbance of cultural/historical resources; disturbance and/or replacement by non-native species such as noxious weeds within riparian corridors and along trails and campsites caused by heavy recreation use; crowding and loss of solitude; deterioration of water quality from improper disposal of human waste and waste water which could lead to localized threats to biological/ecological processes and biodiversity. All alternatives contain direction that would help to restore, maintain or enhance wilderness attributes. Alternative B, which has a goal to restrict equestrian use to a designated trail system, would result in a reduction in potential impacts from horse use in the wilderness. Alternatives A and C would not result in this potential reduction in impacts.

Other environmental effects which impact the integrity of the natural systems in wilderness include air pollution from outside sources, interruption of naturally-functioning systems by fire suppression, and threats to native plant species from the spread of non-native invasive plants (NNIS) from sources outside wilderness. Alternative A requires fire suppression in the wilderness and is silent on allowing prescribed fire. Alternatives B and C on the other hand emphasize the natural role of fire in wilderness and permit prescribed fire to help replace natural fires interrupted by human activity outside the wilderness boundaries (more fully discussed below). Alternatives B and C also contain a desired condition for minimal evidence of NNIS or their impacts to native vegetation, which would open the door for potential treatments to eliminate NNIS within the wilderness. As a result Alternatives B and C would improve the integrity of the natural systems more than Alternative A.

Maintenance of the approximately 10 miles of hiking trails and trail infrastructure is completed using hand tools only and access into the wilderness is made using non-mechanized/non-motorized means. Should the Uwharrie National Recreation Trail be constructed through the Birkhead Mountains Wilderness in this planning period, management would be subordinate to the Wilderness Management Area, and this would be the same for all alternatives.

Fire in the Wilderness

Fire management direction for the Birkhead Mountains Wilderness in Alternative A is silent on the possibility of using prescribed fire to help restore the natural fire regime, whereas Alternatives B and C include this management strategy as a desired condition. Firefighter and public safety would always be the primary consideration for all fire management strategies and tactics. For all alternatives the full range of appropriate suppression strategies can be utilized, ranging from direct attack that attempts to minimize acreage burned and resource value loss, to indirect attack, and to simply monitor a fire to evaluate its progress (known as Use of Wildland Fire to Achieve Multiple Objectives). Fire suppression strategies and tactics would be commensurate with the resource values at risk. Natural barriers such as rock slides, riparian corridors, trails and boundary roads would be utilized when possible to minimize the construction of fire lines and to mitigate the impacts to soil, water, vegetation, and to provide for other safety considerations.

Use of Wildland Fire to Achieve Multiple Objectives allows managers to utilize lightning ignitions, both inside and outside of wilderness, and various parameters such as weather, fuel conditions, and expected fire behavior to determine if the fire is within its management parameters. Management parameters are determined by utilizing the Wildland Fire Decision Support System (WFDSS). A Wilderness Fire Operations Plan is required for each wilderness area if fire management is to be implemented.

Strategies that allow the fire to burn to natural barriers are favored and if a fire control line must be constructed, it would be of minimum width and depth to stop fire spread. Limited brushing and cutting of brush and trees or dead standing trees would be required unless the vegetation posed safety hazard or imminently threat to the security of a fireline.

Management ignited prescribed fires in wilderness may be ignited to reduce unnatural buildups of fuels to meet at least one of the wilderness fire management objectives set forth in FSM 2324.21. Management of lightning-caused fires are preferable to management ignited prescribed fires to meet fire management objectives.

Potential Wilderness Additions

Both recommending potential wilderness additions for wilderness study and not recommending them have environmental consequences. In this EIS, four potential wilderness additions are identified and evaluated. In Alternative A these four areas are allocated to Management Area 1 which allows for typical multiple uses including commercial timber and car-touring. With Alternative A the opportunities for increased solitude and remoteness and increased naturalness would not be assured. In Alternatives B and C they are allocated as Potential Wilderness Additions. Also in Alternatives B and C, tracts U-1630 and U-1631 (totaling 17.1 acres) are recommended to be additions to the Birkhead Mountains Wilderness. Tracts U-1670 and U-209/U-1705 would not be recommended to be added to the Wilderness, but they will be managed to retain their existing potential wilderness character.

Tracts U-1670 and U-209/U-1705 are not being recommended for wilderness study at this time because they have evidence of human habitation and past management and would require active restoration to restore them to a more natural appearance. With Alternatives B and C the resource effects of this management would include maintaining soil, hydrologic, and air quality conditions prevailing within the areas. Roads would be closed, decommissioned, and rehabilitated or allowed to return to a natural state. Structures would be removed. Water quality and air quality remain high locally and the imprint of human influence would diminish over time. Also, with Alternatives B and C, opportunities for solitude and remoteness would increase as does the opportunity for primitive and dispersed recreation (hiking, camping, hunting, and fishing) due to road closures and prohibited motorized use. Visual contrasts between these areas and other forested lands could increase.

Tracts U-1630 and U-1631 are recommended for wilderness study and would be set aside for future consideration as wilderness. The current condition of these tracts would not require any active management for restoration. Actions that would maintain or enhance existing wilderness

character would be allowed under Alternatives B and C. These areas would be managed to allow certain natural processes to occur, providing additional areas for solitude and primitive recreation, and minimizing the impacts of human activities on the land. The highest priority for management would be to preserve the naturalness of the area.

Potential additional acreage for wilderness would theoretically increase carrying capacity and allow for user impacts to be dispersed across a larger area providing an increase in wilderness visitor solitude for those recreationists who visit new areas.

There could be a slight increase in visitation and associated economics in the surrounding local communities. However, there could also be a reduction in economic benefits associated with wildlife and forest management and associated activities from the potential wilderness additions since most resource management activities would not be allowed in these areas.

Due to the small acreage involved in the potential Birkhead Mountains Wilderness Additions, the extent of impacts from any alternative is likely to be small.

Cumulative effects to wilderness and potential wilderness additions

In Randolph County where Birkhead Mountains Wilderness and the potential wilderness additions are located, the land adjacent to the national forest is mostly in a Rural Growth Management Area where significant high intensity residential growth is discouraged or not anticipated for ten to fifteen years. At the same time it is recognized that residential development near the national forest is likely to increase. Increased development adjacent to wilderness can result in increasing use of the wilderness for recreation, increasing risks of intrusion of sights and sounds of civilization and NNIS infestation, and challenges to fire management.

At the same time climate change may also increase management challenges. Wildfire occurrence, intense storm events, and insect and disease outbreaks are all forecast to increase with climate change. While many of these would fall under an umbrella of natural disturbance events acceptable in wilderness, they could also pose challenges to retaining the integrity of natural systems.

RIVER CORRIDORS ELIGIBLE FOR WILD AND SCENIC RIVER STATUS

AFFECTED ENVIRONMENT

The Wild and Scenic Rivers Act (Public Law 90-542: 16 USC 1271-1287, October 2, 1968) and its amendments provide for the protection of selected rivers and their immediate environments. To be eligible for designation rivers must possess one or more outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. Designation preserves rivers in free-flowing condition, protects water quality and protects their immediate environments for the benefit and enjoyment of present and future generations.

Most rivers are added to the National Wild and Scenic Rivers System (National System) through federal legislation, after a study of the river's eligibility and suitability for designation. The USDA Forest Service is required to consider and evaluate rivers on lands they manage for potential designation while preparing land and resource management plans under Section 5(d)(1) of the Act.

Rivers and stream corridors accommodate many different uses such as picnicking, fishing, day hiking and walking for pleasure, primitive camping, boating (canoeing, kayaking, rafting, tubing), swimming and nature study. The National Survey on Recreation and the Environment 2000 interviewed over 15,000 people to determine their participation in a variety of activities. According to the results, an estimated 76.1 million people participated in boating (including rafting, kayaking and canoeing) and 20 million participated in rafting, tubing or any other type of floating on flowing waters.

Demand for Wild and Scenic River (WSR) designation is expressed primarily through public comment and responses to agency proposals. The degree to which public input favors designation indicates the demand for a wide range of uses, activities, and resources qualities associated with WSR management. Although demand is closely related to the current population and the projected growth of the local area, WSR designation would likely lead to increased levels of recreation use in designated and potential WSR corridors.

North Carolina currently has three designated Wild and Scenic Rivers that are managed by the USDA Forest Service. These include Horsepasture (Scenic and Recreational segments), Wilson Creek (Wild, Scenic, and Recreational segments), and portions of the Chattooga River (Wild, Scenic, and Recreational segments). Horsepasture and Wilson Creek are located on the Pisgah National Forest and the Chattooga River is located on the Nantahala, Francis Marion-Sumter, and Chattahoochee National Forests. There are currently no WSRs designated on the Uwharrie National Forest.

The 1986 Croatan and Uwharrie Land and Resource Management Plan (1986 Forest Plan) Amendment #2 reviewed the Uwharrie River and Barnes Creek on the Uwharrie NF for potential WSR eligibility. Amendment #2 to the 1986 Forest Plan provided a systematic approach to evaluate the rivers/streams within the Uwharrie NF that were included in the National Rivers Inventory (NRI) to determine their eligibility. While the Uwharrie River and Barnes Creek were determined to be 'eligible' for a wild or scenic river designation, their 'suitability' determination has not been made and Congress has not directed any further studies of these rivers.

For this forest plan revision, the Uwharrie River and Barnes Creek will continue to be managed as 'eligible' rivers for potential WSR designation. No other rivers were suggested for review through the public participation process or the Forest Service's interdisciplinary team. These streams were classified according to Section 2 of the WSR Act (PL 90-542). Table 3-35 shows the sections and their recommended classifications.

Table 3-35. Rivers Studied for Inclusions as National Wild and Scenic Rivers.

River	County	Total Length	Private Ownership	FS Ownership	Potential Classification
Barnes Creek	Montgomery/	9.0 Miles	71%	29%	Recreational

River	County	Total Length	Private Ownership	FS Ownership	Potential Classification
	Randolph				
Uwharrie River	Montgomery/ Randolph	61.0	73% (within Forest Proclamation Boundary)	27% (within Forest Proclamation Boundary)	Recreational

ENVIRONMENTAL CONSEQUENCES

The identification of a river for study through the forest planning process does not trigger any protection under the act until official designation by Congress. Identifying rivers as eligible, or eligible and suitable, does not create any new agency authority; rather, it focuses the management actions within the discretion of the USDA Forest Service on protecting identified river values. For agency-identified study rivers, the preliminary (inventoried) classification is to be maintained absent a suitability determination. The recommended classification is to be maintained throughout the duration of the forest plan. Table 3-33 describes the eligible river segments and their classifications.

Management emphasis for the eligible rivers and their corridors is focused on protection and enhancement of the values for which they were established, without limiting other uses that do not substantially interfere with public use and enjoyment of those values. The establishment value for Barnes Creek is fish and wildlife and the values for the Uwharrie River are scenic, historical, and cultural.

River sections classified as recreational are managed with a wide variety of activities allowed within the river corridor. However, forest management would be subordinate to the river’s outstandingly remarkable values, which include wildlife and fish for Barnes Creek, and scenic, historical, and cultural for Uwharrie River. Recreational rivers would experience a range of effects from activities outside and within the river corridor.

Rivers eligible for WSR designation would be managed in the Eligible Wild and Scenic River Corridors (EWSRC) Management Area under Alternatives B and C and management activities would be designed to maintain the outstandingly remarkable values. Alternative A does not designate such a management area.

With Alternatives B and C the EWSRC management area is classified as not suitable for timber production except where there are existing pine plantations that need to be restored. This would result in a more natural appearing corridor in the long term. There is no timber suitability determination made for the corridor in Alternative A, with only streamside standards and guidelines applicable. Restoration to more natural appearing conditions would be unlikely to occur.

CUMULATIVE EFFECTS

Increasing human population density and the resulting intensive human uses of the landscape put high stresses on aquatic systems in many areas through nonpoint source pollution and habitat degradation. Historically, riparian zones were largely forested, but human activities have reduced

forest land cover to less than 60 percent in many large watersheds. Development along rivers and streams is not only reducing water quality and habitat on many rivers, but limiting public access for fishing and other river related activities. Protection of rivers and streams through the forest planning process helps to assure high quality, free flowing rivers and streams, as well as river related recreation opportunities.

FOREST PRODUCTS

AFFECTED ENVIRONMENT

There are five counties in the wood products market area of the Uwharrie National Forest (Davidson, Montgomery, Moore, Randolph, and Stanly). Within these five counties, there are approximately seventy two (72) companies that buy timber, provide logging services or further process forest products. These companies include logging companies, sawmills, timber purchasers, wood dealers, and specialty mills such as plywood, planer, or pallet plants. Over the past five years Uwharrie timber offered for sale has received bids from five companies. In most cases the successful bidders logged the sale or contracted the logging with the various products merchandized to several locations to maximize the value of return (USDA Forest Service 2007).

An average of 500,000 cubic feet (5,000 hundred cubic feet (ccf)) of timber has been sold annually from the Uwharrie over the years from 1990 to 2006. This is only about half as much timber as was sold on average per year during the period 1980 through 1989. This is consistent with nationwide trends that resulted from a move away from intensive timber production on national forests to a more integrated resource approach to managing the landscape for ecosystem function and restoration of native species.

Under the 1986 Plan over 80% of the Forest is currently managed as suitable for sustainable timber production. In addition to contributing to America's supply of wood products, commercial timber sales are used as a method for creating certain wildlife habitat conditions, for managing fuels, restoration of native tree species, and other vegetation management needs.

Over the period 2003-2005 the average volume harvested per acre was 7.8 ccf with that volume split approximately equally between pulpwood and sawtimber volume. From 2003 – 2005 the majority of the timber harvests were thinnings and not regeneration harvests. Because 93% of all harvest acres were thinnings, the volumes per acre were much lower than what was anticipated for the 1986 Plan. The total value of the timber harvested during this time (2003 – 2005) was \$282,512. From the total funds generated all required reforestation costs were covered as well as various wildlife habitat improvement projects. Uwharrie NF timber sales were generally competitive, with several bidders, indicating a strong demand for National Forest timber (USDA Forest Service 2007).

Uwharrie NF's Timber Supply Role

When viewed at a state-level the Uwharrie national forest contributes a small portion of North Carolina's round wood output. Cooper and Mann (2009) reported that all public lands (state, federal, county) provided 2 percent of the roundwood produced in North Carolina. When compared to the total timber supply in the 5-county timber market area, the Uwharrie NF provides less than one percent of the available timber.

While the total volume of timber harvested off the Uwharrie NF in any given year is a small percentage of the gross raw material the area mills utilize, it still represents one source of material to the local mills. Several local loggers and mills do rely on purchasing national forest timber for a considerable percentage of their annual work.

Forest Land Tentatively Suitable for Timber Production

During forest land and resource management planning, the Forest Service is required to identify lands unsuited for timber production. The initial stage (Stage I) identifies land tentatively suitable for timber production. Refer to Appendix B for more information on the three stages of determining timber suitability. Table 3-36 displays the acres tentatively suitable for timber production.

Table 3-36. Lands Tentatively Suitable for Timber Production

Total National Forest Lands	50,814
Non-Forest Lands/ Lands with Unavailable Information	733
Lands Withdrawn from Timber Production (Wilderness)	5,160
Lands that Cannot be Adequately Restocked	0
Lands where Irreversible Damage would Occur	0
Lands Tentatively Suitable for Timber Production	44,921

ENVIRONMENTAL CONSEQUENCES

Alternative A emphasizes providing timber with a target output of approximately 18,700 ccf per year. This is more than three times the actual harvest volume over the past 15 years and closer to the amount harvested in the 1980's.

Alternatives B and C emphasize restoration of native tree species or managing for low-tree densities (open woodland conditions), will result in the Uwharrie NF producing forest products such as sawtimber, roundwood, or fiber, but at a lower volume than proposed in Alternative A. Desired conditions related to restoring historical forest communities will require removal of the existing overstory trees that are inhibiting the restoration objectives. For example, over the past fifty years numerous loblolly pines were planted on sites that would be restored to longleaf pine, oak-hickory, or mixed pine-hardwood forest communities. Removal of the loblollies using some type of timber harvest such as group selection, thinning, or partial overstory removal will produce

timber for local markets and contribute to the supply of wood products used by the American public. Restoration efforts could produce approximately 11,647 ccf annually over the next decade. While this is more than has been provided recently, it reflects an existing backlog of unthinned and mature loblolly and shortleaf pine stands that would be a priority for restoration activities.

Forest Land Suitable for Timber Production

As displayed previously in Table 3-36, there are 44,921 acres tentatively suitable for timber production. During the development of the alternatives, lands were then identified as not appropriate for timber production. These are lands proposed for resource uses that preclude timber production, or lands that are not cost-efficient in meeting forest objectives.

The following table discloses the lands suitable for timber production, and the total acres determined to be not suitable for timber production.

Table 3-37. Lands Suitable for Timber Production

	Alternative A	Alternatives B & C
Total National Forest Lands	50,814	50,814
Non-Forest Lands/ Lands with Unavailable Information	733	733
Lands Withdrawn from Timber Production	5,160	5,160
Lands Tentatively Suitable for Timber Production	44,921	44,921
Lands Not Appropriate for Timber Production	6,085	11,435
Lands Suitable for Timber Production	38,836	33,486
Total Lands Not Suitable for Timber Production	11,978	17,328

Base Sale Schedule and Long-Term Sustained Yield

Table 3-37 shows the base sale schedule for the alternatives. The schedules for all the alternatives show a departure from a “non-declining” schedule. Alternative A was developed to reflect the management direction from the 1986 Plan, which had a total of 600 acres regenerated each year and 245 acres thinned annually. While there is an opportunity to thin more acres than that identified in the 1986 Plan, analysis has identified that a rate of regeneration harvest of 600 acres per year is not a level that can be maintained, given the desired rotation ages. The base sale schedule reflects an adjustment needed in the second decade to get the forest on to a non-declining schedule over time. After the second decade, the total volume does increase above the first decade because of an increase in the acres being thinned. By the fourth decade, approximately 460 acres would be regenerated annually and 650 acres would be thinned annually. If Alternative A was reconfigured to meet a non-declining schedule, the first decade would have a regeneration harvest level of around 440 acres per year, and the total volume would be around 15,000 MCF for the

decade instead of 18,700 and in the second decade the total volume would increase to around 17,800 MCF.

Since Alternative A is meant to reflect what would happen with a continuation of the existing Plan, it was decided to show the effects in this environmental impact statement of continuing with the existing Plan levels, rather than disclosing the effects of a level needed to provide for a non-declining base sale schedule.

Alternatives B and C also depart from a non-declining base sale schedule. A departure can occur when overall multiple-use objectives would be better attained. In this case, the emphasis in Alternatives B and C is to restore native ecosystems, to convert loblolly plantations and shortleaf pine stands to longleaf pine and oak-hickory forests, and to accomplish these restoration activities in a timely manner. As a result of implementing these objectives, the increase in volume and acres treated in the third decade occurs because the majority of the acres in the loblolly stands are currently younger than 60 years of age and they won't be available for harvest (using a minimum regeneration age of 60) until the third decade. The decrease occurs then after the third decade because as each decade progresses, there becomes fewer and fewer loblolly and shortleaf pine stands to treat, and the restored forest types produce less volume per acre than the loblolly and shortleaf pine types.

Table 3-38. Base Sale Schedule for All Products by Decade (MCF/Decade)

Alternative	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
A	18,714	16,638	19,253	19,844	19,851
B & C	11,647	12,358	17,070	15,993	14,904

Table 3-39. Long-Term Sustained Yield by Alternative

Alternative	A	B & C
Long-Term Sustained Yield (MCF/Year)	2,513.6	1,340.2

Table 3-39 shows the Long-Term Sustained Yield for the alternatives. The Long-Term Sustained Yield (LTSY) represents the amount of timber that could be removed in perpetuity once the forest reaches its desired conditions. This shows that for Alternative A, the volumes in the base sale schedule are less than the LTSY (of 25,136 MCF for each decade). Alternatives B and C, however, have a LTSY of 13,402 for each decade, which is lower than the base sale schedule in the third through fifth decades. Similar to what was described above, a departure from the Forest's long-term sustained-yield capacity can occur when overall multiple-use objectives would be better attained. In this case, as the loblolly plantations and shortleaf pine stands are being restored to longleaf and oak-hickory forests, these restored forests types produce less volume per acre. So a fully restored forest of longleaf and oak-hickory will have a lower long-term sustained-yield capacity than what currently exists (which is reflected in the LTSY of Alternative A at 25,136 MCF for each decade).

Allowable Sale Quantity and Total Timber Sale Program Quantity

The Allowable Sale Quantity (ASQ) is defined as the maximum amount of timber that may be sold on lands suitable for timber production during a decade of implementing the Forest Plan. The ASQ plus volume produced on lands unsuitable for timber production through achievement of desired conditions or salvage operations comprise the total Timber Sale Program Quantity (TSPQ). Table 3-40 displays the ASQ and TSPQ for the alternatives, and Table 3-41 displays the estimated TSPQ by product.

Table 3.40. Allowable Sale Quantity and Total Timber Sale Program Quantity

	Alternative A	Alternatives B & C
Allowable Sale Quantity (MCF/Decade)	18,714	11,647
Total Non-Scheduled Volume (MCF/Decade)	0	0
Total Timber Sale Program (MCF/Decade)	18,714	11,647
Total Timber Sale Program (MBF/Decade)	93,570	58,235

Table 3-41. Total Timber Sale Program Quantity by Product (CCF/Year)

	Alternative A	Alternatives B & C
Softwood - Pulpwood	4,285	3,885
Softwood - Sawtimber	6,428	5,827
Hardwood - Pulpwood	3,200	774
Hardwood - Sawtimber	4,801	1,161

CUMULATIVE EFFECTS

Recent emphasis nationally in biofuels could lead to an increased demand for wood products from the Uwharrie NF. In April 9, 2010 the US-Israeli biofuels technology development firm HCL CleanTech has announced that its first pilot plant is to be established in North Carolina (<http://www.brighterenergy.org>). The company is developing a fermentation process to turn woody biomass material into ethanol fuel, which may provide a market for by-products from North Carolina's paper industry. The pilot plant is to be located at Southern Research Institute's Advanced Energy and Transportation Technologies Center in Durham. Currently, Durham is approximately 100 miles away from the Uwharrie NF and outside of the timber demand market area. However, the new facility will result in an increase demand for non-traditional wood products. The Uwharrie NF is close enough to Durham that it could result in an increased demand for by-products generated from traditional timber production, such as bark from generated from saw timber or salvaging wood pieces from logging decks.

Climate Change is associated with increasing CO₂ levels in the atmosphere. To the extent other nutrients and sufficient water is available, increases in CO₂ could result in increased tree growth. Counter to that would be the likelihood of increased storm events and insect and disease outbreaks. These occurrences would have more effects on loblolly pine plantations than on longleaf pine or oak/hickory ecosystems. Therefore, Alternatives B and C, which propose to remove off site loblolly and restore longleaf and oak hickory ecosystems, would be more resilient to the effects from climate change compared to Alternative A.

CULTURAL RESOURCES

AFFECTED ENVIRONMENT

The Uwharrie NF Heritage Resources Program follows federal laws and regulations including a 2009 Programmatic Memorandum of Agreement (PMOA) with the President's Advisory Council on Historic Preservation (ACHP), the North Carolina State Historic Preservation Office (SHPO), and Catawba Indian Nation Tribal Historic Preservation Office (THPO). These laws mandate that all projects and federal undertakings require prior consultation and inventory of cultural resources. Important cultural resources (sites) must be protected and impacts mitigated. Cultural resources include physical remnants (historic properties), traditional cultural properties, folkways, and traditions. The National Historic Preservation Act of 1966, as amended 1999 (NHPA), and the Archaeological Resources Protection Act of 1979, as amended 1988 (ARPA), are the most referred to and applicable federal laws. NEPA requires that cultural resources be considered following the process set forth in the NHPA.

The Uwharrie NF has one of the greatest concentrations of archaeological sites in the southeastern United States. These resources include artifacts and archeological sites that document human use and changes of the area over time. For more than 14,000 years, the land that makes up the Uwharrie NF was home to people who left behind abundant evidence of their activities and cultures. The prehistoric sites, those prior to AD 1500, and historic sites after AD 1500, are witness to their effects on the landscape as well as the environment's effects on the people and can only be understood with further preservation and study. Many of the sites are ancestral to the Catawba Indian Nation which resided in the area during and after European settlement.

The Uwharrie NF contains many statewide, regionally, and nationally unique and important cultural resources. Some of the earliest archeological investigations were conducted in this part of North Carolina such as the 1930's Works Project Administration (WPA), Dr. Joffre Coe's 1960's research at Hardaway, Doershuk and Morrow Mountain. These projects resulted in defining and determining archeological site types and culture history. Most importantly, artifact typology and chronology were developed and are applicable to the entire southeastern United States even today.

The most significant categories of prehistoric sites are associated with the underlying geology of the Uwharrie NF, volcanic rock (lithics). These sites include prehistoric stone quarries and historic gold mines. Prehistoric stone quarries were created by American Indian groups gathering rock for

their use and for trade. This rock was their preferred source to create tools for everyday living (projectile points, scrapers, arrowheads, drills, knives, axes, etc). The volcanic stone from the Uwharrie Mountains was utilized across the southeast for making tools which enabled the survival of American Indians in the area for thousands of years.

Not only was the Piedmont attractive to prehistoric peoples because of its lithic supplies, it also offered an abundance of natural plant and animal resources. However, climate changes and land management over the past 15,000 years has changed vegetation on the Uwharrie NF from a landscape dominated by oak hickory to one dominated by mixed oak and pine forests. Recovered pollen samples show evidence that prehistoric people affected natural vegetation in a number of ways. Agricultural pollen remnants include corn, gourd, squash, beans, and weeds indicative of land clearing and farming. Carbon 14 dated charcoal also shows evidence of land clearing, cultivation, and forest burning. These forest burns not only cleared land for cultivation but also increased early successional habitat for hunted game species.

In the early 1700s, European settlement introduced new land uses such as historic logging, farming, and mining. "After extensive colonization, the Piedmont was subjected to the brutal onslaught of destructive cultivation practices. First the soils in the fertile bottoms were depleted and abandoned. Then the hills and ridges were cleared, farmed, and also abandoned at an astonishing rate as erosion became more and more severe. The soil from the uplands filled the river and stream channels with sediment and created wet, swampy conditions in areas that had once contained prime agricultural land. Because of these misguided agricultural practices, the Piedmont became one of the most severely eroded agricultural areas in the United States. Since the early eighteenth century in North Carolina, the average depth of soil loss through erosion in the Piedmont was 5.5 inches" (Trimble 1974:1).

Being relatively mountainous, the Uwharrie NF received fewer of these erosion impacts compared to the surrounding Piedmont and Sandhills. Although destructive to prehistoric sites, these activities left behind their own legacy including farmsteads, mines and cemeteries. Examples of these can be found throughout the Uwharrie NF. The National Register of Historic Places (NRHP) listed the 1840's - 1980's Thornburg farmstead, the 1770's Flora MacDonald's home, the 1800's Lawrenceville (Montgomery County's third county seat), and the 1800's Russell Gold Mine. Ongoing research includes identifying sites associated with the Civil War and connections to the Underground Railroad.

The Uwharrie NF is one of the last areas in North Carolina that has well-preserved and federally protected cultural resources. By 2010, approximately 67% of the national forest was inventoried and 1,777 sites were recorded. Overall site density was one site in 18.9 acres, which is relatively high compared to other forests. Site size varies from less than one acre to greater than 15 acres in size. Areas on the forest with high densities of significant sites have been identified as Historic Special Interest Areas (SIAs), to be managed with an emphasis on preserving these important and irreplaceable cultural resources. The highest probability for cultural resources sites is in the Badin Lake area with the probability for sites somewhat less (but still moderate to high) across the rest of the national forest. The abundance of cultural resources provides many opportunities for historic interpretation (Thornburg property, Crump Farm, Arrowhead Trail, goldmines), and scientific

research (lithic quarries and bogs/upland swamps). Bogs and upland swamps are likely to contain well-preserved fossils and vegetation which are used as ecological indicators to interpret past environments. Researching these areas will help us better understand regional climatic history and its role on the modern day environment.

Increasing use of the Uwharrie NF has resulted in severe impacts to a number of important cultural resources. Recreational activities have increased tremendously and continue to have adverse effects. Timber harvest, wildlife field construction, recreation developments, and associated access roads/trails, have all impacted these resources over the past decades. Recently exposed artifacts have been collected by the public without authorization and some sites have been intentionally looted and vandalized. All activities that cause soil displacement and erosion are likely to impact cultural resources. These activities are prohibited under the Archeological Resources Protection Act of 1979, which protects all artifacts and sites over 100 years of age located on federal lands.

A 2010 survey of system and non-system trails in the Badin Lake area gives an indication of the existing trail density and the potential negative impacts to proposed Historic Special Interest Areas.

There are approximately 5.6 miles of system trails that cross proposed Historic SIAs in the Badin Lake area, 3.19 miles of which are OHV trails, and 0.52 miles of which are equestrian trails.

There are 5.6 miles of non-system trails in the Badin Lake area that cross proposed Historic Special Interest Areas (SIAs), 5.1 miles of which are primarily equestrian.

Table 3-42. Miles of Trail in Historic SIAs and Crossing Archeological Sites (Badin Lake area)

Trail Type	Miles in an Historic SIA	Acres	Number of Arch sites within 100 feet of a trail
System OHV	3.19	38.28	30
Non-system OHV	0.50	6.00	6
System Equestrian	0.52	6.24	38
Non-system Equestrian	5.10	61.2	72

ENVIRONMENTAL CONSEQUENCES

All activities that cause ground disturbance, soil movement or mixing, compaction, deflation, and/or changes in soil moisture have the potential to adversely impact cultural resources. Historic sites, structures, and traditional cultural properties can also be adversely affected by effects to the cultural landscape – visual or even audible intrusions; historic structures can be adversely affected by neglect or by maintenance or repairs that do not conform to the Secretary of the Interior’s Standards for historic properties. The Forest Service is legally required to consider those cultural resources that are listed in or eligible for listing in the National Register of Historic Places (historic properties) or those cultural resources that have not yet been evaluated for National Register eligibility (unevaluated cultural resources). For planned project activities, Section 106 surveys are completed prior to the action taking place and recommendations for site protection must be followed. Sites are recorded and significant sites are recommended for avoidance. Activities that

have the potential to impact cultural resources include skidding and yarding of timber, road and trail construction and reconstruction, road and trail use, wildlife field construction and maintenance, disking or subsoiling, facilities construction, and dozer fire line construction. Looting of artifacts is a constant threat; therefore any activities that increase ground visibility and access may facilitate increases in archeological site looting.

Indicators used to compare the effects of alternatives on cultural resources include:

- Acres of prescribed burning;
- Acres of archeological sites impacted by OHV and horse trails;
- Acres of vegetation restoration affecting cultural resource site conditions;
- Acres identified for management as Historical Special Interest Areas.

Acres of prescribed burning

Low intensity prescribed fires typically do not adversely affect cultural resources. Of course, flammable historic structures and markers are to be avoided. However, low intensity burns can have the indirect effect of making cultural resources more visible and thus susceptible to unauthorized and illegal collection and looting. This is especially true in SIAs and where prehistoric sites may have surface manifestations and are relatively shallow in the soil. High intensity burns increase the likelihood for direct adverse effects to prehistoric stone (rhyolite and quartz) artifacts and also increase erosion of resultant bare soils and opportunities for looting, but these are rare occurrences. Fire-line and dozer-line construction could directly affect cultural resources as well as potentially exposing artifacts through soil disturbance. Increased burn acres is often associated with increased fire -line construction which could lead to an increase in potentially adverse effects to cultural resources.

Table 3-43. Acres of Prescribed Fire by Alternative

ACTIVITY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Prescribed Fire (Avg. Annual Acres Burned)	Up to 3,000	3,000 to 6,000	3,000 to 6,000

Alternatives B and C would have a greater potential to impact cultural resources from prescribed burning compared to Alternative A by potentially exposing more cultural resources and making them vulnerable to collection and looting. An increase in prescribed burning acres also has the potential for increased miles of dozer constructed fire line which could increase impacts to cultural resources.

Acres of archeological sites impacted by OHV, Equestrian and Mountain Bike trails

Roads and trails can directly impact cultural resources sites if their construction or use exposes artifacts to damage and/or unauthorized collection. On the positive side, roads and trails provide increased access for public interpretation and scientific research of cultural resources.

Alternative A allows approximately two miles of road construction each year without specifying locations. It provides no direction to do away with unauthorized roads. This alternative also provides detailed directions for system trail construction, but no direction to close unauthorized

trails. Alternative A would continue to allow equestrians and mountain bikers to have unrestricted access to ride across the forest (except in locations specifically signed as closed). While cultural resources located in recreation areas, and along designated trails and roads can be monitored, signed, and protected, the impacts outside these areas are largely uncontrolled and unknown. By allowing cross-country travel for equestrians and mountain bikers, there is a greater potential to negatively impact cultural resources and make them more accessible to looting and vandalism. Table 3-42 displays the existing extent of where non-system trails in the Badin Lake area are located in proximity to cultural resources. As visitor use to the Uwharrie NF is expected to increase, so would the density of non-system trails and potential impacts to cultural resources increase with implementation of Alternative A.

Alternatives B and C do not anticipate much if any new system road construction and provide direction to do away with unauthorized roads. With implementation of Alternatives B and C, a comprehensive trail planning effort would be conducted during the planning period that would eventually limit bikes to a designated system. Alternative B also identifies a goal for equestrians to be limited to designated trails and areas. This combination of actions would result in Alternative B having the least potential for adverse effects to cultural resources, followed by Alternative C, with Alternative A having potentially more adverse effects from trails. With implementation of Alternative B, impacts to cultural resources from existing non-system trails should diminish over time.

Acres of vegetation restoration affecting historic site conditions

Restoring the national forest to a more natural ecological condition can potentially enhance cultural resource preservation by maintaining a forest that is less susceptible to insects and disease and therefore less tree mortality and subsequent soil disturbance caused by tip-ups when trees fall over. Restoring vegetation to historically accurate vegetation benefits cultural resource interpretation as well as physical site preservation. Historic farmsteads, cemeteries, and prehistoric sites that have a more open understory are less prone to tree blow down and tree tip-ups and are better preserved and protected from looting. The indicator measure for the effects from restoration treatments is the number of acres planned for restoration activities.

Alternative A does not provide for restoration of longleaf pine, oak hickory, or Schweinitz's sunflower communities, and provides no direction to restore historic farms, cemeteries, or other cultural sites.

Alternatives B and C call for vegetation restoration activities on an average of 400 acres per year, plus restoration of vegetation at one of the historic farmsteads each year. Therefore, Alternatives B and C would better provide for vegetation restoration affecting historic site conditions compared to Alternative A.

Acres identified for management as Historical Special Interest Areas (SIAs)

While Alternative A provides direction and standards to protect cultural resources and provide for interpretation and research, Alternatives B and C go beyond that by identifying management of cultural resources as a major theme or focus area for the planning period. In support of the Goals

and Desired Conditions in Alternatives B and C, over 2,000 acres of historical areas, bogs, and upland swamps are proposed as SIAs. This designation removes the areas from being classified as “suitable for timber production,” but they remain available for other forms of vegetation management such as prescribed fire, and they remain open for recreation use. Alternative A recognizes only 39 acres of bogs and upland swamp as SIAs.

Table 3-44. Historical Special Interest Areas of the Uwharrie National Forest by Alternative

Special Interest Area Name	Special Attributes	Acres	
		Alt. B & C	Alt. A
Abner Bog	Botanical/Historical	10	6
Badin Upland Depression Swamps and	Botanical/Scenic/Historical	129	25
Cotton Place	Historical	76	
Daniels/Shingle Trap Mountain	Botanical/Recreational/Historical	751	
Falls Mountain	Historical	84	
Headwaters	Historical	123	
Horse Trough	Historical	156	
Nifty Rocks	Scenic/Geological/Historical	64	
Pleasant Grove Bog and Pine Savanna	Botanical/Scenic/Historical	44	3
Rocky Creek Longleaf Pine Forest and	Botanical/Scenic/Historical	94	
Roberdo Bog	Botanical/Historical	5	5
Russell Mine	Historical	263	
Spencer Creek Hillside Seepage Bog	Botanical/Scenic/Historical	52	
Talbert	Historical	65	
Thornburg	Historical	168	
TOTAL		2084	39

The three alternatives differ in the amount of acreage that is identified for SIAs. Within these SIAs, ground disturbing activities would be designed to maintain the areas’ special characteristics, cultural resources, and species. Alternative B and C designate 2,084 acres as historic SIAs compared to only 39 acres in Alternative A. The additional acres in Alternatives B and C provide more protection for cultural resources by limiting management and ground disturbing activities that would impact the cultural resources.

CUMULATIVE EFFECTS

Climate change may result in more prevalent wildfires which often burn hotter, adversely affecting cultural resources and require more quickly dozer constructed firelines which directly impact cultural resources. Changes in moisture directly affect the hydrology at cultural resources, especially those adjacent to bogs, swamps and rivers. These effects directly result in artifact deterioration and may expose artifacts to illegal collecting. This would increase the potential for adverse impacts beyond the impacts of the alternatives themselves.

LOCAL COMMUNITIES

AFFECTED ENVIRONMENT

The Uwharrie NF is comprised of land in three counties in the North Carolina Piedmont:

- Montgomery County – 39,884 acres or about 12.4% is National Forest System land
- Randolph County – 9,527 acres or about 2% is National Forest System land
- Davidson County – 958 acres or about 0.3% is National Forest System land

The town of Troy (in Montgomery County) and a number of small communities are within the proclamation boundary and several towns are just outside the boundary. The Uwharrie NF is also within a two hour drive from the largest population centers in the state many of whose residents use the national forest for outdoor recreation. Fort Bragg, a major United States Army installation with the size and population of some North Carolina counties, is another nearby entity whose occupants rely on the Uwharrie NF both operationally and for leisure.

All three counties are experiencing slower rates of population growth compared to the state average, as well as negative job growth.

Montgomery County

Montgomery County is a rural county with an estimated population of close to 28,000. Traditionally Montgomery County's economy has been dependent on textiles and lumber products. With the decline of textiles there is an interest in helping existing industries find niche markets and diversifying the industrial base. Travel and tourism is considered a growth industry in the county and potentially the largest industry in the county. The chain of lakes on the western edge of the county, premier golf courses, and the Uwharrie NF are the largest attractors of tourists (Economic Development Corporation website accessed 8/16/2010, <http://www.montgomery-county.com/edc-economic-development-corporation.html>)

The Badin Lake Recreation Area is within Montgomery County and has water access, campgrounds, horse trails, off-highway vehicle trails, hiking trails, picnic areas, and a shooting range. Many individuals who have been involved in the Uwharrie NF planning effort cite the importance of the trail systems and the other amenities as major attractors. Also in Montgomery County is the Woodrun mountain bike trails system, access to the Uwharrie National Recreation Trail, and two rivers eligible for consideration as Wild and Scenic: the Uwharrie River and Barnes Creek. While these features attract tourists, they are also heavily used by residents of Montgomery County on a regular basis. Special events in this area draw both local community residents and visitors. These events include mountain bike events, OHV events, equestrian event,; triathlons, trail runs, and the Uwharrie Mountain Festival.

Virtually all logs and pulpwood from Uwharrie NF harvest areas are purchased and processed by Montgomery County businesses. Additionally, several businesses in Montgomery County depend on the visitors to the Uwharrie NF including general stores, private campgrounds, stables and

outfitters, and restaurants. Use of the national forest for military exercises also brings income into the local community.

Direct payments to Montgomery County from USDA Forest Service payments to states under the Secure Rural Schools and Community Self-determination Act and Payment in Lieu of Taxes for 2009 were \$182,705.

Randolph County

Randolph County is a largely rural county with an estimated population over 142,000. Randolph County has a varied economy that includes manufacturing, services, and agriculture. The county boasts several major tourist destinations. It is home to the [North Carolina State Zoological Park](#), the nation's largest natural-habitat zoo with 500 acres of exhibits and over 1,000 animals. Also located in Randolph County are the Richard Petty Museum, the NC Pottery Center and the Seagrove area potteries, which enjoy an international reputation for exceptional hand-thrown pottery. The northernmost portion of the Uwharrie NF, Birkhead Mountains Wilderness, is located in Randolph County along with some hiking trails including the northern trailhead for the Uwharrie National Recreation Trail.

Access to the Uwharrie NF and amenities such as developed recreation opportunities are more limited in the Randolph County portion of the national forest. The national forest is less important to the local economy here than in Montgomery County, however it is very important to local residents as a place to recreate. Individuals participating in the planning process who live in Randolph County expressed a desire to have good access to the forest and possibly develop more recreation opportunities in that part of the national forest.

Direct payments to Randolph County from USDA Forest Service payments to states under the Secure Rural Schools and Community Self-determination Act and Payment in Lieu of Taxes for 2009 were \$42,168.

Davidson County

Davidson County, with an estimated population close to 154,000, has a higher population density than Randolph or Montgomery Counties but is still classified as rural. With less than a thousand acres of national forest system lands in the southeast corner of the county, the Uwharrie NF plays only a small role in the local economy. Lexington-style barbeque, furniture outlets, art galleries and wineries are tourist attractions in Davidson County.

Direct payments to Davidson County from USDA Forest Service payments to states under the Secure Rural Davidson and Community Self-determination Act and Payment in Lieu of Taxes for 2009 were \$3,975.

ENVIRONMENTAL CONSEQUENCES

Alternative A – the 1986 Plan - was designed to provide a moderate amount of recreational opportunities (relative to maximizing recreation) and a moderate-to-low amount of timber output

(relative to the maximum possible sustained yield). The actual outputs from Alternative A over the last decade are that less timber and more recreation was provided than what was planned.

Alternatives B and C are designed to recognize that the Uwharrie NF provides a high amount of recreational opportunities and places greater emphasis on managing and improving the recreation resources, especially trails. This emphasis should benefit the local communities, especially those in Montgomery County, which recognize tourism as an important and growing segment of their economy.

While Alternatives B and C are designed to provide less timber output than was planned for in Alternative A, the output is likely to be very similar to or greater than what has actually been produced over the past decade.

CUMULATIVE EFFECTS

Two current and future actions are likely to impact the local communities to some degree:

- The Department of Transportation is planning to four-lane NC 24/27 through Montgomery County, the major road that connects Charlotte, NC to US 73/74 that runs north to Greensboro.
- Fort Bragg is expanding to include two additional commands relocating from Ft. McPherson in Atlanta. This is expected to increase the area population by 40,000 by 2013.

These events are expected to increase the visibility of the Uwharrie NF and Montgomery County and with that would come increases in use of the national forest and likely increases in income to the county and local community businesses. These events could increase the rate of population growth somewhat and reduce job losses slightly. The extent of change from these events remains speculative.

SOCIAL AND ECONOMIC ENVIRONMENT

AFFECTED ENVIRONMENT

The Uwharrie NF is located in the North Carolina Piedmont, largely in Montgomery and Randolph Counties, with a small amount of land in Davidson County. The populations, demographics, and summary of the economic situations of the three counties are displayed in the tables below.

Table 3-45. Population Characteristics (2009 estimate unless stated otherwise, U.S. Census Bureau retrieved from <http://www.census.gov/>)

	Montgomery	Randolph	Davidson	North Carolina	USA
Population	27,745	142,151	158,582	9,380,884	307,006,550
% change since 2000	+3.4%	+9.0%	+7.7%	+16.5%	+9.1%
Persons per square mile	54.5	165.8	266.8	165.2	86.8
Median family	\$37,180	\$42,480	\$44,136	\$46,574	\$49,777

	Montgomery	Randolph	Davidson	North Carolina	USA
income 2008					
Minority %	38.6%	18.9%	17.9%	33.2%	20.4%
Unemployment Rate (avg.6/09-7/10)	13.3%	12.2%	12.9%	9.7% (August 2010)	9.3-9.7%
Population % >25 with Bachelor's degree or higher 2000	10.0%	11.1%	12.8%	22.5%	24.4%

Table 3-46. Economic Diversity (2000 Census data retrieved from <http://www.census.gov/> - will be updated with 2010 Census information when available)

	Montgomery County	Randolph County	Davidson County	North Carolina
Employed civilian population 16 years and over	11,830	67,150	74,150	3,824,741
Percent by OCCUPATION				
Management, professional, and related occupations	23.2	21.5	22.8	31.2
Service occupations	11.7	10.9	11.5	13.5
Sales and office occupations	18.5	23.3	24.4	24.8
Farming, fishing, and forestry occupations	1.6	0.5	0.2	0.8
Construction, extraction, and maintenance occupations	12.4	12.5	11.9	11.0
Production, transportation, and material moving occupations	32.7	31.4	29.2	18.7
Percent by INDUSTRY				
Agriculture, forestry, fishing and hunting, and mining	3.6	1.2	0.7	1.6
Construction	8.8	8.1	6.8	8.2
Manufacturing	39.4	34.8	32.1	19.7
Wholesale trade	2.3	3.9	3.8	3.4
Retail trade	8.5	11.1	11.5	11.5
Transportation and warehousing, and utilities	2.8	5.3	5.1	4.6
Information	1.1	1.7	1.6	2.3
Finance, insurance, real estate, and rental and leasing	3.0	3.9	5.1	6.0
Professional, scientific, management, administrative, and waste management services	4.1	4.7	5.1	7.7
Educational, health and social services	14.3	13.1	15.8	19.2
Arts, entertainment, recreation, accommodation and food services	3.5	5.2	5.3	6.9
Other services (except public administration)	4.1	4.2	4.2	4.6
Public administration	4.5	2.6	2.7	4.1

All three counties show rates of population growth far below the average, with lower median household incomes and higher unemployment rates as well. All three counties also show a much lower percentage of the population with a college education compared to the state and national averages.

Economic Impact of the Uwharrie National Forest

The three counties receive payments each year from the USDA Forest Service under Public Law 110-343 Amended Secure Rural School and Community Self-Determination Act and Payment in Lieu of Taxes (from *Forest Facts*, retrieved from <http://www.cs.unca.edu/nfsnc/forest.htm>).

USDA Forest Service expenditures also contribute to the local economies. Table 3-47 displays expenditures attributable to the Uwharrie NF in 2010.

Figure 3-24. Payments to the Three Counties Over the Last Ten Years

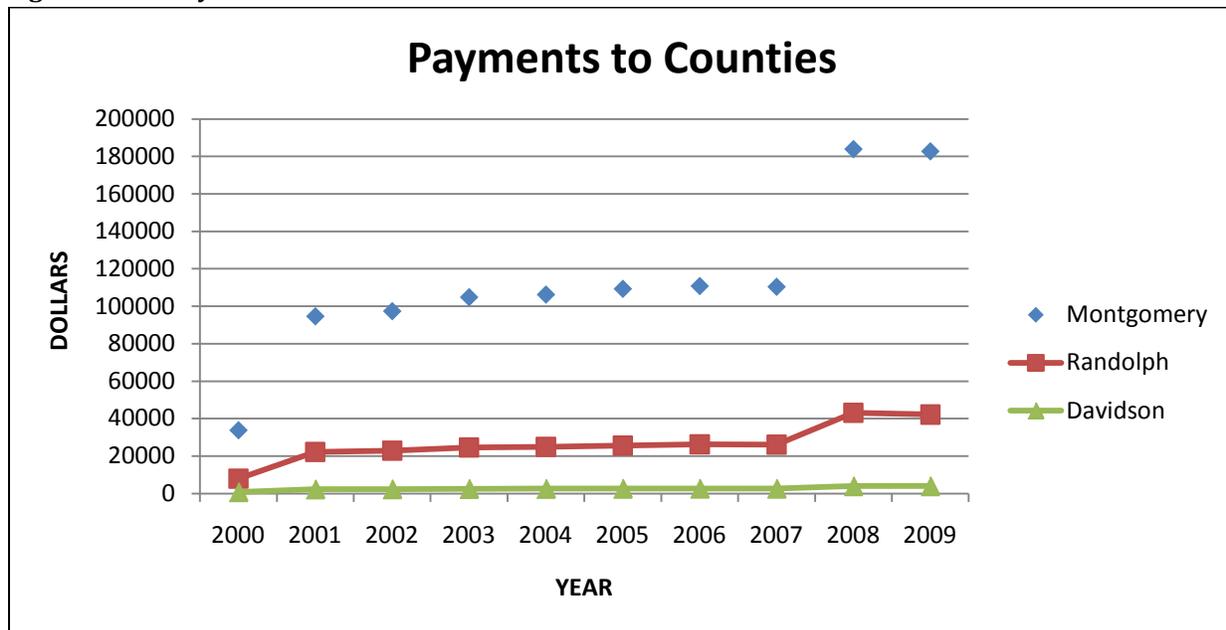


Table 3-47. Uwharrie NF Expenditures in 2010

Expenditure Type	Amount
Salaries and payments to employees	\$ 802,956
Materials and supplies	\$ 169,022
Contracts	\$ 560,187
Fleet	\$ 99,121
Rent and Utilities	\$ 59,021
TOTAL	\$1,690,307.00

Using the Forest Service’s IMPLAN (Impact for planning) software and FEAST (Forest Economic Analysis Spreadsheet Tool) provides an additional way to estimate economic impacts and contributions. Table 3-48 that follows illustrates the percentage contribution of the Uwharrie NF’s

current management program to the area's economy, as estimated using these models. The Uwharrie NF is associated with 0.13 percent of the total local economy's jobs, and 0.11 percent of the labor income. Agriculture, Manufacturing, Retail Trade, Accommodation and Food Services and Government are the sectors of the economy that show the most benefit from the forest's activities.

Table 3-48. Current Role of Forest Service-Related Contributions to the Area Economy.

	Employment (jobs)		Labor Income (Thousands of 2011 dollars)		Output (Thousands of 2011 dollars)	
	Area Totals	FS-Related	Area Totals	FS-Related	Area Totals	FS-Related
Agriculture	5,213	15	\$165,730	\$646	\$875,622	\$3,840
Mining	493	0	\$27,886	\$9	\$120,696	\$75
Utilities	829	1	\$75,946	\$62	\$485,387	\$434
Construction	19,802	3	\$679,703	\$105	\$2,046,839	\$270
Manufacturing	43,633	18	\$2,216,027	\$901	\$14,327,34	\$6,701
Wholesale Trade	8,191	21	\$433,039	\$1,129	\$1,154,287	\$3,172
Transportation & Warehousing	7,779	8	\$364,982	\$365	\$1,022,797	\$1,082
Retail Trade	25,039	62	\$746,896	\$1,635	\$1,388,694	\$3,925
Information	1,611	2	\$84,958	\$86	\$394,171	\$601
Finance & Insurance	4,969	3	\$238,980	\$145	\$923,276	\$574
Real Estate & Rental & Leasing	7,887	6	\$81,313	\$96	\$2,621,374	\$1,722
Prof, Scientific, & Tech Services	7,907	8	\$352,071	\$361	\$692,533	\$1,190
Management of Companies	4,952	2	\$389,082	\$153	\$823,735	\$416
Admin, Waste Management & Removal Services	14,815	11	\$277,935	\$193	\$653,188	\$479
Educational Services	3,374	2	\$92,349	\$48	\$179,853	\$109
Health Care & Social Assistance	30,219	12	\$1,387,520	\$524	\$2,653,986	\$1,091
Arts, Entertainment, and Recreation	4,919	27	\$102,652	\$654	\$227,359	\$2,171
Accommodation & Food Services	17,733	105	\$334,348	\$2,025	\$999,890	\$6,284
Other Services	20,136	10	\$522,852	\$223	\$1,047,482	\$641
Government	37,216	24	\$1,896,171	\$1,989	\$2,426,915	\$1,221
Other		0		\$0	\$0	\$183
Total	266,716	338	10,470,439	11,349	35,065,433	36,181
FS as Percent of Total	---	0.13%	---	0.11%	---	0.10%

ENVIRONMENTAL CONSEQUENCES

One way the USDA Forest Service analyzes its contribution to the local economy is by estimating costs, net benefits, and cumulative present net value by alternative. Market values include those values where the USDA Forest Service receives money such as for timber and special uses. Non-market values are estimated values for amenities such as wildlife and recreation. The table below compares the costs and benefits of the alternatives.

Table 3-49. Cumulative Present Net Values of Costs and Benefits in 2010 Dollars

	Alt A	Alt. B	Alt. C
Cumulative Total Present Net Value (M\$)	\$1,074,565	\$1,057,032	\$1,070,227
Present Value benefits by Program:			
Range	\$0	\$0	\$0
Timber	\$9,797	\$8,079	\$8,079
Minerals	\$0	\$0	\$0
Recreation	\$992,670	\$976,854	\$990,050
Wildlife	\$121,712	\$121,712	\$121,712
PV of Benefits	\$1,124,179	\$1,106,646	\$1,119,842
Present Value costs by Program:			
Fire	\$6,966	\$8,144	\$8,144
Timber	\$7,545	\$6,367	\$6,367
Recreation/Engineering/Facilities	\$16,479	\$16,479	\$16,479
Lands/Minerals	\$1,829	\$1,829	\$1,829
Heritage	\$505	\$697	\$697
Fisheries/Wildlife/Botany	\$2,133	\$2,133	\$2,133
Soil, Water, & Air	\$610	\$718	\$718
Silviculture/Forest Health	\$1,839	\$1,839	\$1,839
Administration	\$8,997	\$8,697	\$8,697
Planning/Inventory/Monitoring	\$2,711	\$2,711	\$2,711
PV Costs	\$49,614	\$49,614	\$49,614

Alternative A, if fully implemented, would provide slightly higher dollar benefits compared to Alternatives B and C due to the higher volume of timber sales, and slightly higher recreation benefits. Alternatives B and C provide the same timber benefits and Alternative C has somewhat higher recreation benefits. These slightly higher recreation benefits are the result of assuming a small loss of use when certain uses are restricted to designated systems.

In regard to costs, the assumption is no change in overall funding would be available, but funds might be allocated slightly differently to reflect changes in management emphasis from Alternative A to Alternatives B and C.

The IMPLAN and FEAST models generate additional information to compare alternative contributions to the economy.

Table 3-50 illustrates how employment varies by alternative, defined as the average annual number of workers, be they part time, full time, seasonal, or temporary. Due to possible substitution effects from competing non-government sources (such as similar volume of timber harvesting which may occur on private lands if national forest timber is not offered to the market), these jobs are characterized as being associated with local economic activity initiated by Forest Service programs and activities, rather than caused by these activities.

Table 3-50. Employment by Program by Alternative (Average Annual, Decade 1).

	Total Number of Jobs Contributed		
	ALT A	ALT B	ALT C
Recreation: non-local only	95	95	95
Wildlife and Fish: non-local	20	20	20
Grazing	0	0	0
Timber	34	26	26
Minerals	0	0	0
Payments to States/Counties	2	2	2
Forest Service Expenditures	33	33	33
Total Forest Management	184	176	176

Labor Income (employee compensation, being the value of wages and benefits, plus income to sole proprietorships) by scenario is given in the tables below.

Table 3-51. Labor Income by Program by Alternative (Average Annual, Decade 1; \$1,000)

	Thousands of 2011 dollars		
	ALT A	ALT B	ALT C
Recreation: non-local only	\$2,857	\$2,857	\$2,857
Wildlife and Fish: non-local	\$618	\$618	\$618
Grazing	\$0	\$0	\$0
Timber	\$1,503	\$1,158	\$1,158
Minerals	\$0	\$0	\$0
Payments to States/Counties	\$68	\$68	\$68
Forest Service Expenditures	\$1,975	\$1,975	\$1,975
Total Forest Management	\$7,020	\$6,675	\$6,675

Fish and Wildlife Employment that is caused by local recreation, remains unchanged across all programs by alternatives.

Table 3-52. Local Recreation, Fish & Wildlife Employment by Program by Alternative (Average Annual, Decade 1).

	ALT A	ALT B	ALT C
Employment	Total Number of Jobs Contributed		
Recreation: local only	76	76	76
Wildlife and Fish: local	16	16	16
Income	Thousands of 2011 dollars		
Recreation: local only	2,244	2,244	2,244
Wildlife and Fish: local	503	503	503
Total	92	92	92

Employment and income found in Tables 3-50 and 3-51, respectively, are divided into the major sectors of the Uwharrie NF economy in Tables 3-53 and 3-54. For each scenario, Agriculture, Manufacturing, Retail Trade, and Accommodation & Food are the sectors most affected by Forest Service programs and expenditures. Labor income in the form of wages and proprietors' earnings follows a similar pattern, with the aforementioned sectors benefitting the most as well.

Table 3-53. Employment by Major Industry by Alternative (Average Annual, Decade 1).

	Total Number of Jobs Contributed		
	ALT A	ALT B	ALT C
Agriculture	13	9	9
Mining	0	0	0
Utilities	0	0	0
Construction	2	2	2
Manufacturing	11	11	11
Wholesale Trade	7	6	6
Transportation & Warehousing	4	4	4
Retail Trade	24	24	24
Information	1	1	1
Finance & Insurance	2	2	2
Real Estate & Rental & Leasing	4	3	3
Prof, Scientific, & Tech Services	7	6	6
Management of Companies	1	1	1
Admin, Waste Management & Removal Services	7	7	7
Educational Services	1	1	1
Health Care & Social Assistance	8	8	8
Arts, Entertainment, and Recreation	11	11	11
Accommodation & Food Services	53	53	53
Other Services	6	6	6
Government	19	19	19
Total Forest Management	184	176	176
Percent Change from Current	0.0%	-4.4%	-4.4%

Table 3-54. Labor Income by Major Industry by Alternative (Average Annual, Decade 1; \$1,000).

	Thousands of 2011 dollars		
	ALT A	ALT B	ALT
Agriculture	\$582	\$372	\$372
Mining	\$3	\$3	\$3
Utilities	\$41	\$39	\$39
Construction	\$79	\$78	\$78
Manufacturing	\$613	\$567	\$567
Wholesale Trade	\$343	\$333	\$333
Transportation & Warehousing	\$195	\$187	\$187
Retail Trade	\$668	\$657	\$657
Information	\$55	\$54	\$54
Finance & Insurance	\$85	\$81	\$81
Real Estate & Rental & Leasing	\$35	\$34	\$34
Prof, Scientific, & Tech Services	\$315	\$310	\$310
Management of Companies	\$90	\$87	\$87
Admin, Waste Management & Removal Services	\$132	\$129	\$129
Educational Services	\$38	\$36	\$36
Health Care & Social Assistance	\$385	\$366	\$366
Arts, Entertainment, and Recreation	\$278	\$277	\$277
Accommodation & Food Services	\$1,171	\$1,167	\$1,16
Other Services	\$177	\$166	\$166
Government	\$1,736	\$1,734	\$1,73
Total Forest Management	\$7,020	\$6,675	\$6,67
Percent Change from Current	0.0%	-4.9%	-

ENVIRONMENTAL JUSTICE

The concerns of environmental justice encompass specific considerations of equity and fairness in resource decision-making. As required by Executive Order 12898, all federal actions must consider potentially disproportionate effects on minority or low-income communities. The principles for considering environmental justice outlined in Environmental Justice Guidance under the National Environmental Policy Act (Council on Environmental Quality, 1997) were considered in this analysis. Chapter 3 of the EIS discloses the environmental effects of the alternatives. The Social and Economic Environment section of the chapter identifies the demographics of the local area. The Executive Order also requires agencies to work to ensure effective public participation and access to information.

To fulfill these principles, environmental justice was considered throughout the land management planning process in the following phases:

1. Scoping and public participation – Efforts were made by the forest to reach as many people in the area as possible, through mailings, newspaper articles, news releases, radio interviews and contacts with federal, state, and local governments, libraries, non-profit organizations, civic associations, industries, academia, and other types of organizations. Participation was sought in various locations and formats throughout the planning area.
2. Determining the Affected Environment – The Social and Economic Environment section of Chapter 3 of the EIS presents information related to population growth, minority populations, population density, income, unemployment, and economic diversity in the area directly affected by Uwharrie NF management and compared this with a more regional context when appropriate. There were no segments of the population identified that depend on subsistence consumption of fish, wildlife, or vegetation within the planning area. Montgomery County has a higher percentage minority population, lower median family income, and higher unemployment than the nation as a whole. Benefits to the economy from Uwharrie NF management would accrue to Montgomery County, and demonstrated in the Social and Economic Environment section of this document.

There are no disproportionate negative environmental or health effects to minority or low-income populations anticipated from any alternative. Public involvement during plan revision was inclusive and provided ample opportunity for issues of environmental justice to be raised.

PROGRAMS AND PLANS OF OTHER FEDERAL AGENCIES, STATE AND LOCAL GOVERNMENTS AND INDIAN TRIBES

AFFECTED ENVIRONMENT

USDI Fish and Wildlife Service

The USDA Forest Service partners with the U.S. Fish and Wildlife Service (USFWS) in migratory bird conservation and management, and in working toward recovery of Threatened and Endangered species. In the southeast these agencies work with other public and private entities to promote restoration of longleaf pine ecosystems, the Endangered red-cockaded woodpecker, and the Endangered Schweinitz's sunflower. The Carolina Sandhills National Wildlife Refuge is 45,348 acres in Chesterfield County, South Carolina. Approximately 40 miles south of the Uwharrie NF, it is a showcase of progressive longleaf pine/wiregrass management and restoration efforts, and is home to more than 130 red-cockaded woodpecker family groups (USFWS 2010(a)). The Pee Dee National Wildlife Refuge, approximately 20 miles to the south, contains 8,443 acres in Anson and Richmond Counties, NC. The refuge was established to provide wintering habitat for migratory waterfowl. The refuge also supports an abundance of nesting neotropical migratory birds, bobwhite quail, wild turkey, and white-tailed deer (USFWS 2010(b)).

Fort Bragg

This major US Army base covers somewhere in the neighborhood of 160,000 acres approximately 35 miles east-southeast of the Uwharrie NF. In 2010 the base won an award for its accomplishments in sustaining the environment, and has been called a model installation for maintaining its natural resources. With one of the largest populations of red-cockaded woodpeckers, over 350 family groups (USFSW 2006), the base has a natural resources management plan that emphasizes restoring the longleaf pine ecosystem and performing controlled burns (US Army 2010).

Catawba Indian Nation

The Catawba Indian Nation is located eight miles east of Rock Hill South Carolina and was aboriginal to the Carolinas. A strategic plan was underway in 2008.

The State of North Carolina

In June 2000, the North Carolina General Assembly passed into law the goal of protecting 1 million acres (G.S. 113A-241). This law says it will be the goal of the State of North Carolina to protect an additional million acres of farmland, open space and other conservation land. The law directs the secretary of the N.C. Department of Environment and Natural Resources (NCDENR) to oversee the realization of the million acre goal.

With an end goal of preserving one million additional acres of open space in North Carolina this decade, the Million Acre Initiative coordinates preservation efforts between a number of organizations — federal, state and local governments, conservation groups and citizens. While supporting existing programs, the initiative also encourages cooperation by providing technical assistance and information to people interested in helping our state meet its goal. Funding provided through North Carolina's conservation trust funds has been critical for the implementation of the goal of protecting 1 million acres. Significant federal contributions have come from Farm Bill program management through the Natural Resources Conservation Service.

North Carolina has several other tools in place to encourage conservation of undeveloped land:

[Cost Share programs](#) - Funding to make conservation affordable for landowners

[Technical Assistance](#) – Professional expertise provided at no charge

[Right to Farm Law](#) – Properly operated farm and forestry operations are protected from nuisance suits

[Purchase of Development Rights](#) – Funding in exchange for keeping land in agricultural or forestry use

[Present Use Value Taxation](#) - Lower property tax rate based on current use of the land (agriculture, forestry, horticulture, wildlife habitat)

[Agritourism](#) - Value-added agricultural activity that provides recreational and entertaining experiences (NCDENR 2010).

Morrow Mountain State Park

On the west bank of the Pee Dee River just west of the Uwharrie NF administrative boundary is Morrow Mountain Park. Early development of park property was a cooperative effort between state and federal governments. Work crews of the Civilian Conservation Corps and the Work Projects Administration constructed many of the facilities from 1937 to 1942. Additional facilities were added with state funds in the 1950s and 1960s. Today, the park covers 4,742 acres. In addition to many of the recreational activities available on the Uwharrie NF, the park also rents boat, has an exhibit hall and a historic homestead open to the public (North Carolina State Parks 2010).

State Wildlife Action Plan

The North Carolina State Wildlife Action Plan (NCWRC 2007) seeks to encourage retention of large private forest tracts, use of prescribed burning for maintaining habitat, and creation of multi-aged forests. As part of the N.C. Sandhills Conservation Partnership, the North Carolina Wildlife Resources Commission and North Carolina Department of Parks and Recreation collaborate with other public and private entities to protect longleaf pine forests near Bragg which support the area red-cockaded woodpecker family groups.

N.C. Natural Heritage Program

The North Carolina Natural Heritage Program has identified more than 2,000 Significant Natural Heritage Areas (SNHA) across the state. A Significant Natural Heritage Area is an area of land or water identified by the NHP as being important for conservation of the State's biodiversity. SNHAs contain one or more Natural Heritage elements - high-quality or rare natural communities, rare species, and special animal habitats. Additional sites are identified as [inventory work](#) progresses. Approximately 25% of these sites are entirely or partially in conservation ownership, including many that are on National Forest System lands. Sites identified on the Uwharrie NF are on this list and many of these, in whole or in part, are located in the Special Interest Areas.

County Land Use Plans

Almost all of the Uwharrie NF lies within Montgomery and Randolph Counties. Land use plans (or drafts) for these counties reflect a desire to maintain green space. In Montgomery County forestry and agriculture are among the most desired land uses in the rural areas and sensitive natural environments are recognized as important. In Randolph County most of the land adjacent to the national forest is in a Rural Growth Management Area where significant high intensity residential growth is discouraged or not anticipated for ten (10) to fifteen (15) years. These are areas where maintaining the rural character and the natural heritage asset resources are important. At the same time these two counties recognize that residential development near the national forest is likely to increase (Chesson et al. 2010, Randolph County Department of Planning and Development 2009).

ENVIRONMENTAL CONSEQUENCES

Alternatives B and C, with their emphasis on longleaf pine restoration and designation of additional Special Interest Areas, would be more consistent with other agency and area plans since several of these also focus on longleaf pine ecosystem restoration and protection of rare plants and animals. While there are no red-cockaded woodpeckers on the Uwharrie NF at this time, with longleaf restoration and the proximity of source populations nearby, they could expand into the national forest in the future.

In regard to outdoor recreation, Morrow Mountain is the only State Park nearby that offers similar types of recreation opportunities; however it does not offer off-highway vehicles trails. The Uwharrie NF remains one of very few opportunities for OHVs in the Piedmont region.

The county land use plans recognize the value of undeveloped green space and encourage that use near the national forest. In this respect they complement one another and any of the alternatives would complement them.

Cumulatively, all the planning and land use policies reviewed for this documents have similar goals to protect natural and cultural heritage and restore for the future those ecosystems and species that were more prevalent in the past.

OTHER EFFECTS

RELATIONSHIP OF SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

The relationship between the short-term uses of the environment and the maintenance and enhancement of long-term productivity is complex. Short-term uses are generally those that occur irregularly on parts of the Forest, such as prescribed burning. Long-term refers to a period greater than ten years.

Productivity is the capability of the land to provide market and amenity outputs and values for future generations. Soil and water are the primary factors of productivity and represent the relationship between short-term uses and long-term productivity. The quality of life for future generations would be determined by the capability of the land to maintain its productivity. By law, the Forest Service must ensure that land allocations and permitted activities do not significantly impair the long-term productivity of the land.

The alternatives considered in detail, including the preferred alternative, incorporate the concept of sustained yield of resource outputs while maintaining the productivity of all resources. The specific direction and mitigation measures included in the forest-wide management standards ensure that long-term productivity would not be impaired by the application of short-term management practices.

Each alternative was analyzed using an EXCEL spreadsheet model (See Appendix B – Description of the Analysis Process), to ensure that the minimum standards could be met. The alternative was

changed if some aspect did not meet any of the minimum standards. Through this analysis, long-term productivity of the national forest's ecosystems is assured for all alternatives.

As stated earlier, the effects of short-term or long-term uses are extremely complex, and depend on management objectives and the resources that are emphasized. No alternative would be detrimental to the long-range productivity of the Uwharrie N F.

The management prescriptions and the effects of implementing the Proposed Plan will be monitored.

Evaluation of the data collected will determine if standards for long-term productivity are being met, or if management practices need to be adjusted.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable commitments of resources are normally not made at the programmatic level of a Forest Plan. Irreversible commitments are decisions affecting non-renewable resources such as soils, minerals, plant and animal species, and cultural resources. Such commitments of resources are considered irreversible because the resource has been destroyed or removed, or the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense. While a Forest Plan can indicate the potential for such commitments, the actual commitment to develop, use, or affect non-renewable resources is normally made at the project level.

Irretrievable commitments represent resource uses or production opportunities, which are foregone or cannot be realized during the planning period. These decisions are reversible, but the production opportunities foregone are irretrievable. An example of such commitments is the allocation of management prescriptions that do not allow timber harvests. For the period of time during which such allocations are made, the opportunity to produce timber from those areas is foregone, thus irretrievable.

EFFECTS ON WETLANDS AND FLOODPLAINS

No significant adverse impacts on wetlands or floodplains are anticipated. Wetlands values and functions would be protected in all alternatives through the implementation of the Streamside Management Area prescription and/or following North Carolina's Best Management Practices for Forestry. Under the requirements of Executive Order 11990 and Clean Water Act, Section 404, wetland protection would be provided by ensuring that new construction would not have an adverse effect on sensitive aquatic habitat or wetland functions. In addition, wetland evaluation would be required before land exchanges or issuance of special-use permits in areas where conflicts with wetland ecosystems may occur. Forest Plan components have been designed to conserve riparian areas and protect floodplains through the Streamside Management Area prescription and/or standards and guidelines. Executive Order 11988 also requires site-specific analysis of floodplain values and functions for any project occurring within the 100-year floodplain zone, and prior to any land exchange involving these areas. Effects to wetlands are also discussed in Water Resources, Botanical Resources, Wildlife, and Aquatic Wildlife sections of Chapter 3.

UNAVAILABLE OR INCOMPLETE INFORMATION

The Uwharrie National Forest has used the most current scientific information available and state-of-the-art analytical tools to evaluate management activities and to estimate their environmental effects. However, gaps will always exist in our knowledge. The Council on Environmental Quality regulations discuss the process for evaluating incomplete and unavailable information (*40 CFR 1502.22 (a) and (b)*). Incomplete or unavailable information is noted in this chapter for each resource, where applicable. Forest Plan monitoring is designed to evaluate assumptions and predicted effects. Should new information become available, the need to change management direction or amend the Forest Plan would be determined through the monitoring and evaluation process.

CHAPTER 4: LIST OF PREPARERS

Ruth Berner: Forest Planner, B.S. Biology, M.S. Human Resources Development, 22 years experience in public affairs, conservation education, and forest planning.

Sheryl Bryan: Forest Fisheries and Wildlife Biologist, B.S. Biology, M.S. Fisheries Science, 20 years experience in fisheries management, 3 years experience in wildlife management.

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Bill Jackson: Air Resource Specialist, B.A. Biology, B.S. Forestry, 27 years Forest Service experience in forest health, air pollution impacts to forest resources, and impacts of Forest Service activities on air quality.

Jason Jennings: Forest Soil Scientist, B.S. Forest Resource Management, Master of Forest Resources, 7 years experience in soil science, forest resources, and watershed management.

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Mary Morrison: B.S. in Forestry and Wildlife, M.S. in Forestry, 22 years experience in prescription writing, silviculture, and district and forest planning.

Rachelle Powell: Wildlife Biologist, B.S. Wildlife Sciences, 9 years experience in natural resource inventory, planning, and management.

Jason A. Rodrigue: Forest Silviculturist, Master of Science in Forestry, Bachelor of Science in Forestry and Environmental Biology, 10 years experience in Forest Land Management and Silviculture.

Theresa Savery: Uwharrie District Other Resources Assistant (Recreation, Wilderness, Trails, Roads, Watershed), A.A. S. Ecology and Environmental Technology, B.S. Environmental and Forest Biology, M.S. Forest Resources with Emphasis in Forest Hydrology, 21 years experience in watershed management, forest hydrology, and recreation planning.

Rodney J. Snedeker: Forest Archeologist & Tribal Liaison, B.A. Anthropology, 32 years experience in archeology, cultural resource management and environmental compliance.

CHAPTER 5: AGENCIES AND INDIVIDUALS RECEIVING DEIS

Catawba Indian Nation

Advisory Council on Historic Preservation

USDA APHIS

Rural Utilities Service

Natural Resources Conservation Service

USDA, National Agricultural Library

NOAA Office of Policy and Strategic Planning

National Marine Fisheries Service

U.S. Army Engineer Great Lakes and Ohio Division

U.S. Army Engineer South Atlantic Division

Environmental Protection Agency Region 4

U.S. Department of the Interior

Ohio River Basins Commission

Tennessee Valley Authority

U.S. Coast Guard

Federal Aviation Administration Southern Region

Federal Highway Administration

U.S. Department of Energy

North Carolina Department of Administration (State Clearinghouse distributes to individual state agencies)

North Carolina Zoo

Montgomery County Board of Commissioners

Montgomery County Manager

Chapter 5

Randolph County Board of Commissioners

Davidson County Board of Commissioners

Montgomery Community College

Mayor, Town of Troy

In addition, approximately 250 Individuals and organizations were notified of the availability on the web of the Draft Environmental Impact Statement and Proposed Plan. Names, addresses, and/or e-mail addresses are in the planning record.

CHAPTER 6: GLOSSARY

Acronyms

AMS - Analysis of the Management Situation	EIS - Environmental Impact Statement
ARPA—Archaeological Resources Protection Act	EPA - Environmental Protection Agency
ASQ - allowable sale quantity	ESA - Endangered Species Act
ATV - all-terrain vehicle	FEIS - Final Environmental Impact Statement
BA - basal area; Biological Assessment	FIA - Forest Inventory and Analysis
BCC - birds of conservation concern	FMAP - Fire Management Action Plan
BE—Biological Evaluation	FONSI—Finding of No Significant Impact
BMP - best management practice	FR - Forest Road
BO—Biological Opinion	FSH - Forest Service Handbook
CAA - Clean Air Act	FSM - Forest Service Manual
CCF - hundred cubic feet	FY - fiscal year
CEQ - Council on Environmental Quality	GAO - Government Accounting Office
CF - cubic foot	GIS - Geographic Information System
CFR - Code of Federal Regulations	HUC - Hydrologic Unit Code
CISC - Continuous Inventory of Stand Conditions	HWA - Hemlock Woolly Adelgid
CMAI - culmination of mean annual increment	IDT - Interdisciplinary Team
CWA - Clean Water Act	LRMP - Land and Resource Management Plan
DEIS - Draft Environmental Impact Statement	LWD - large woody debris
DFC - desired future condition	M&E—monitoring and evaluation
ECS - Ecological Classification System	MA - management area
EA - Environmental Assessment	MCF - thousand cubic feet
	MIS - management indicator species

MMCF - million cubic feet	ROW - right-of-way
MOU - memorandum of understanding	SHPO - State Historic Preservation Officer
NAAQS - National Ambient Air Quality Standards	SIO - Scenic Integrity Objective
NEPA - National Environmental Policy Act	SIP - State Implementation Plan
NF - National Forest	SMS - Scenery Management System
NFMA - National Forest Management Act	SPB - southern pine beetle
NFRS - National Forest Recreation Survey	SPM - semi-primitive motorized
NFS - National Forest System	SPNM - semi-primitive non-motorized
NHPA - National Historic Preservation Act	SMZ - Streamside Management Zone
NNIS – Non-native invasive species	T&E - threatened and endangered species
NOI - Notice of Intent	TES - threatened, endangered, and sensitive species
NPS - National Parks Service	THPO – Tribal Historic Preservation Officer
NRCS - Natural Resources Conservation Service	TSI - timber stand improvement
NVUM - National Visitor Use Monitoring	USC - United States Code
OHV - off-highway vehicle	USDA - U.S. Department of Agriculture
ORV - off-road vehicle	USDI - U.S. Department of Interior
ORW – Outstanding Resource Waters	USFWS - U.S. Fish and Wildlife Service
RAP - Roads Analysis Process or Procedure	USGS - U.S. Geological Survey
RMO - Road Management Objectives	VMS - Visual Management System
RN - roaded natural	VQO - visual quality objective
ROD - record of decision	WSR - Wild and Scenic River
ROS - Recreation Opportunity Spectrum	WO - Washington Office

a

accessibility – The relative ease or difficulty of getting from or to some place, especially the ability of a site, facility or opportunity to be used by persons of varying physical or mental abilities.

activity – A measure, course of action, or treatment that is undertaken to directly or indirectly produce, enhance, or maintain a desired condition or objective on a Forest, Grassland, Prairie, or other comparable administrative unit.

advance regeneration – Young trees, usually seedlings and saplings, growing in the understory of existing stands.

age class – A grouping of living things based on their age.

allocation – The assignment of management prescriptions or combination of management practices to a particular land area to achieve the goals and objectives of the alternative.

allowable sale quantity – The quantity of timber that may be sold from the area of suitable land covered by the Forest Plan for a time period specified by the Forest Plan. This quantity is usually expressed on an annual basis as the “average annual allowable sale quantity.”

all terrain vehicle (ATV) – Any motorized, off-highway vehicle 50 inches or less in width, having a dry weight of 600 pounds or less that travels straddled by the operator. Low pressure tires are six inches or more in with and designed for use on wheel rim diameters of 12 inches or less, utilizing an operating pressure of 10 pounds per square inch (psi) or less as recommended by the vehicle manufacturer.

alternative – In forest planning, a mix of resource outputs designed to achieve a desired management emphasis as expressed in goals and objectives and in response to public issues or management concerns.

analysis of the management situation (AMS) – A determination of the ability of the planning area to supply goods and services in response to society’s demand for those goods and services. The AMS for the Chattahoochee-Oconee National Forests is contained in a 182-page report available from the Forest Supervisor. The Forest Plan includes a summary of the AMS.

b

Badin Lake Recreation Area - The area on the Uwharrie National Forest that is adjacent to the east side of the Narrows Reservoir and Badin Lake, west of NC Highway 109 North, south of SR 1156 (Blaine Road) and north of the confluence of the Uwharrie River and the Yadkin-Pee Dee River. This area is special to the Piedmont Region of North Carolina for the recreational opportunities it offers to the people of North Carolina the nation.

basal area – The area of the cross-section of a tree inclusive of bark at breast height (4.5 feet or 1.37 meters above the ground) most commonly expressed as square feet per acre or square meters per hectare.

base sale schedule (BSS) – A timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade, and this planned sale and harvest for any decade is not greater than the long-term sustained yield capacity.

best management practice (BMP) – A practice, or a combination of practices, that is determined to be the most effective and practical means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

biodiversity/biological diversity – The variety and abundance of species, their genetic composition, their communities, and the ecosystems and landscapes of which they are a part.

bog – a wetland type that accumulates acidic peat, a deposit of dead plant material—usually mosses.

C

canopy cover – The percent of a fixed area covered by the crown of an individual plant species or delimited by the vertical projection of its outermost perimeter; small openings in the crown are included. Used to express the relative importance of individual species within a vegetation community or to express the canopy cover of woody species. Canopy cover may be used as a measure of land cover change or trend and is often used for wildlife habitat evaluations.

clearcutting (for even-aged regeneration) - Removal, in a single cutting, of older trees to establish a new stand of trees in a fully exposed microclimate. All merchantable trees on an area are harvested, and remaining trees are cut or killed in site preparation. Regeneration is from stump sprouts, seedling sprouts, natural seed in place or from adjacent stands, direct seeding, planted seedlings, and/or advance reproduction. Cutting may be done in groups or patches (Group or Patch Clearcutting), or in strips (Strip Clearcutting). This method would be used only when no other method is feasible.

clearcutting with reserves (for even-aged regeneration) – Similar to clearcutting, but where up to 10 sq ft/ac of basal area of reserve trees are not cut or harvested and are left indefinitely to attain management goals other than regeneration.

coarse woody debris – Downed wood on the ground in the forest.

collaboration – People working together to share knowledge and resources to describe and achieve desired conditions for National Forest System (NFS) lands and for associated social, ecological, and economic systems in a plan area. Collaboration applies throughout the planning process, encompasses a wide range of external and internal relationships, and entails formal and informal processes.

composition, stand – The proportion of each tree species in a stand expressed as a percentage of either the total number, basal area, or volume of all tree species in the stand.

commercial forest products - For the purposes of this plan, merchantable saw logs, small round wood, biomass, and other forest products removed in the process of harvesting or cutting trees from NFS lands.

corridor – A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries.

Council on Environmental Quality (CEQ) – An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

critical habitat – Habitat which is essential to the conservation of the endangered or threatened species. The Secretary of Interior determines critical habitat.

cubic foot – A unit of measure reflecting a piece of wood 12 inches long, 12 inches wide, and 12 inches thick.

culmination of mean annual increment (CMAI) – The age at which the average annual growth is greatest for a stand of trees. Mean annual increment is expressed in cubic feet measure and is based on expected growth according to the management intensities and utilization standards assumed. Culmination of mean annual increment includes regeneration harvest yields and any additional yields from planned intermediate harvests.

cultural resources – An object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Cultural resources are prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties.

d

decommission – To remove a designated road or trail from the Forest Service system. Oftentimes the decommissioned road or trail will receive activities to stabilize and restore it to a more natural state.

demand– The amount of a good or service that users would be willing to acquire at a specified price, time period, and condition of sale.

den trees – Trees having rainproof, weather-tight cavities used by wildlife.

designated trail – A trail officially recognized by the Forest Service and entered into the trails database for tracking and monitoring.

desired conditions – The social, economic, and ecological attributes toward which management of the land and resources of the plan area are to be directed. Desired conditions are aspirations and are not commitments or final decisions approving projects and activities, and may be achievable only over a long time period.

developed recreation site - Outdoor recreation area requiring significant capital investment in facilities to handle a concentration of visitors on a relatively small area. Examples are campgrounds and picnic areas.

disturbance – A relatively discrete event, either natural or human-induced, that causes a change in the existing condition of an ecological system.

diversity of plant and animal communities. – The distribution and relative abundance or extent of plant and animal communities and their component species, including tree species, occurring in an area.

downed wood – Fallen trees, large dead branches, and large fragments of wood found on or near the forest floor. These provide living spaces for a host of organisms and serve as long-term storage sites for moisture, nutrients, and energy.

e

early successional habitat – A vegetative condition typically characterized by low density to no tree canopy cover and an abundance of herbaceous and/or woody ground cover. This condition may include early-successional forest, maintained openings, pastures, and open woodlands.

ecological conditions – Components of the biological and physical environment that can affect diversity of plant and animal communities and the productive capacity of ecological systems. These components could include the abundance and distribution of aquatic and terrestrial habitats, roads and other structural developments, human uses, and invasive, exotic species.

ecological processes - The actions or events that link organisms and their environment, such as predation, mutualism, successional development, nutrient cycling, carbon sequestration, primary productivity, and decay.

ecosystem, ecological system - An interacting system of living organisms and their environment.

ecosystem diversity - The variety and relative extent of ecosystem types, including their composition, structure, and processes within all or a part of an area of analysis.

eligible wild and scenic river corridor - For the Uwharrie National Forest, ¼ mile zone on either side the those segments of the Uwharrie River and Barnes Creek that traverse National Forest System lands.

endangered species - A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.

environmental impact statement (EIS)- The Draft Environmental Impact Statement (DEIS) is a disclosure document revealing the environmental effects of a proposed action, which is required for major Federal actions under Section 102 of the National Environmental Policy Act and released to the public and other agencies for comment and review. Final Environmental Impact Statement (FEIS) is the final version of the statement disclosing environmental effects required for major Federal actions under Section 102 of the National Environmental Policy Act. (FEIS)

ephemeral streams – Streams having flows that occur for short periods of time in direct response to precipitation or snowmelt. The stream channel is above the water table at all times.

epidemic – Affecting or tending to affect a disproportionately large number of individuals within a population, community, or region at the same time.

equestrian – Of or pertaining to horseback riding or horseback riders.

erosion – The wearing away of the land surface by the action of wind, water, or gravity.

even-aged silvicultural system – A planned sequence of treatments designed to maintain and regenerate a stand with one age class. The range of tree ages is usually less than 20 percent of the rotation. *See also* clearcutting, coppice, seedtree, and shelterwood.

extirpation – Extinction of a species from all or part of its range.

f

Federal Register – The designated document that notifies the public of federal actions and includes items such as Notice of Intent, calls for public involvement, etc. This document also publishes the regulations needed to implement those Federal actions.

federally recognized Indian tribe - An Indian or Alaska Native Tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges to exist as an Indian Tribe pursuant to the Federally Recognized Indian Tribe List Act of 1994, 25 U.S.C. 479a.

felsic - Indicative of the presence of feldspars and silicates in the underlying rocks.

fire management plan – Strategic plans that define a program to manage wildland fires based on an area’s approved land management plan. They must address a full range of fire management activities that support ecosystem sustainability, values to be protected, protection of firefighter and public safety, public health and environmental issues, and must be consistent with resource management objectives and activities of the area.

fire return interval - Time (in years) between two successive fires in a designated area.

fire regime. The fire pattern across the landscape, characterized by occurrence interval and relative intensity. Fire regimes result from a unique combination of climate and vegetation. Fire regimes exist on a continuum from short-interval, low-intensity stand maintenance fires to long-interval, high intensity stand replacement fires.

fire use – The combination of wildland fire use and prescribed fire application to meet resource objectives.

floodplain – That portion of a stream valley, adjacent to the channel that is covered with water when the stream overflows its banks at flood stages.

forage – All browse and nonwoody plants that are available to livestock or game animals used for grazing or harvested for feeding.

forb – An herbaceous plant, excluding grasses.

forest land - Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use. Lands developed for non-forest use include areas for crops, improved pasture, residential or administrative areas, improved roads of any width and adjoining road clearing, and powerline clearings of any width.

forest service handbook (FSH) – A handbook that provides detailed instructions for proceeding with specialized phases of programs or activities for Forest Service use.

forest service manual (FSM) – Agency manuals that provide direction for Forest Service activities.

forest type – A descriptive term used to group stands of similar composition and development due to given ecological factors, by which they may be differentiated from other groups of stands.

forest supervisor – The official responsible for administering the National Forest System lands in a Forest Service administrative unit, which may consist of two or more national forests or all the forests within a State, who reports to the Regional Forester.

fuel treatment – The rearrangement or disposal of fuels to reduce fire hazard. Fuels are defined as both living and dead vegetative materials consumable by fire.

g

game species – Any species of wildlife or fish for which seasons and bag limits have been prescribed and which are normally harvested by hunters, trappers, and fishermen under State or Federal laws, codes, and regulations.

general forest - For the purposes of this plan, Uwharrie National Forest System land that is not one of the following: Streamside Forest, Special Area, Eligible Wild and Scenic River Corridor,

Developed Recreation Site, Schweinitz's Sunflower Habitat Management Area. General forest is typically suitable for multiple-uses.

geographic information system (GIS) – An information processing technology to input, store, manipulate, analyze, and display spatial resource data to support the decision-making processes of an organization. Generally, an electronic medium for processing map information, typically used with manual processes to effect specific decisions about land base and its resources.

glade – open area in woodland, a clearing.

global ranks – Ranks assigned by the Nature Conservancy and state heritage programs based on number of occurrences.

goal – A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed.

group selection cutting (for uneven-aged regeneration) - Cutting small areas between 0.2 and 1.0 acre each, distributed over a large area, with the intent over time to establish three or more distinct age-classes. Width of an individual opening would be 1.5 - 2 times the height of trees adjacent to the opening. Small trees having good growth potential may be left standing within openings, and priority for openings would be where mature timber occurs. The number of openings would depend on the size of the area where selection would be used, the frequency of timber sale entry, and the desired age of the oldest trees. Intermediate harvests to improve the condition of the residual stand or to establish advance regeneration may be done between openings when needed.

guidelines - an expected course of action that promotes the achievement of Forest Plan desired condition, goals and objectives. A project-level analysis and a signed decision (by the responsible official) including specific rationale are required in order to deviate from an established guideline.

h

habitat - (a) An area in which a specific plant or animal can naturally live, grow, and reproduce. (b) For wildlife, habitat is the combination of food, water, cover, and space.

hazard tree – A tree that poses a safety hazard to the public due to condition and/or location.

hazard – The degree of vulnerability of a plant community, or an individual plan, to a specific pest once that pest is present.

herbicide – A pesticide used for killing, or controlling the growth of undesirable plants.

historic property – Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria.

hydrological connectivity – Water-mediated transfer of matter, energy, and/or organisms within or between elements of the hydrologic cycle. Human activities such as construction of roads and trails or degradation of stream banks and meadows can alter or disrupt hydrologic connectivity. This disruption can negatively affect nutrient availability to organisms, limit the availability of suitable habitat, change the pattern of stream flow resulting in different hydrologic processes and result in the decline of riparian or aquatic dependent species

i

infestation – The attack by macroscopic organisms in considerable concentration.

interdisciplinary team – A group of resource specialists (e.g. forester, wildlife biologist, archaeologist, etc.) responsible for developing the Forest Plan/Environmental Impact Statement, and for making recommendations to the forest supervisor.

intermittent streams – Streams that flow in response to a seasonally fluctuating water table in a well-defined channel. The channel will exhibit signs of annual scour, sediment transport, and other stream channel characteristics, absent perennial flows. Intermittent streams typically flow during times of elevated water table levels, and may be dry during significant periods of the year, depending on precipitation cycles.

intolerant – A plant requiring sunlight and exposure for establishment and growth.

invasive species – Non-native species that are introduced into an area in which they did not evolve, and in which they usually have few or no natural enemies to limit their reproduction and spread. These species can cause environmental harm by significantly changing the ecosystem composition, structure, or processes, and can cause economic harm or harm to human health.

issue - A subject or question of widespread public interest relating to management of National Forest System.

l

land adjustment – Changing National Forest System land ownership through acquisition, exchange, or disposal of land or interest in land.

land adjustment plan - A document to guide the long-range (5-10 years) land ownership program and to plan the annual program of work at the regional and forest levels. In this context, land adjustment includes purchases and donations of land or interests in land, exchanges, interchanges or transfers with other federal agencies, sales, grants, title claims and reconveyance of land erroneously acquired.

landing – Any place where cut timber is assembled for further transport from the timber sale area.

lands generally suited for timber harvest - Lands where timber production is compatible with the achievement of desired conditions and objectives established by the plan, and other lands where salvage sales or other harvest necessary for multiple-use objectives other than timber production may take place.

large woody debris – Any large piece of relatively stable woody material with a diameter greater than 10 centimeters and longer than 1 meter.

limits of acceptable change - A set of criteria that has been created to protect or restore the conditions necessary to maintain wilderness values that visitors seek. It focuses on limiting change to resources and social encounters that, if overused, would degrade the wilderness experience and resource.

Longleaf Pine Restoration Area – Most of the southeastern part of the forest. Within this management area management actions would retain, restore, or enhance the longleaf pine community when the following conditions are encountered:

- Presence of existing remnant longleaf
- Presence of Piedmont longleaf associated forbs and grasses such as little bluestem and indiagrass
- Dry ridge or south facing slope

long-term sustained-yield timber capacity - The highest uniform wood yield that may be sustained under specified management intensities consistent with multiple-use objectives after stands have reached desired conditions.

m

mafic - Indicative of the presence of magnesium and iron in the underlying rock.

management area(MA) – An area with similar management objectives and a common management prescription

management indicator species (MIS) – Any species, group of species, or species habitat element selected to focus management attention for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity.

mast – The fruit of trees considered as food for wildlife. Hard mast is the fruits or nuts of trees such as oak, beech, walnut, and hickories; soft mast includes the fruits and berries from plants such as dogwood, viburnum, elderberry, blueberry, and blackberry.

mature forest – For the purposes of this Environmental Impact Statement, mature forest is defined as forests in the late successional stage. This is the stage of forest development at which overstory trees have attained most of expected height growth and have reached ecological maturity.

maximum modification – A visual quality objective in which man’s activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

mean annual increment growth – The total increase in girth, diameter, basal area, height, or volume of individual trees or a stand up to a given age divided by that age.

mesic – Of, characterized by, or adapted to a moderately moist habitat.

mesophytic – Growing in or adapted to a moderately moist environment.

midstory – Those stems with a height intermediate between the overstory and the understory in community with a multi-layered structure of canopies.

mid-successional – The stage of forest development during which distinct overstory, midstory, and understory canopies are developed.

mineral resource – A concentration of naturally occurring solid, liquid or gaseous material in or on the Earth’s crust in such form and amount that economic extraction at a profit may be feasible under current or future conditions.

Minimum management requirement – Requirements of NFMA to ensure resource protection, vegetative manipulation, silvicultural practices, riparian areas, and diversity that guide the development, analysis, implementation, monitoring and evaluation of Forest Plans. These are reflected in the objectives, standards and guides, and monitoring requirements of the LMRP.

mitigation – Actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

modification – A visual quality objective in which human activity may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture appearing as a natural occurrence when viewed in foreground or middle ground.

monitoring - A systematic process of collecting information to evaluate changes in actions, conditions, and relationships over time and space or progress toward meeting desired conditions or plan objectives.

multiple use - The management of all the various renewable surface resources of the National Forest System so they are used in the combination that will best meet the needs of the American people: making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in the use to conform to changing needs and conditions; that some lands will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output (Multiple Use-Sustained-Yield Act 1960, U.S.C. 531).

n

National forest land and resource management plan - A plan developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended, that guides all natural resource management activities and establishes management standards and guidelines for the National Forest System lands of a given national forest.

National Forest System - All National Forest lands reserved or withdrawn from the public domain of the United States, all National Forest lands acquired through purchase, exchange, donation, or other means, the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), the Midewin Tallgrass Prairie, and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system (16 U.S.C. 1608).

National Recreation Trail - Trails designated by the Regional Forester as part of the National system of trails authorized by the National Trails System Act.

National Register of Historic Places - The USA's official list of districts, sites, buildings, structures, and objects worthy of preservation. The National Register is administered by the US. Park Service.

National Wild and Scenic River System - Rivers with outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values designated by Congress under the Wild and Scenic Rivers Act for preservation of their free-flowing condition.

native species - Species indigenous to an area of analysis. Animals or plants that have historically occupied a given aquatic or terrestrial system.

natural appearing - Landscape character that has resulted from human activities, yet appears natural, such as historic conversion of native forests into farmlands, pastures, or other areas that have reverted back to forests through reforestation activities or natural regeneration.

natural regeneration – An age class created from natural seeding, sprouting, suckering, or layering.

niche – the position or function of an organism in a community of plants and animals.

non-forest land - Lands that do not meeting the definition of forest land.

nonnative invasive species (NNIS) – A plant or animal species with all of the following characteristics: (a) not naturally occurring within the plan area; that is, required human intervention to originally establish, (b) physical and biological environmental factors typically ineffective at preventing establishment or slowing spread once established, (c) one or more effective transport mechanisms, and (d) establishment and growth occurring to the detriment of native species, typically by pre-empting their habitat niche.

non-point source pollution – A diffuse source of pollution not regulated as a point source. May include atmospheric deposition, agricultural runoff, and sediment from land-disturbing activities.

not suitable for timber production - Lands where other management goals and desired conditions are not compatible with timber production.

O

objectives – Concise projections of measurable, time-specific intended outcomes. The objectives for a plan are the means of measuring progress toward achieving or maintaining desired conditions. Like desired conditions, objectives are aspirations and are not commitments or final decisions approving projects and activities.

off-highway vehicle (OHV) – Any vehicle capable of being operated off established roads; e.g. motorbikes, four-wheel drives, and snowmobiles.

old-growth – see mature forests

outstanding mineral rights – Instances in which the minerals in lands federally owned were severed prior to the transaction in which Government acquired the land. Such rights are not subject to the Secretary of Agriculture's rules and regulations. Removal or extraction of these minerals must be allowed in accordance with the instrument severing the minerals from the surface and under applicable State and local laws and regulations.

overstory – That portion of trees in a two or multilayered forest stand that provides the upper crown cover.

P

pathogen – A parasitic organism directly capable of causing disease.

payment in lieu of taxes – Payments to local or State governments based on ownership of federal land and not directly dependent on production of outputs or receipt sharing.

perennial stream – A stream which flows year round except during drought years and is typically maintained by groundwater flow during the dry season.

performance measure - Indicators used to quantify outcomes of plan's desired conditions and objectives.

pest – A plant, animal, or environmental stress which the land manager determines to be detrimental to achieving resource management objectives.

physiographic region – A region of similar geologic structure and climate that has had a unified geomorphic history.

plan - A document, or set of documents, that integrates and displays information relevant to management of the National Forest System unit.

plan area - The National Forest System lands covered by a plan.

planning period - NFMA call for plans to be revised every at least every 15 years. For the purposes of this plan the planning period is 15 years.

potential natural vegetation –An ecological classification based on the historical distribution, to the extent known, of vegetation occupying sites with similar landscape (slope, exposure, etc.) features, ecological attributes (geological substrate, etc.), and ecological processes (fire intensity and frequency).

prescribed fire – Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) must be met prior to ignition.

proclamation boundary – The boundary contained within the Presidential proclamation that established the national forest.

project record – The comprehensive set of documents used for development of the DEIS.

program strategies – A multi-year course of action proposed under a given set of assumptions and constraints.

project – An organized effort to achieve an objective identified by location, activities, outputs, effects, times, and responsibilities for execution.

proposed action –In terms of the National Environmental Policy Act, the project, activity, or decision that a Federal agency intends to implement or undertake. The proposed action described in the Environmental Impact Statement is the Forest Plan.

public lands – Any land, and interest in land, administered by the Secretary of the Interior through the Bureau of Land Management (Federal Land Policy and Management Act of 1976). This includes the mineral estates underlying National Forest System lands.

public participation – Activities that include a wide range of public involvement tools and processes such as collaboration, public meetings, open houses, workshops, and comment periods.

R

rare species – For the purposes of this analysis and associated forest plan rare species includes federally threatened and endangered, Regional Forester sensitive species, and locally rare species.

Recreation Opportunity Spectrum (ROS) – A framework of land delineations that identifies a variety of recreation experience opportunities categorized into classes on a continuum. The Spectrum’s continuum has been divided into six major classes for Forest Service use: Urban (U), Rural (R), Roaded Natural (RN), Semi-Primitive Non-Motorized (SPNM), Semi-primitive Motorized (SPM), and Primitive (P) (FSM 2311). Most of the Uwharrie National Forest is classified as Roaded Natural since it the whole area (public and private land) is highly roaded, and few areas are remote. The Uwharrie has areas classified as RN1, RN2, and SPNM:

- RN1 – A sub-classification of Roaded Natural setting generally located within a half mile of an open road. Interaction between users is moderate and evidence of other users is prevalent.
- RN2 – a sub-classification of Roaded Natural that, while still near open roads, has a generally lower road density than RN1. Interaction between users is lower than in RN1.
- SPNM – An area characterized by a predominantly natural-appearing environment of moderate-to-large size. Interaction between users is low. On the Uwharrie National Forest, only the Birkhead Mountains Wilderness meets this definition.

regeneration – The renewal of a tree crop, whether by natural or artificial means; also the young crop itself.

Regional Forester – The official responsible for administering a single Forest Service region.

restoration – The act of putting something back to a prior position, place, or condition.

retention – if its defined in scenery section, don’t repeat here

right-of-way – Land authorized to be used or occupied for the construction, operation, maintenance, and termination of a project or facility passing over, upon, under, or through such land.

riparian areas – Geographically delineated areas with distinctive resource values and characteristics that are comprised of aquatic and riparian ecosystems, 100-year floodplains,

and wetlands. They also include all upland areas within a horizontal distance of approximately 100 feet from the edges of perennial streams or other perennial water bodies.

S

Scenic Integrity Objectives (SIO) – A desired level of excellence based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations to the valued attributes of the characteristic landscape. Objectives include Very High, High, Moderate, and Low. These categories are defined below:

- Very High – Generally provides for only ecological changes in natural landscapes and complete intactness of landscape character in cultural landscapes.
- High – Human activities are not visually evident to the casual observer. Activities may repeat attributes of form, line, color, and texture found in the existing landscape.
- Moderate – Landscapes appear slightly altered. Noticeable human created deviations remain visually subordinate to the landscape character being viewed.

Schweinitz's sunflower habitat management area – That portion of the Uwharrie National Forest classified as having the ecological attributes that make it most conducive to restoring Schweinitz's sunflower.

sediment – Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice.

seep – A wet area where a seasonal high water table intersects with the ground surface. Seeps that meet the definition of a wetland are included in the riparian corridor.

sensitive species – Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: (FSM 2670)

- a. Significant current or predicted downward trends in population numbers or density.
- b. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

shade intolerant – Having the capacity to compete for survival under shaded conditions.

shelterwood with reserves (for two-aged regeneration) – Similar to clearcutting with reserves, but where 15-30 sq ft/ac of basal area of reserve trees are not cut or harvested to attain management goals other than regeneration and so that two distinct ages of trees are maintained on the same site. Depending on diameter, this could be between 7 and 40 trees per acre (fewer large trees are required to reach a given basal area) left in clumps or uniformly distributed across the stand. Reserve trees should be long-lived since they may be expected to live 40 years or more past their present age.

silvicultural system – A planned series of treatments for tending, harvesting, and re-establishing a stand. The system name is based on the number of age classes (coppice, even-aged, two-aged, uneven-aged) or the regeneration method (clearcutting, seed tree, shelterwood, selection, coppice) used.

site preparation – The preparation of the ground surface prior to reforestation. Various treatments are applied as needed to control vegetation that will interfere with the establishment of the new crop of trees or to expose the mineral soil sufficiently for the establishment of the species to be reproduced.

skid trails – A travel way through the woods formed by loggers dragging (skidding) logs from the stump to a log landing without dropping a blade and without purposefully changing the geometric configuration of the ground over which they travel.

snag – A standing dead tree.

soil productivity – The inherent capacity of a soil for supporting growth of specified plants, plant communities, or sequence of plant communities.

special interest areas – Areas in the National Forest System designated for their unique or special characteristics.

special use permit – A permit, term permit, or easement that allows occupancy, use, rights, or privileges of National Forest System land.

species diversity – The number and relative abundance of different species within a plan area.

species – Any member of the currently accepted and scientifically defined plant or animal kingdoms of organisms.

stand – A community of trees or other vegetation sufficiently uniform in composition, constitution, age, spatial arrangement, or condition to be distinguishable from adjacent communities and so form a silvicultural or management entity.

standard – Requirement that precludes or imposes limitations on resource management practices and uses, usually for resource protection, public safety, or addressing an issue.

streamside forest – For the purposes of this plan, a 100-foot zone on both sides of all perennial streams, and all alluvial forest (an area of alluvial deposition such as a flood plain or delta). Streamside forests provide shading, stability to stream banks, a source of coarse wood for in-stream habitat, and special habitat components such as cover and travel corridors for wildlife.

successional stages – The different structural and compositional phases of vegetation development of forests, grasslands, and prairies that occur over time and include the major developmental or seral stages within a particular environment.

suitability – The appropriateness of a particular area of land for applying certain resource management practices, as determined by an analysis of the existing resource condition and the social, economic, and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

sustainability – Meeting needs of the present generation without compromising the ability of future generations to meet their needs. Sustainability is composed of desirable social, economic, and ecological conditions or trends interacting at varying spatial and temporal scales embodying the principles of multiple-use and sustained-yield.

Schweinitz's Sunflower Habitat Management Areas – Portions of the Uwharrie NF classified as having the ecological attributes that make it most conducive to restoring Schweinitz's sunflower.

t

thinning – Cutting trees that are diseased or damaged, suppressed by other trees, or that are crowding other trees. The best trees in terms of species, size or quality are left to grow. Some minimum basal area is usually set using this type of timber stand improvement.

threatened species – Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and that has been designated in the *Federal Register* by the Secretary of Interior as a threatened species.

timber harvest – The removal of trees for wood fiber use and/or other multiple-use purposes.

timber production - The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use.

timber stand improvement (TSI) – A term comprising all intermediate cuttings made to improve the composition, constitution, condition, and increment of a timber stand.

transportation and utility corridor – A parcel of land, without fixed limits or boundaries, which is used as the location for one or more transportation or utility right-of-ways.

two-aged silvicultural system – A planned sequence of treatments designed to maintain and regenerate a stand with two age classes.

u

unauthorized road or trail – A road or trail that is not included in a forest transportation atlas. Typically, user-created trails outside the established trail system.

understory – The trees and other vegetation growing under a more or less continuous cover of branches and foliage formed collectively by the upper portion (overstory) of adjacent trees and other woody growth.

unevaluated cultural resource – A cultural resource that has not been evaluated for eligibility to the National Register of Historic Places.

universal access – Programs and facilities are accessible to all people, thereby providing for the integration of all people in outdoor developed recreation areas, without separate or segregated access for people with disabilities.

V

values – the ideals, customs, institutions, etc., of a society toward which the people of the group have an affective regard.

values, market – Prices of market goods and services measured in real dollars in terms of what people are willing to pay as evidenced by market transactions.

values, nonmarket – Prices of nonmarket goods and services imputed from other economic values.

viable population – Population of plants or animals that has the estimated numbers and distribution of reproductive individuals to ensure its continued existence is well distributed in the planning area.

viewshed – The total landscape seen or potentially seen from all or a logical part of a travel route, use area, or water body.

visibility – An air quality related value, this term refers to the ability of an air mass to convey the landscape image.

vulnerability – Open to attack or damage.

W

warmwater fishery – Aquatic habitats that support fish species that have their best reproductive success and summer water temperature tolerance between 75 degrees and 85 degrees Fahrenheit (23-29 C) or about 80 degrees Fahrenheit. The various sunfish species and largemouth bass are examples.

watershed – The total area above a given point on a stream that contributes water to the flow at that point.

watershed condition – The state of the watershed based on physical and biogeochemical characteristics and processes such as hydrologic, geomorphic, landscape, topographic,

vegetative cover, and aquatic habitat, water flow characteristics and processes such as volume and timing, and water quality characteristics and processes such as chemical, physical, and biological as they affect water quality and water resources (65 FR 62572, October 18, 2000).

wetlands – Swamps, marshes, bogs, sloughs, wet meadows, ponds and similar areas managed and protected under Executive Order 11990 (FSH 2409.15-05).

wild and scenic river – A river or section of river designated as such by congressional action under the Wild and Scenic Rivers Act of October 2, 1968, as supplemented and amended, or those sections of a river designated as wild, scenic, or recreational by an act of the legislature of the state or states through which it flows.

Wilderness - Any area of land designated by Congress as part of the National Wilderness Preservation System that was established in the Wilderness Act of 1964 (16 U.S.C. 1131-1136).

wilderness study area – One of the areas selected by the Chief of the Forest Service from an inventory of unroaded and undeveloped National Forest System lands as having apparent high qualities for wilderness. They will be studied to determine whether they should be recommended for addition to the National Wilderness Preservation System.

wildfire – An unplanned ignition caused by lightning, volcanoes, unauthorized, and accidental human-caused actions and escaped prescribed fires.

wildland fire – A general term describing any non-structure fire that occurs in the vegetation and/or natural fuels. This includes both wildfire (unplanned ignitions) or prescribed fire (planned ignitions).

wildlife demand species – see demand species

wildlife opening – An area with few trees but abundant shrubs, grasses and other herbaceous vegetation that provides concentrated food sources for certain wildlife species, especially in winter and spring. A planted wildlife opening may include areas that are sown with grains, warm season grasses, or other crops that mimic the type of habitat provided by old-time farm fields.

woodland – Forest land incapable of producing 20 cubic feet per acre per year of industrial wood under natural conditions, because of adverse site conditions.

X

xeric – Of, characterized by, or adapted to an extremely dry habitat.

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APPENDIX A *THE PUBLIC INVOLVEMENT PROCESS*

In the summer of 2005, a publication summarizing the management situation and need for changing the 1986 Plan was sent to a broad mailing list. Local government officials were invited to meet prior to starting the collaborative public involvement process to develop plan components. A meeting also occurred between USDA Forest Service officials and representatives of the local Hmong community, and the Catawba Indian Nation was contacted.

The public collaborative planning process to develop plan components consisted of 10 subsequent meetings and two field trips during 2005 and 2006 with up to 100 participants per meeting. Other federal and state agency representatives, local officials, adjacent landowners, non-governmental organization and user group representatives, members of the academic community, and other interested individuals participated. At each meeting participants had the opportunity to learn something about the forest resources, give suggestions for plan components, review and refine work from the previous meeting.

An initial Proposed Plan was issued for comment in 2007. Shortly after this the federal regulations regarding forest planning were successfully challenged in court, which put the Uwharrie NF planning process on hold. New regulations came out in 2008 and the Proposed Plan was issued for comment a second time in early 2009. The 2008 planning regulations were also successfully challenged in court and the Uwharrie NF planning process was stopped a second time. In 2010, using the 1982 planning regulations, a Notice of Intent to revise the 1986 Plan was published, with the Proposed Plan published concurrently under the title *Preliminary Draft Land and Resource Management Plan*.

Very similar comments were received each time the Proposed Plan was issued, with the exception that Off-highway vehicle enthusiasts submitted many more comments in response to the 2010 NOI. Generally, comments have been very favorable. Those comments that reflect remaining concerns, such as those from the equestrian community (see below), were used by the planning team to modify or clarify language or plan components, or to develop an alternative to the Proposed Plan.

APPENDIX B: *THE PLANNING AND ANALYSIS PROCESS*

I. The Planning Process

36 CFR Part 219.12 describes the required process for preparation, revision, or significant amendment of a forest plan. This following describes the required steps and how the Uwharrie LRMP revision process will fulfill those steps. Documents identified are in the process record.

Identification of Purpose and Need (CFR 219.12(b))

The *Uwharrie National Forest Watershed Analysis* (2004 in draft) began to characterize the geology and soils, hydrology, vegetation, species and habitats, and human uses of the Uwharrie NF. Issues and key questions were identified by the interdisciplinary team (ID Team) for the topics of aquatic resources, forest health, recreation, archeological resources, forest fragmentation, the local economy, transportation, recovery of T&E species, and air quality.

Using the knowledge acquired through the watershed analysis, in early 2005 the ID Team formalized a preliminary statement of purpose and need in the form of a document called *Uwharrie National Forest – A Strategic View*. This document identified the existing conditions and potential role of the Uwharrie NF in the meeting the needs of the social, economic, and ecological systems. This document was distributed to interested parties in the summer of 2005 and used as a starting point for discussion with the public and agency partners to develop a preliminary list of public issues, management concerns, and resource use and development opportunities. *Identifying the Need to Change the Current Plan* (available in the process record) was the result of this stage of the planning process.

Planning Criteria (219.12(c))

The following are identified as planning criteria used in the development of the Uwharrie NF revised Forest Plan.

Laws

Alternatives should meet the intent of the Organic Administration Act and Weeks Law identifying the purpose of the National Forest to improve and protect the forest, to secure favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the U.S.

Alternatives should meet the intent of the Multiple-Use Sustained-Yield Act of 1960 to administer the National Forest for outdoor recreation, range, timber, watershed, and wildlife and fish purposes. That these resources are utilized in the combination that will best meet the needs of the

American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

Alternatives should meet the intent of the Forest and Rangeland Renewable Resources Planning Act of 1974 as amended by the National Forest Management Act of 1976 including requirements to provide for multiple use and sustained yield of the products and services obtained therefrom in accordance with the Multiple-Use Sustained-Yield Act of 1960, and, in particular, include coordination of outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness.

Alternatives should comply with the Clean Water Act, Endangered Species Act and other applicable laws. Protection of water quality to provide for current and future beneficial uses will be a high priority in all alternatives.

National Direction (formerly RPA Program)

The goals and objectives of the current Forest Service Strategic Plan will be addressed as applicable to the Uwharrie NF. These include:

Goal 1. Restore, Sustain, and Enhance the Nation's Forests and Grasslands

Objective 1.1 Reduce the risk to communities and natural resources from wildfire

Objective 1.2 Suppress wildfires efficiently and effectively

Objective 1.3 Build community capacity to suppress and reduce losses from wildfires

Objective 1.4 Reduce adverse impacts from invasive and native species, pests, and diseases

Objective 1.5 Restore and maintain healthy watersheds and diverse habitats

Goal 2. Provide and Sustain Benefits to the American People

Objective 2.1 Provide a reliable supply of forest products over time that (1) is consistent with achieving desired conditions on NFS lands and (2) helps maintain or create processing capacity and infrastructure in local communities

Objective 2.3 Help meet energy resource needs.

Goal 4. Sustain and Enhance Outdoor Recreation Opportunities

Objective 4.1 Improve the quality and availability of outdoor recreation experiences

Objective 4.2 Secure legal entry to national forest lands and waters

Objective 4.3 Improve the management of off-highway vehicle use

Goal 5. Maintain Basic Management Capabilities of the Forest Service

Objective 5.1 Improve accountability through effective strategic and land management planning and efficient use of data and technology in resource management

Objective 5.2 Improve the administration of national forest lands and facilities in support of the agency's mission

Public Issues and Management Concerns

The alternatives will be developed and analyzed with consideration for the public issues, management concerns, and resource use and development opportunities identified and described in the purpose and need. (See Chapter 1 of the DEIS and Appendix A for more information.)

Other Plans

The alternatives will be developed and analyzed with consideration for the plans and programs of other Federal and State agencies, local governments, and Indian tribes. The responsible official will review these programs and plans to determine how the Uwharrie NF plan may complement or find consistency with these other plans.

Ecological Factors

The management actions needed to restore, sustain, and/or enhance the composition, structure, and function of the ecological communities within the national forest will be considered in developing the alternatives. The potential effects of climate change will be considered in developing and analyzing the alternatives.

Social Factors

Alternatives will consider the effects of different management strategies on the local communities.

Economic Factors

Budget constraints based on past funding trends will be used in the development of desired conditions and objectives to provide meaningful measures that can reasonably be expected. The resulting plan shall provide for multiple use and sustained yield of goods and services from the national forest in a way that maximizes long term net public benefits in an environmentally sound manner.

Resource Integration

During the forest planning process, lands which are not suited for timber production shall be identified in accordance with the criteria in Sec. 219.14.

The methods, timing, and intensity of vegetation management practices shall be defined in the forest plan with applicable standards and guidelines and associated outcomes in the form of goals, desired conditions, and objectives.

The allowable sale quantity of timber that may be sold each decade will be established for each alternative.

Unless otherwise provided by law, roadless areas within the National Forest System shall be evaluated and considered for recommendation as potential wilderness areas.

Direction shall be provided for the management of designated wilderness and primitive areas.

Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. Each alternative shall establish objectives that would help maintain or improve habitat for management indicator species.

A broad spectrum of outdoor recreation opportunities shall be provided for in each alternative. The identification of recreation opportunities will include an updated inventory of Recreation Opportunity Spectrum classification. The Scenery Management System will be used in planning to identify scenery resources and guide management of these resources. The alternatives will provide a diversity of recreation opportunities including motorized and non-motorized recreation.

Mineral exploration and development in the planning area shall be considered in developing alternatives. General suitability for minerals and energy development will be established. Private mineral rights will be considered in all decisions made in the planning process.

The alternatives shall provide for protection and management of the water and soil resources. Important water uses will be identified.

The alternative shall provide for the identification, protection, interpretation, and management of significant cultural resources on the national forest. Planning for the resource shall be governed by the requirements of Federal laws pertaining to historic preservation. Interactions with other multiple uses will be considered and impacts analyzed.

The list of unique or important forest, aquatic, or geologic types needed to complete the national network of RNA's will be checked to ascertain if any potential missing RNA types are located on the Uwharrie NF.

The alternatives shall provide for diversity of plant and animal communities and tree species consistent with the overall multiple-use objectives of the planning area. The interdisciplinary team shall consider how diversity will be affected by various mixes of resource outputs and uses, including proposed management practices. The diversity analysis should be based on processes

readily identifiable with other state or national systems, such as NatureServe. The analysis will address both ecosystem and species diversity.

The minimum management requirements for resource protection, vegetation manipulation, silvicultural practices, even-aged management, riparian areas, soil and water, and diversity shall be incorporated into the objectives, standards and guidelines in each alternative.

Inventory data and information collection (219.12(d))

The following are examples of data and information sources used in the planning and analysis process for the Uwharrie NF revised LRMP and environmental impact statement (EIS):

- Stand examination inventory data collected in the field is entered into our corporate database for tracking overstory vegetation with fields of information such as forest type, stand age, condition, and acres. Our current GIS (geographic information system) utilizes ArcGIS version 9.3, which links to our FSveg tabular database using sde(spatial database engine) to connect to FSveg Spatial (oracle db).
- Other types of inventory data collected and entered into corporate databases and our GIS include roads and trails and conditions, recreation sites and conditions, archeological sites, stream networks, certain wildlife habitats, fire history, digital elevation, and land ownership.
- Federal and State agency, local government and tribal websites are a source of information about other programs and plans, lists of rare species and occurrence records, some economic information, forest health information, soil and water information.
- NatureServe's ecological systems (2004) are used as a starting point to define ecosystem types on the Uwharrie NF.
- Place based knowledge and information is contributed by participants in the collaborative planning process.
- U.S. Census Bureau data is used to summarize demographics and some economic information.
- Citations listed in the References chapter provide additional information including the best available scientific information in regard to specific analysis topics.

Analysis of the Management Situation (219.12(e))

The analysis of the management situation (AMS) is a determination of the ability of the planning area covered by the forest plan to supply goods and services in response to society's demands. Benchmarks define the range within which alternatives can be constructed and include: (1) the minimum level of management; (2) the maximum physical and biological production potentials; and, (3) the maximum present net value. When considered along with the current level of goods

and services provided, projections of demand, a determination of the potential to resolve public issues and management concerns, and considering the data and information available, this provides a basis for determination of the need for change.

Documents related to the AMS may be accessed on the national forest website or in the process record.

Formulation of Alternatives (219.12(f))

A range of alternative plan contents are expressed and considered in the process of formulating a proposed plan. The process of developing this proposed plan and alternatives focused first on defining common ground among the interested parties and narrowing the initially broad possibilities for plan content to those elements generally agreeable to most participants in the planning process. General agreement was established for the planning themes: restoring native ecosystems, better management of heritage resources, and the importance of outdoor recreation, specifically well-managed trails and facilities. Alternative points of view were expressed for a number of resource topics; among them were the suitability of areas for timber production, choosing areas to be included in the Special Interest Areas category, the appropriate size for openings in oak-hickory forests, and the appropriateness of requiring equestrians to use only designated trails. One idea that did not move forward due to cost was to state in the plan a desire to have a staffed visitor center near the entrance to the Badin Lake Recreation Area. Another idea that was scaled back considerably from its original proposal was to have large cultural resource zones that would severely restrict multiple-use management.

The range of ideas put forward by participants were considered and increasingly narrowed. The result became the contents of the proposed plan and is analyzed in the EIS as Alternative B. Opposition to the goal to have equestrians only on a designated trail system continued to remain unresolved and therefore a major public issue. To address this an alternative to the proposed plan that does not include this goal, Alternative C, will be analyzed in detail. Alternative A is the 1986 Plan, which is current management direction. These three alternatives are distributed between the minimum resource potential and maximum resource potential to reflect the commodity and resource uses and values appropriate for addressing the propose and need for plan revision in the first decade of the 21st century.

Estimated Effects of Alternatives (219.12(g))

The estimated effects of the alternatives are described in Chapter 3 of this document. Some of the more pertinent effects and outcomes are displayed in tables at the end of Chapter 2.

Evaluation of Alternatives (219.12(h))

The ID Team compared the aggregate effects of the alternatives with regard to physical, biological, economic, and social impacts, outputs of goods and services, and overall protection and enhancement of the environment.

Preferred Alternative (219.12(i))

The Forest Supervisor has reviewed the ID Team’s evaluation and has recommended to the Regional Forester that Alternative B be considered the preferred alternative; it is so identified in the draft EIS, and displayed as the proposed plan.

Plan Approval (219.12(j))

The Regional Forester shall review the proposed plan and final EIS and either approve or disapprove the plan. A record of decision shall be prepared.

Monitoring and Evaluation ((219.12(k))

Monitoring requirements are identified in the proposed plan to evaluate on a sample basis how well implementation is adhering to plan direction.

II. Determining the Base Sale Schedule (BSS)/Allowable Sale Quantity (ASQ)/Long-Term Sustained Yield (LTSY)

A detailed Excel Spreadsheet Model was developed to determine the Base Sale Schedule, Allowable Sale Quantity, and Long-Term Sustained Yield for the benchmarks and alternatives. This model tracked the changes that would occur over 50 years for each ecological system group/age class/management area combination. When acres would be treated with a silvicultural harvest, the model would track the volume removed from that activity. The changes in age class distributions were tracked, along with the number of acres that would be converted from one ecological system to another (e.g., from loblolly pine to longleaf pine). Lastly, formulas were incorporated into the model to determine the long-term sustained yield for any benchmark/alternative formulation.

The following sections describe the various components of the spreadsheet model that was constructed.

Land Stratification

For modeling purposes, the following ecological systems were combined into ecological system groups that were analyzed in the following table:

Ecological System	Ecological System Modeling Group
Xeric Oak Forest	Dry-Oak Hickory
Dry Oak-Hickory Felsic Forest	
Dry Oak-Hickory Mafic Forest	
Dry-Mesic Oak-Hickory Felsic Forest	Dry-Mesic Oak Hickory
Dry-Mesic Oak-Hickory Mafic Forest	
Southern Piedmont Mesic Forest	
Southeastern Interior Longleaf Pine	Longleaf Pine
Successional Forest	Loblolly Pine

Ecological System	Ecological System Modeling Group
	Shortleaf Pine
Southern Pine-Oak Woodland	Rare Communities
S. Piedmont Glades and Barrens	
S. Piedmont Mafic Hardpan	
S. Piedmont/R&V/Upland Swamp	
Piedmont Seepage Wetland	
Streamside Forest	Streamside Forest

The acres within each group were separated by 10-year age class increments. The acres of each ecological system group/age class combination were then determined for each Management Area. (For Alternative A, this included Management Areas 1, 3 and 4; while for Alternatives B and C, this included the General Forest Management Area and the Longleaf Restoration Management Area.)

Silvicultural Prescriptions

The following table describes the silvicultural options that were incorporated into the Excel spreadsheet model, along with a description of the minimum regeneration age that was considered.

Ecological System Modeling Group	Thinning Options	Silvicultural Regeneration Method	Minimum Regeneration Age	Modeled in Which Plan Alternative(s)
Loblolly	Options to thin starting at age 25, and every 20 years after initial thin	Two-Aged	60	A
		Two-Aged	60	B/C
		Conversion	60	B/C
		Shelterwood	60	A
		Clearcut	60	A
	None	Uneven-Aged	4 age classes @ 15 year intervals	B/C
Shortleaf	Options to thin starting at age 25, and every 20 years after initial thin	Two-Aged	70	A
		Two-Aged	60	B/C
		Conversion	60	B/C
		Shelterwood	70	A
		Clearcut	70	A
	None	Uneven-Aged	4 age classes @ 15 year intervals	B/C
Longleaf	Options to thin starting at age 25, and every 20 years after initial thin	Two-Aged	70	A
		Two-Aged	100	B/C
		Shelterwood	70	A
		Clearcut	70	A
	None	Uneven-Aged	4 age classes @ 15 year intervals	B/C
Dry Oak-Hickory	Options to thin starting at age 25,	Two-Aged	80	A
		Two-Aged	110	B/C

Ecological System Modeling Group	Thinning Options	Silvicultural Regeneration Method	Minimum Regeneration Age	Modeled in Which Plan Alternative(s)
	and every 20 years after initial thin	Shelterwood	80	A
		Clearcut	80	A
	None	Uneven-Aged	4 age classes @ 15 year intervals	B/C
Dry-Mesic Oak-Hickory	Options to thin starting at age 25, and every 20 years after initial thin	Two-Aged	80	A
		Two-Aged	110	B/C
		Shelterwood	80	A
		Clearcut	80	A
	None	Uneven-Aged	4 age classes @ 15 year intervals	B/C

Timber Volumes

Plot data from the Forest Inventory and Analysis (FIA) data set for North Carolina was inputted into the Forest Vegetation Simulator (FVS) to estimate the timber volumes used in the BSS/ASQ/LTSY analysis model. The following table shows the number of plots from each FIA Forest Type that were used to estimate the volumes for the five different Ecological Modeling Groups.

FIA Forest Type	Plot Count	Modeling Group
Chestnut Oak	57	Dry Oak-Hickory
Chestnut Oak/Black Oak/Scarlet Oak	158	Dry Oak-Hickory
White Oak	49	Dry Oak-Hickory
Loblolly Pine	753	Loblolly Pine
Loblolly Pine/Hardwood	219	Loblolly Pine
Longleaf Pine	37	Longleaf Pine
Longleaf Pine/Oak	12	Longleaf Pine
Shortleaf Pine	22	Shortleaf Pine
Shortleaf Pine/Oak	26	Shortleaf Pine
Northern Red Oak	10	Dry-Mesic Oak-Hickory
White Oak/Red Oak/Hickory	220	Dry-Mesic Oak-Hickory
Yellow-poplar	88	Dry-Mesic Oak-Hickory
Yellow-poplar/White Oak/Northern Red Oak	191	Dry-Mesic Oak-Hickory

The results of the FIA analysis showed a higher volume per acre than what an analysis of the average volume removed over the last 13 years showed. However upon further investigation, it was determined that a majority of stands that had been harvested during that time were from

lower stocked stands, resulting in lower yields. In comparing the average historical volume with the volume of some more recent sales, it was determined that the average historical volume was too low, and that the results of the FIA analysis should be used for the BSS/ASQ/LTSY analysis.

It should also be noted that the volumes from the FIA/FVS analysis and as used in the BSS/ASQ/LTSY analysis, are in cubic feet. When cubic feet need to be converted to board feet for reporting purposes, a conversion factor of 5 BF/CF was used.

Culmination of Mean Annual Increment (CMAI) Analysis

The National Forest Management Act establishes the requirement that “prior to harvest, stands of trees ... shall generally have reached the culmination of mean annual increment of growth” (16 USC 1604(m)). The FIA/FVS analysis described above was used to also determine the ages of CMAI for the different ecological system modeling groups. The result of this analysis is shown in the following table.

Ecological Modeling Group	Age CMAI is Reached *
<i>Age CMAI is Reached – Without Intermediate Thinning</i>	
Loblolly Pine	31
Longleaf Pine	41
Shortleaf Pine	45
Dry Oak-Hickory	34
Dry-Mesic Oak-Hickory	30
<i>Age CMAI is Reached – With Intermediate Thinning</i>	
Loblolly Pine	37
Longleaf Pine	41
Shortleaf Pine	42
Dry Oak-Hickory	35
Dry-Mesic Oak-Hickory	36
* Using Standard Cubic Top Volume Calculations	

Revenues and Costs

Based on historical timber sale averages, the following revenues, timber management costs, road costs and road factors were used in the economic analysis of the silvicultural management options.

Revenues:

- Hardwood Sawtimber - \$25.80/ccf
- Hardwood Pulpwood - \$3.95/ccf
- Pine Sawtimber - \$47.72/ccf
- Pine Pulpwood - \$3.48/ccf

Timber Management Costs:

- Sale Preparation - \$10.26/ccf
- Sale Administration - \$9.00/ccf
- Site Preparation - \$60.00/acre
- Planting - \$118.00/acre (used to regenerate pine stands)
- General Release - \$125.00/acre (used with both natural regeneration and planting)
- Crown Release - \$180.00/acre (used in hardwood stands the decade following regeneration)
- Prescribed Fire - \$35.00/acre (return interval average 1.5 times per decade in hardwoods and 3 times average per decade for pine types).

Road Costs and Factors:

- Road Construction - \$76,517/mile
- Road Reconstruction - \$6,743/mile
- Road Maintenance - \$2,834/mile
- Average Miles Road Constructed per Acre Harvested = .00037 miles/acre
- Average Miles Road Reconstructed per Acre Harvested = .00280 miles/acre
- Average Miles Roads Maintained per Acre Harvested = .01138 miles/acre

III. Timber Suitability Analysis

Stage 1: Lands Tentatively Suitable for Timber Production

There are three “stages” in determining lands suitable for timber production. The first stage identifies the lands that are non-forest, lands withdrawn from timber production, lands that cannot be adequately restocked, etc. to identify the lands “tentatively suitable” for timber production. The following table shows the results of this first stage of analysis.

Total National Forest Lands	50,814
Non-Forest Lands/ Lands with Unavailable Information	733
Lands Withdrawn from Timber Production (Wilderness)	5,160
Lands that Cannot be Adequately Restocked	0
Lands where Irreversible Damage would Occur	0
Lands Tentatively Suitable for Timber Production	44,921

Stage 2: Timber Suitability – Economic Analysis

The second “stage” is an analysis of the lands that are tentatively suitable for timber production to “identify the management intensity for timber production for each category of land which results in the largest excess of discounted benefits less discounted costs” (36 CFR 219.14(b)).

For each of the five ecological system modeling groups, the following management intensities were evaluated to determine which silvicultural management regime would be the most economically efficient:

- Two-Aged Shelterwood (leave Reserves) – Longer Rotation; Thin at age 25 and 45 for loblolly pine, Thin at 35 and 55 for shortleaf pine and Thin at 40 for longleaf pine types and 55 for hardwood types
- Two-Aged Shelterwood (leave Reserves) – Shorter Rotation; Thin at age 25 and 45 for loblolly pine, Thin at 35 for shortleaf pine and Thin at 40 for longleaf pine types and 55 for hardwood types
- Shelterwood (remove Reserves same decade); Thin at age 25 and 45 for loblolly pine, Thin at 35 and 55 for shortleaf pine and Thin at 40 for longleaf pine types and 55 for hardwood types
- Clearcut; Thin at age 25 and 45 for loblolly pine, Thin at 35 and 55 for shortleaf pine and Thin at 40 for longleaf pine types and 55 for hardwood types
- Uneven-Aged Management (UEAM)

The following tables show the Present Net Value (PNV) for each management intensity in each ecological system modeling group. (PNV is the difference between the discounted revenues and discounted costs, using a 4% discount rate.)

Loblolly Pine – Longleaf Restoration Emphasis	
Management Intensity	PNV/Acre
Two-Aged SW – Longer Rotation	-\$520.84
Two-Aged SW – Shorter Rotation	-\$533.23
Clearcut	-\$450.82
Shelterwood	-\$450.82
UEAM	-\$718.58

Shortleaf Pine	
Management Intensity	PNV/Acre
Two-Aged SW – Longer Rotation	-\$357.28
Two-Aged SW – Shorter Rotation	-\$374.51
Clearcut	-\$333.39

Shortleaf Pine	
Management Intensity	PNV/Acre
Shelterwood	-\$333.39
UEAM	-\$510.67

Longleaf Pine	
Management Intensity	PNV/Acre
Two-Aged SW – Longer Rotation	-\$401.17
Two- Aged SW – Shorter Rotation	-\$416.50
Clearcut	-\$354.83
Shelterwood	-\$354.83
UEAM	-\$672.87

Dry Oak-Hickory	
Management Intensity	PNV/Acre
Two-Aged SW – Longer Rotation	-\$410.70
Two- Aged SW – Shorter Rotation	-\$411.62
Clearcut	-\$421.50
Shelterwood	-\$421.50
UEAM	-\$566.65

Dry-Mesic Oak-Hickory	
Management Intensity	PNV/Acre
Two-Aged SW – Longer Rotation	-\$411.16
Two- Aged SW – Shorter Rotation	-\$414.45
Clearcut	-\$425.29
Shelterwood	-\$425.29
UEAM	-\$510.61

Loblolly Pine	
Management Intensity	PNV/Acre
Two-Aged SW – Longer Rotation	-\$109.88
Two-Aged SW – Shorter Rotation	-\$123.30
Clearcut	-\$77.89
Shelterwood	-\$9.59
UEAM	-\$281.50

Appendix B: The Analysis Process

This analysis shows that the most economically-efficient management technique varies by forest community type. Though none of the techniques resulted in a positive PNV, even aged management techniques like clearcutting and shelterwood management provided the least negative PNV for the pine types followed by two-aged sequences and uneven-aged management.

For the two hardwood types included in this analysis, two-aged systems resulted in the smallest negative PNV, followed by the two traditional even aged treatments and uneven-aged management. Under a traditional loblolly pine management scenario, the shelterwood provided the lowest negative PNV. This was followed by clear cutting and the two-aged treatments. The lowest PNV under the traditional loblolly pine scenario was UEAM.

For shelterwood and clearcutting, the PNVs are similar because it is assumed that all the volume will be removed within the same decade, just that the removal would occur over a longer period of time with the shelterwood.

The analysis also shows that for the two-aged management intensities, it is more economical to have longer rotations (and therefore having higher volumes at final harvest).

Stage 3: Identification of Lands Suitable for Timber Production

The third stage identifies the tentatively suitable for timber production lands that are not appropriate for timber production. These are lands proposed for resource uses that preclude timber production or lands that are not cost-efficient in meeting desired forest objectives. The table below shows the lands identified as not appropriate for timber production for each alternative, and then the resulting identification of lands that are “suitable for timber production”, and the corresponding lands that are “not suitable for timber production”.

	Alternative A	Alternatives B & C
Total National Forest Lands	50,814	50,814
Non-Forest Lands/ Lands with Unavailable Information	733	733
Lands Withdrawn from Timber Production	5,160	5,160
Lands Tentatively Suitable for Timber Production	44,921	44,921
Lands Not Appropriate for Timber Production	6,085	11,435
Lands Suitable for Timber Production	38,836	33,486
Total Lands Not Suitable for Timber Production	11,978	17,328

IV. Benchmark Analysis

Benchmark analyses are used to approximate maximum economic and biological resource production opportunities and are useful in evaluating the compatibilities and conflicts between individual resource objectives and in defining the range within which integrated alternatives can be developed.

Minimum Level of Management Benchmark

This benchmark represents the minimum level of management needed to maintain and protect the Uwharrie NF as part of the National Forest System. This level of management does involve some activities and costs in order to meet the following minimum requirements.

- Protect the life, health, and safety of incidental users;
- Prevent environmental damage to the land or resources of adjoining lands of other ownerships or downstream users;
- Conserve soil and water resources;
- Prevent significant or permanent impairment of the productivity of the land; and
- Administer unavoidable non-Forest Service special uses and mineral leases, licenses, permits, contracts, and operating plans.

Under a minimum level of management, the allowable sale quantity would be zero, and there would be zero acres classified as suitable for timber production. Active management to address restoration needs and species habitat needs would not be accomplished. Over time, due to the lack of maintenance, many roads, trails and recreation sites would have to be closed due to safety concerns and/or environmental damage concerns.

Current Level of Management Benchmark

This benchmark is the same as the Current Management Alternative, which is described in this environmental impact statement as Alternative A.

Maximum Level of Timber Production Benchmark

For this benchmark, an analysis was conducted using the BSS/ASQ/LTSY Excel spreadsheet model described previously. Since the regeneration method of clearcutting provides the greatest level of timber products per acre, that option was the only one used. Also the harvesting schedule was constrained so that there would be a non-declining flow of timber products over time. The result of this analysis is summarized in the table below.

Base Sale Schedule for All Products by Decade (MCF/Decade)

Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
18,642	19,958	23,983	24,437	24,689

Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Long-Term Sustained Yield = 29,366 MCF (or 2,937 MCF/year)				

Maximum Present Net Value Benchmark and Present Net Value Determinations of the Alternatives

Financial efficiency is defined as how well the dollars invested produce revenues to the agency. Economic efficiency is defined as how well the dollars invested produce benefits to society. Present Net Value (PNV) is used as an indicator of financial and economic efficiency.

An Excel spreadsheet was used to calculate the PNV over a 50-year period. A 4 percent discount rate was used. Decadal and 50 year cumulative present values for program benefits and costs as well as present net values are the product of this spreadsheet. For each decade, an average annual resource value was estimated, multiplied by 10 years, and discounted from the mid-point of each decade.

The revenue values for timber were the values described previously in the timber suitability analysis section. The estimates of recreation visitors were derived from the National Visitor Use Monitoring (NVUM) Report for the National Forests in North Carolina, which was updated in 2009. The benefit values for the recreation visits came from research conducted by the Southern Research Station. (A recreation “visit” is defined as the entry of one person onto a national forest site or area to participate in recreation activities for an unspecified period of time. This site visit ends when the person leaves the site or area for the last time.)

The table below displays the economic values that were used in the Present Net Value analysis for each recreation activity.

Recreation Activity	Description	Value/Visit
Camping	Camping at a developed recreation site	\$51.26
Driving	Motorized recreation including driving for site seeing and motorized boating activities	\$43.84
General	Generalized recreation including just relaxing, swimming, and non-specific forest recreation	\$80.03
Hiking	Hiking	\$51.26
Nature/Historical	Nature based activities including special forest gathering, historical site visit, nature study visit, and nature study	\$51.26
Off-Highway Vehicles	Off-Highway Vehicle activities including three/four wheelers and motorcycles	\$51.26
Primitive Camping/Wilderness	Primitive camping (using undeveloped sites) and backpacking	\$76.10
Picnicking	Picnicking	\$90.55

Recreation Activity	Description	Value/Visit
Trails	Trail use including bicycling, horseback riding and non-motorized water activities such as canoeing	\$205.34
Viewing Scenery/ Viewing Wildlife	Nature viewing and wildlife viewing	\$60.01
Hunting	Hunting	\$140.53
Fishing	Fishing	\$45.96

Source: J. Michael Bowker, et. al., Estimating the Net Economic Value of National Forest Recreation: An Application of the National Visitor Use Monitoring Database, FS 09-02, September 2009, The University of Georgia.

Note: The values were originally reported in 2004 dollars, and were updated to 2010 dollars using the GDP Price Deflator from the US Department of Commerce, Bureau of Economic Analysis.

A “Maximum Present Net Value” benchmark would represent the combination of management activities that would create the greatest difference between the discounted revenues/benefit values compared to the discounted costs. In comparing the economic values of the uses of the Uwharrie National Forest, recreation (and wildlife-related recreation) provides the majority of the total estimated discounted benefits. So a management scheme that would “maximize” the recreation potential on the Uwharrie National Forest, and specifically one that would emphasize bicycling, horseback riding and hunting activities, would need to be enacted to “maximize” the present net value on the Forest.

For a benchmark that would “Maximize Present Net Value Using Market Values Only”, the recreation/wildlife benefit values disclosed above would not be used since they are not market values (i.e., values representing money exchanged in a market place). Instead, the fees received from developed recreation areas/campgrounds, and the monies paid for hunting and fishing permits would be the “values”. So, under this form of management, developed recreation/campground opportunities would be maximized, along with hunting and fishing opportunities. Also, since timber management results in “returns to the treasury”, timber production would be a part of this benchmark, emphasizing pines over hardwoods and the preferred harvest methods used would be clearcutting and shelterwood. (See the results of the “Stage 2 Timber Suitability Economic Analysis.”)

Since the purpose of a benchmark is to identify the range within which integrated alternatives can be developed, it was felt that an attempt to speculate and quantify exactly what a “maximum” level of recreation uses might be for these two benchmarks would not be very useful. However, it is important to identify the types of management emphases that would be conducted under such “benchmark” forms of management to help facilitate the identification of a range within which alternatives can be developed.

For the alternatives, recreation, wildlife, and timber outputs were estimated and a Present Net Value of each alternative could be determined. In estimating the PNV for the alternatives, the costs used were derived from the estimated budgets for all the program areas on the National Forest. (In this case, it was determined that the overall total budget for the Forest would likely stay the same

between the alternatives, but the program areas being emphasized would differ.) The following table shows the PNVs for the alternatives.

Present Net Values of Costs and Benefits in M Dollars (2010) for the Alternatives

	Alt A	Alt. B	Alt. C
Cumulative Total Present Net Value	\$1,074,565	\$1,057,032	\$1,070,227
Present Value Benefits by Program:			
Range	\$0	\$0	\$0
Timber	\$9,797	\$8,079	\$8,079
Minerals	\$0	\$0	\$0
Recreation	\$992,670	\$976,854	\$990,050
Wildlife:	\$121,712	\$121,712	\$121,712
Total PV of Benefits	\$1,124,179	\$1,106,646	\$1,119,842
Present Value Costs by Program:			
Fire	\$6,966	\$8,144	\$8,144
Timber	\$7,545	\$6,367	\$6,367
Recreation/Engineering/Facilities	\$16,479	\$16,479	\$16,479
Lands/Minerals	\$1,829	\$1,829	\$1,829
Heritage	\$505	\$697	\$697
Fisheries/Wildlife/Botany	\$2,133	\$2,133	\$2,133
Soil, Water, & Air	\$610	\$718	\$718
Silviculture/Forest Health	\$1,839	\$1,839	\$1,839
Administration	\$8,997	\$8,697	\$8,697
Planning/Inventory/Monitoring	\$2,711	\$2,711	\$2,711
Total PV Costs	\$49,614	\$49,614	\$49,614

SOCIAL ECONOMIC IMPACT ANALYSES

The Model

Economic effects to local counties were estimated using an economic input-output model developed with IMPLAN 3.0 (IMPLAN). IMPLAN (Impact Analysis for Planning) is a software package for personal computers that uses the latest national input-output tables from the Bureau of Economic Analysis, as well as data from the Bureau of Labor Statistics and the Census Bureau. The software was originally developed by the Forest Service and is now maintained by the [Minnesota IMPLAN Group, Inc \(MIG\)](#). Data used for the impact analysis was from secondary data for those counties considered to be in the forest's impact area. The forest's zone of economic influence was delineated using a standard Forest Service protocol (Retzlaff, 2010).

Forest Contribution and Economic Impact Analyses

The IMPLAN model was used to assess the economic contributions of the Uwharrie NF. Economic contribution is a way of assessing the degree to which current forest management supports regional and local economies. An impact analysis, on the other hand, describes what happens under different management strategy alternatives. The impact of changes in final sales stemming from

management actions are measured by changes in employment and income. Economic impacts were estimated for 2015, using the expenditure data for recreation, wildlife, and hunting (U.S. Forest Service's National Visitor Use and Monitoring data (NVUM)) and harvest volume estimates for timber.

Impacts to local economies are measured in two ways: employment and labor income. Employment is expressed in number of jobs. A job can be seasonal or year-round, full-time or part-time. The income measure used was labor income expressed in 2011 dollars. Labor income includes both employee compensation (pay plus benefits) and proprietors income (e.g. self-employed).

Data Sources

IMPLAN, an "input-output" model produces a linear relationship so that impact estimates need only be calculated once per model and then applied to the direct change in final demand for each alternative. A Forest Service-developed spreadsheet known as "FEAST" (Forest Economic Analysis Spreadsheet Tool) was used to apply the IMPLAN impact results to each alternative, expressed in units of output. FEAST transformed the dollar impact for a given industry from IMPLAN to the resource output by alternative into a specific employment and income estimate. Specifications for developing IMPLAN impact estimates (response coefficients) and levels of dollar activity are stated below.

Timber

Volume Data – Volume data was derived from cut and sold reports and estimates from the timber staff, by alternative.

Use of the Model – Hardwood and softwood saw-timber were processed through the sawmill industry. Data from the forest shows that only 56% of the saw timber volume was processed in the study area. Most of that was processed by saw mills, but a small percentage was processed by veneer mills and other wood products manufacturing. Only 45% of the roundwood was processed in the study area. Of that, most was processed by pulp mills, with a small percentage going to reconstituted wood products manufacturing. Impacts represent the economic activity occurring in all backward linking sectors associated with the final demand output of the timber industries described above.

Recreation

Recreation visits include hunting and fishing as well as hiking, camping, OHV riding, equestrian, and mountain biking. Recreation visits were derived from the National Visitor Use and Monitoring survey that is done for one-quarter of national forests each year. The Croatan and Uwharrie NFs were surveyed in 2008. The resulting calculations yielded visits for local and non-local, day use, on national forest overnight use, and off national forest overnight use. These use metrics were entered into FEAST to link with IMPLAN impact response coefficients to yield an impact for recreation and wildlife resources.

Spending Segments

The spending that occurs on a recreation trip is greatly influenced by the type of recreation trip taken. For example, visitors on overnight trips away from home typically have to pay for some form of lodging (e.g., hotel/motel rooms, fees in a developed campground, etc.) while those on day trips do not. In addition, visitors on overnight trips will generally have to purchase more food during their trip (in restaurants or grocery stores) compared to day-use visitors. Visitors who have not traveled far from home to the recreation location usually spend less money than visitors traveling longer distances, especially on items such as fuel and food. Analysis of spending patterns has shown that a good way to construct segments of the visitor market with consistent spending patterns is to use the following seven groupings:

1. local visitors on day trips,
2. local visitors on overnight trips staying in lodging on the national forest,
3. local visitors on overnight trips staying in lodging off the national forest,
4. non-local visitors on day trips,
5. non-local visitors on overnight trips staying in lodging on the national forest,
6. non-local visitors on overnight trips staying in lodging off the forest, and
7. non-primary visitors (visits to the Uwharrie NF were not the primary destination for the visit).

The Table below shows the distribution of visits by spending segment (data from the National Forests in North Carolina NVUM Report, 2008).

Distribution of National Forest Visits^a by Spending Segment^b on the Croatan and Uwharrie National Forests

	Non-local Segments			Local Segments			Non-Primary ^c	Total
	Day	Overnight on NF	Overnight off NF	Day	Overnight on NF	Overnight off NF		
Percent of National Forest Visits ^a	1.28	11.00	2.95	72.67	3.86	0.0024	8.24	100

^a A National Forest visit is defined as the entry of one person onto a national forest to participate in recreation activities for an unspecified period of time. A National Forest Visit can be composed of multiple Site Visits.

^b The market segments shown here relate to the type of recreation trip taken. A recreation trip is defined as the duration of time beginning when the visitor left their home and ending when they got back to their home. "Non-local" trips are those where the individual(s) traveled greater than approximately 50 miles from home to the site visited. "Day" trips do not involve an overnight stay outside the home, "overnight on-forest" trips are those with an overnight stay outside the home on National Forest System (NFS) land, and

“overnight off-forest” trips are those with an overnight stay outside the home off National Forest System land.

° “Non-primary” trips are those where the primary recreation destination of the trip was somewhere other than the national forest under consideration.

The table shows that almost three quarters of the visits to the Croatan and Uwharrie NFs are people on day trips away from home, nearly all from local area residents. Over 17 percent of the visitors spend the night while on their trip. Most that spend the night in the area do so in Forest Service campgrounds, rather than in other lodging. Also, according to data from the 2008 NVUM Report, about half of the visiting parties spend \$30 or less per party per visit. Just over 43 percent of the visiting population comes from households in the \$50,000 to \$74,999 range; around 27 percent come from households in the \$25,000 to \$49,999 range.

Federal Expenditures and Employment

Expenditure Data – A forest budget was estimated for each alternative, and these estimates were used for forest expenditures, some of which had local economic effects. The proportion of funds spent by program varied by alternative according to the themes emphasized for that alternative. Forest Service employment was estimated by the forest staff based on examination of historical Forest Service obligations.

Use of the Model – To obtain an estimate of total impacts from Forest Service spending, salary and non-salary portions of the impact were handled separately. Non-salary expenditures were determined by using budget object code information from the National Finance Center. This profile was run through the model for non-salary expenditures per one million dollars, and the results multiplied by total forest non-salary expenditures. FEAST was again used to make the calculations. Salary impacts result from forest employees spending a portion of their salaries locally. IMPLAN includes a profile of personal consumption expenditures for several income categories.

Revenue Sharing – Secure Rural Schools Payments

Expenditure Data – On October 3, 2008, the Secure Rural Schools and Community Self-Determination Act of 2000 was reauthorized as part of Public Law 110-343. The new Secure Rural Schools Act has some significant changes. To implement the new law, the Forest Service requested states and counties to elect either to receive a share of the 25-percent rolling average payment or to receive a share of the Secure Rural Schools State (formula) payment. A county electing to receive a share of the State payment that is greater than \$100,000 annually is required to allocate 15 to 20-percent of its share for one or more of the following purposes: projects under Title II of the Act; projects under Title III; or return the funds to the Treasury of the United States.

Use of the Model – Title I funds were allocated to roads and schools using the national expenditure profile for state/local government education (schools) and local model estimates for road construction. In IMPLAN, \$1 million of each profile was used to obtain a response coefficient for Title I Forest Service payments to impact area counties. A response coefficient for Title II funds was

Appendix B: The Analysis Process

estimated by running 1 million dollars through the Forestry Services Sector Title III funds are given directly to state and local governments.

APPENDIX C *EVALUATION OF POTENTIAL WILDERNESS ON THE UWHARRIE NATIONAL FOREST*

The Uwharrie National Forest has four potential additions to the Birkhead Mountains Wilderness totaling approximately 388 acres. The areas were evaluated for their potential wilderness suitability in three categories: capability (the qualities that make an area suitable or unsuitable for wilderness), availability (assessing the wilderness and non-wilderness resources and local demands on the area), and need (existence of other wilderness in the area and trends in use). All four areas are reported together in this evaluation due to their close proximity and similar characteristics

BIRKHEAD MOUNTAINS ADDITIONS - UWHARRIE NATIONAL FOREST

OVERVIEW

Location and Vicinity

The Birkhead Mountains Additions are located in Randolph County, NC in the northernmost Uwharrie National Forest. The additions are located approximately six air miles from Asheboro, NC. Access to U-1670 is from NC State Road 1186; U-1630 and U-1631 can only legally be accessed from the existing Birkhead Mountains Wilderness; and U-209/U-1705 is accessed via Trail 100 (Birkhead Mountain Trail) from the trailhead at State Road 1163.

Eastern Portion of Tract U-1670

Tract U-1670 (approximately 62 acres), was purchased by the USDA Forest Service (USFS) in 1993. Silver Run Creek runs through the eastern portion of the tract. Eleven acres in the western portion are managed for wildlife fields of cultivated plantings using mechanical equipment, which would disqualify that portion from consideration as wilderness (FSH 1909.12_71.11(2)). There is also a structure on the disqualified portion of the tract. The qualified eastern portion is approximately 51 acres in size.

Tract U-1630

Tract U-1630 (approximately 2.6 acres) was acquired by the USFS through exchange in 1987. Betty McGees Creek borders the tract on the west.

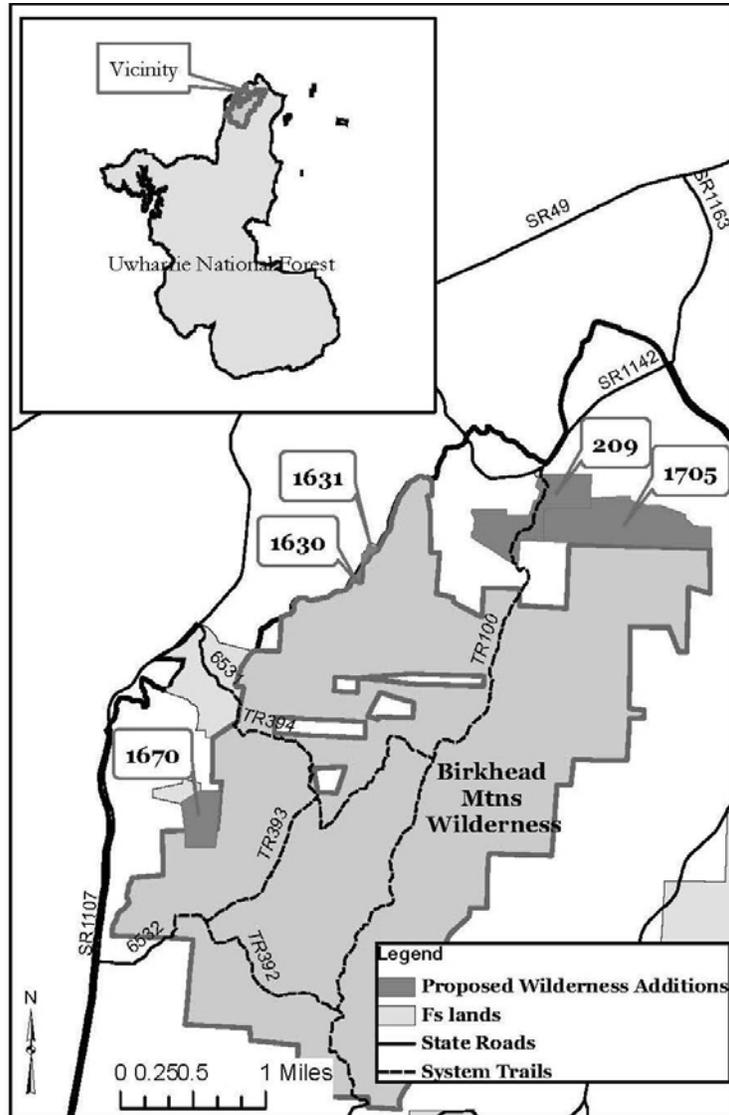
Tract U-1631

Tract U-1631 (approximately 4.5 acres) was acquired by the USFS through exchange in 1987. Betty McGees Creek borders the tract on the east. This tract occurs outside of the National Forest Proclamation Boundary.

Tracts U-209 and U-1705

Tract U-209 is approximately 140 acres and Tract U-1705 is approximately 190 acres. Tract U-209 was purchased by the USFS in 1942. Talbotts Branch runs through the eastern portion of U-209. Tract U-1705 was purchased by the USFS in 2005 and connected Tract U-209 with the existing Birkhead Mountains Wilderness. Betty McGees Creek runs through the center of this tract.

Figure C-1. Birkhead Mountains Potential Additions



Current Use

These areas are primarily used for dispersed recreation activities. Hunting, fishing, and hiking all take place in or around the area. Current recreational uses are along Trail 100 (Birkhead Mountain Trail) in Tract U-209. It has been observed by District staff that Tract U-209 is commonly mistaken

as already being part of the Congressionally designated wilderness due to its proximity to the Birkhead Mountains Wilderness and lack of vegetation management activities.

Appearance of the Area and Characteristics of Surrounding Contiguous Areas

Silvicultural data is unavailable for these tracts in part due to recent acquisition; however vegetation is typically Oak-Hickory in the uplands and Piedmont Alluvial Forest in the drainages. The eastern portion of Tract U-1705 appears to have had some recent agricultural or timber activity (from 1998 aerial infra-red photography) plus evidence of past habitation, while the western portion is densely forested. Old roadbeds are still visually evident in Tracts U-209, U-1705, and U-1670. There are no records of timber extraction on the remaining tracts; however, Tract U-1670 includes two wildlife fields totaling approximately 11 acres on its western side and not considered as potential for wilderness addition; on its southeastern side an approximately 51 acre portion (immediately adjacent to the wilderness boundary) is densely forested. Each tract has common boundaries with private property.

WILDERNESS CAPABILITY

Natural Integrity of the Area

The area is comprised of Oak-Hickory hardwood forest types in the uplands and Piedmont Alluvial forest types in the drainage areas. There have been no Forest Service timber sales in any of the areas, however there appears to have been recent agricultural or timber extraction activity on the eastern portion of Tract U-1705 (from 1998 aerial infra-red photography), which was acquired by the USFS in 2005. Tract U-1670 contains two wildlife fields that total approximately 11 acres on its western side and are maintained by the North Carolina Wildlife Resource Commission (NCWRC) and not considered for potential wilderness addition; the southeastern side is forested up to the wilderness boundary and is approximately 51 acres in size. A non-native invasive species inventory has not occurred in the area. There is a known occurrence of *Amorpha schwerinii* (Piedmont indigo-bush), a Region 8 Sensitive Species, in the western portion of Tract U-1705.

Undeveloped Character

Tracts U-1630, U-1631, U-209, the western portion of U-1705, and the qualified southeastern portion of U-1670 possess little to no evidence of human habitation and contain no permanent improvements. The eastern portion of Tract U-1705 contains road surfaces and vegetation management activities which occurred prior to USFS acquisition in 2005 as well as an old structure; however no USFS activity has taken place since the tract was purchased and the land is regaining a natural, untrammeled appearance.

Opportunity for Solitude, Challenge, and Primitive Recreation

The Birkhead Mountains Addition areas total approximately 388 acres in size, which prevents them from meeting criteria as a stand-alone designated wilderness. They are located entirely on National Forest lands and are potential additions to the Birkhead Mountains Wilderness. A solitude core

area refers to the semi-primitive recreation opportunity spectrum (ROS) setting identified within the potential additions. A solitude core area has not been identified.

Special Features

There is a known occurrence of *Amorpha schwerinii* (Piedmont indigo-bush), a Region 8 Sensitive Species, in the western portion of Tract U-1705.

Size, Shape, and Manageability

The size of the potential additions is approximately 388 acres, which would be an eight percent increase in the size of the Birkhead Mountains Wilderness. Each of the tracts has a common boundary with private property and would pose challenges in wilderness management as a result of residential development, agricultural production or logging, and possible non-native species introduction. The private land to the west of tract U-209 has been developed as a golf course.

Boundary Conditions, Needs, and Management Requirements

Boundary locations of adjacent private lands are easily locatable and are on the Uwharrie NF's maintenance schedules.

AVAILABILITY FOR WILDERNESS

Wildlife

The western portion of Tract U-1670 is not considered available for wilderness. It contains wildlife openings on just over 11 acres. These are managed by the NCWRC, one of our partners, to provide early successional habitat for increased hunting opportunities of game species such as white-tailed deer, eastern wild turkey, quail and rabbits. This management also provides increased habitat for non-game species such as songbirds, birds of prey, various insects and many small mammals. The opportunity these openings provide is unique for the Uwharrie NF because it is located away from the more developed recreational areas providing a more remote hunting experience. Additionally, these openings are on the northern part of the Uwharrie NF which has less of this type of hunting opportunity than the more heavily managed central and southern portions of the forest. The plan for these openings is to continue to provide early successional habitat. If these fields were to be lost they would need to be replaced by openings in a similar forest setting and location; however, very limited opportunities exist for new openings on this part of the forest.

The four potential wilderness additions are available for wildlife that favors more closed canopy, older forest conditions.

Recreation

These tracts are primarily used for dispersed recreation activities, such as hunting, fishing, and hiking. There are no permanent recreation facilities within the tracts. Trail 100 (Birkhead Mountain Trail) winds through Tract U-209 and is accessed via the trailhead on State Road 1163.

Water Availability and Use

Silver Creek, Betty McGees Creek, and Talbotts Branch are the primary water sources in the area. There are no special use water wells or spring boxes. Water quality should remain the same if designation occurs or not.

Livestock, Timber, and Minerals

There are no current grazing permits on these tracts.

The areas are predominately Oak-Hickory hardwood types in the uplands and Piedmont Alluvial Forests in the drainages. Tracts U-1670 and U-209 are currently suitable for timber production. Tracts U-1630, U-1631, and U-1705 were never assigned a management area in the 1986 Plan. Wilderness designation would remove this acreage from the available timber base and general forest management area.

Gold mining occurred in the area in the past. There is no current mining activity occurring in the area. The federal government owns the mineral rights within these areas. Some rock hounding occurs in the area.

Cultural/Heritage Resources

There are 2 NRHP sites in Tract U-209 and 4 known unevaluated sites in Tract U-1705.

The other tracts have no known sites.

WILDERNESS NEED

The concept of wilderness is multifaceted as envisioned by the authors and framers of the 1964 Wilderness Act. As such, there are a number of factors to consider in assessing the need for additional wilderness.

Outdoor recreation is one of the benefactors of wilderness and is one of the drivers of wilderness demand. According to trend data collected from 1965 to 1994, the trend in recreation visits to National Forest Wilderness has paralleled designations and has increased over time (Cordell, 1999).

In addition to recreation in wilderness, there is a non-user component that values wilderness and is important to understand when analyzing potential wilderness areas, allocations, and the need for additional wilderness. Studies have shown that the non-visiting general public values the knowledge that natural environments exist and are protected. This motivation can be considered an existence benefit. The current generation also obtains the off-site benefit on knowing that protection today will provide Wilderness to future generations. Existence and bequests motivations are sometimes referred to as non-use or passive use benefits. Several studies have shown the importance and value people place on these passive use benefits of wilderness (Cordell, 1999). These values are reflected in the National Survey on Recreation and the Environment (NRSE, 2001) finding that 69.8% of those surveyed agreed or strongly agreed to the question, "How

do you feel about designating more federal lands in your state as wilderness?” Over 96% agreed or strongly agreed with the statement, “I enjoy knowing that future generations will be able to visit and experience wilderness areas.” Wilderness, as designated by Congress and managed by the USDA Forest Service was not explained, so the interpretation of “wilderness” is open to further discussion.

The National Forests in North Carolina manage approximately 102,640 acres of Congressionally designated Wilderness, or approximately 8% of National Forest lands in the state. Additionally, the US Fish and Wildlife Service manages approximately 8,785 acres of the Swanquarter Wilderness in North Carolina. The 5,025 acre Birkhead Mountains Wilderness is the only designated wilderness within the Piedmont area of North Carolina.

ENVIRONMENTAL CONSEQUENCES

See Chapter 3 of the EIS.

APPENDIX D *WILD AND SCENIC RIVERS*

The Wild and Scenic Rivers (WSR) Act of 1968 established the National WSR System.

This appendix describes the rivers on the Uwharrie NF that were found to be eligible for possible designation in the National Wild and Scenic River System. See FSH 1909.12 – Land and Resource Management Planning Handbook, Chapter 80 – Wild and Scenic River Evaluation was the guiding document for this analysis.

BARNES CREEK

Description

The National Rivers Inventory (NRI) identified a total of nine miles as potentially eligible for designation, beginning at the confluence with the Uwharrie River (River Mile 0) and continuing to the headwaters one mile above the Montgomery County line (River Mile 9). One hundred percent of the identified segment lies within the National Forest Proclamation Boundary and 3.9 miles of the stream flow through National Forest System lands. There is a total of 5.5 miles of shoreline along Barnes Creek that border National Forest lands. Of the 3,548 acres included in the ¼ mile wide corridor along each side of the identified segment, approximately 1,039 acres (29%) are National Forest System lands.

There are no impoundments along the identified segment.

The shoreline is largely undeveloped and is a mixture of undeveloped forest and agricultural land. Forest management practices include logging and wildlife openings are evident within the stream corridor.

Portions of Barnes Creek are paralleled by road and there are six road crossings. The remainder of the stream is accessible by foot only and the Uwharrie National Recreation Trail.

State of North Carolina Division of Water Quality Classifications for Barnes Creek

Class C

Waters protected for secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival, and maintenance of biological integrity, agriculture and other uses suitable for Class C. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized or incidental manner.

Outstanding Resource Waters (ORW)

Supplemental classification intended to protect unique and special waters having excellent water quality and being of exceptional state or national ecological or recreational significance. To qualify, waters must be rated Excellent by DWQ, and have one of the following outstanding resource values:

1. Outstanding fish habitat or fisheries,
2. Unusually high level of water based recreation or potential for such kind of recreation,
3. Some special designation such as N.C. Scenic/Natural River, or National Wildlife Refuge,
4. Important component of state or national park or forest; or
5. Special ecological or scientific significance (rare or endangered species habitat, research or educational areas.)

All ORWs are HQW by supplemental classification

ELIGIBILITY

Description of Values

Scenic: Barnes Creek is the largest tributary of the Uwharrie River within the National Forest Proclamation Boundary, averaging 9 meters in width. About 90% of the stream consists of slow moving pools with bedrock or boulder bottom (Menhinick, 1984). It is shallow, but streamflow is sufficient except that the upper parts may become dry during droughts. Fairly steep bluffs overlook portions of the stream. The forest cover is typically mixed hardwood and pine with a variety of understory species. Some unusual plants have been recorded near the bluffs. One Special Interest Area – Barnes Creek Bluffs - is recognized in the corridor.

Class B (Common) is assigned to the scenic values.

Recreational: Current recreational use is limited to some fishing in the lower three miles. The stream depth and volume is not sufficient for boating.

Class C (Minimal) is assigned to the recreational values.

Geologic: The stream provides little or no exposure to the piedmont group of formations. The stream bank and surrounding corridor are almost entirely vegetated.

Class C (Minimal) is assigned to the geological values.

Fish and Wildlife: Barnes Creek supports a diversity of fish species including three game fish and one intolerant darter. Seventeen species have been collected from the stream, which is a large number of species for a medium sized stream in the piedmont region. An unusually high diversity of aquatic macro invertebrates have been collected at one site. The benthic macro invertebrate community contains some very intolerant species and a number of disjunct records for typically montane species

The lower Yadkin-Pee Dee River basin contains six Significant Aquatic Habitats (SAHs), as identified by the North Carolina Natural Heritage Program (NCNHP) (reference North Carolina Department of Environment and Natural Resources 2003 and North Carolina Department of Environment and Natural Resources: Division of Water Quality 2006). These areas support known populations of 17

(25%) of the 69 rare aquatic species with suitable habitat across the Uwharrie NF. Six additional rare aquatic species that do not receive some level of protection by the Uwharrie NF occur within one or more of these SAHs.

Substantial portions of the Little River/Densons Creek and Uwharrie River/Barnes Creek/Caraway Creek SAHs flow through the Forest. These Significant Aquatic Habitats are critical to maintaining aquatic species diversity across the Forest, and within the lower Yadkin-Pee Dee River Basin. For example, of the 23 rare aquatic species occurring within SAHs, 16 (70%) are known to occur within the Little River/Densons Creek and/or Uwharrie River/Barnes Creek/Caraway Creek SAHs.

There is potential to reintroduce rare mussels into the Uwharrie River/Barnes Creek/Caraway Creek SAH.

Class A (Distinctive) is assigned to the fish and wildlife values.

Historic and Cultural: Barnes Creek has a high probability for archeological and historical sites, which is typical of the entire Uwharrie National Forest. There are five known sites on National Forest lands, one of which may qualify for listing on the National Register of Historic Places. However, none of these sites are located in or along the riverbed and are not known to be integrally associated with the creek.

Class B (Common) is assigned to the historical and cultural values.

River Eligible for Designation

Barnes Creek has been determined to be eligible for designation under the Wild and Scenic Rivers Act because it is free flowing and has been determined to have outstandingly remarkable fish and wildlife values.

Because Barnes Creek has been determined to be eligible for designation, it is necessary to determine the potential classification that would result from classification. The entire nine miles qualify for classification as Recreational.

Other Factors Considered

Private Land: Private lands account for 71% of the acreage within the river corridor. The land is generally undeveloped forest land or is used primarily for agriculture or forestry purposes and is owned by numerous individuals.

Public, State, and Local Interest: Barnes Creek is not listed by the State of North Carolina for consideration as a State Natural and Scenic River or a State Water Trail. Since the last planning period, it has been classified as an Outstanding Resource Water (waters of exceptional state or national recreational or ecological significance and exceptional water quality). No public comment

was made during the planning process specifically concerning this stream and its possible designation.

Land Use Changes: Land and water uses within the national forest would change if the river was legislatively designated. Some resource management practices could be restricted or require modification.

UWHARRIE RIVER

Description

The National Rivers Inventory (NRI) identified a total of 61 miles as potentially eligible for designation, beginning at the confluence with the Pee Dee River (River Mile 0) and continuing to the headwaters south of the town of High Point (River Mile 61). Only 29% of the identified segment lies within the National Forest Proclamation Boundary. There is a total of 5.4 miles of shoreline along the Uwharrie River that borders National Forest System lands. Of the 5,107 acres included in a ¼ mile wide corridor along each side of the identified segment within the Forest proclamation boundary, only approximately 1,404 acres (27%) are National Forest System lands.

There are no impoundments along the identified segment of river.

The shoreline through National Forest is undeveloped with some evidence of forest management practices including logging. The shoreline through private land is a mixture of undeveloped forest, agricultural land, and residential development.

Several short segments of the Uwharrie River are paralleled by roads and there are three road crossings. Forest Service Road 555 provides some views of the river. Two trails, TR713 (River Trail) and TR390 (Daniel ORV), are within the ¼ mile corridor. TR713 is a Trail Class 3 Pack and Saddle trail and TR390 is a Trail Class 3 ATV trail. The remainder of the river is accessible by foot only.

State of North Carolina Division of Water Quality Classifications for the Uwharrie River

Class B (from the point the Uwharrie River enters the National Forest Proclamation Boundary to the mouth of Dutchman's Creek)

Waters used for primary recreation and other uses suitable for Class C. Primary recreational activities include swimming, skin diving, water skiing, and similar uses involving human body contact with water where such activities take place in an organized manner or on a frequent basis.

WS-IV (From the mouth of Dutchman's Creek to Lake Tillery, Pee Dee River)

Waters used as sources of water supply for drinking, culinary or food processing purposes where a WS-I, WS-II or WS-III classification is not feasible. These waters are also protected for Class C uses. WS-IV waters are generally in moderately to highly developed watersheds or Protected Areas.

Class C (From the mouth of Dutchman's Creek to Lake Tillery, Pee Dee River)

Waters protected for secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival, and maintenance of biological integrity, agriculture and other uses suitable for Class C. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized or incidental manner.

ELIGIBILITY

Description of Values

These descriptions are for the section of river within the National Forest Proclamation Boundary only.

Scenic: The Uwharrie River is a slow moving stream with some ripples that averages about 20 feet wide and has a medium depth. The surrounding terrain is typical piedmont rolling hills with some steep slopes and rock outcrops in the river curves. The forest cover is generally mixed hardwood and pine with common understory species. Two unique vegetative communities are recognized as Special Interest Areas: (1) Uwharrie River Boundary Bluffs, and (2) Uwharrie River Slopes. Five distinct vegetative communities that are associated with different parts of the slope, rock outcrop, and floodplain can be observed here.

Class A (Distinctive) is assigned to the scenic values.

Recreational: Current recreational use is limited to fishing, canoeing, and kayaking. The Uwharrie River is one of sixteen or more piedmont rivers that provide canoe and kayaking opportunities.

Class B (Common) is assigned to the recreational values.

Geologic: The section of the Uwharrie River in Montgomery County flows through bedded argillites of the Carolina Slate Belt. These layered volcanic "slates" are exposed in places, with major exposures occurring only on steep bluffs at curves in the river. These formations are typical to the piedmont and offer some opportunity for geologic study.

Class B (Common) is assigned to the geologic values.

Fish and Wildlife: The Uwharrie River supports a typical sport fishery. The area provides habitat for wildlife species typical of the Forest.

The lower Yadkin-Pee Dee River basin contains six Significant Aquatic Habitats (SAHs), as identified by the North Carolina Natural Heritage Program (NCNHP) (reference North Carolina Department of Environment and Natural Resources 2003 and North Carolina Department of Environment and Natural Resources: Division of Water Quality 2006). These areas support known populations of 17 (25%) of the 69 rare aquatic species with suitable habitat across the Uwharrie NF. Six additional rare aquatic species that do not receive some level of protection by the Uwharrie NF occur within one or more of these SAHs.

Substantial portions of the Little River/Densons Creek and Uwharrie River/Barnes Creek/Caraway Creek SAHs flow through the Forest. These Significant Aquatic Habitats are critical to maintaining aquatic species diversity across the Forest, and within the lower Yadkin-Pee Dee River Basin. For example, of the 23 rare aquatic species occurring within SAHs, 16 (70%) are known to occur within the Little River/Densons Creek and/or Uwharrie River/Barnes Creek/Caraway Creek SAHs.

There is potential to reintroduce rare mussels into the Uwharrie River/Barnes Creek/Caraway Creek SAH.

Class A (Distinctive) is assigned to the fish and wildlife values.

Historic and Cultural: The Uwharrie River has a high probability for archeological and historical sites, which is typical of the entire Uwharrie National Forest. The confluence of the Uwharrie River and Dutchman's Creek contains the highest density of Class A sites on the Uwharrie National Forest. There are thirty known sites, nineteen of which may qualify for listing on the National Register of Historic Places. Two of these sites are located along the riverbed.

Class A (Distinctive) is assigned to the historical and cultural values.

The Uwharrie River has been determined to be eligible for designation under the Wild and Scenic Rivers Act because it is free flowing and has been determined to have outstandingly remarkable scenic, historical, and cultural values.

Because the Uwharrie River has been determined to be eligible for designation, it is necessary to determine the potential classification that would result from classification. The entire 61 miles qualify for classification as Recreational.

Other Factors Considered

Private Land: Private lands account for 96% of the acreage within the entire river corridor. The land is generally undeveloped forest land or is used primarily for agriculture or forestry purposes and is owned by numerous individuals.

Public, State, and Local Interest: The Uwharrie River is one of only 160 rivers in the nation that meets National Park Service criteria for a National River Park. It is listed by the State of North Carolina for consideration as a State Natural and Scenic River. It is not being considered for a State Water Trail. Public comments received during the planning process clearly indicate the importance of the river for water-based recreation, canoeing in particular. The North Carolina Heritage Program has recommended the Uwharrie River Slopes for registration as a natural area.

Land Use Changes: Land and water uses within the national forest would likely change if the river was legislatively designated. Some resource management practices could be restricted or require modification.

CEDAR CREEK, DUTCHMAN'S CREEK, ROCKY CREEK

These creeks were analyzed in 1988 and determined to not be eligible for designation under the Wild and Scenic Rivers Act because they did not have outstandingly remarkable values (Decision Notice for Interim Protection for Wild and Scenic River Study, 1989). No public comment was made during the planning process concerning these streams and their possible designations. No new information has been received that would lead to reconsideration of the 1988 determination.

